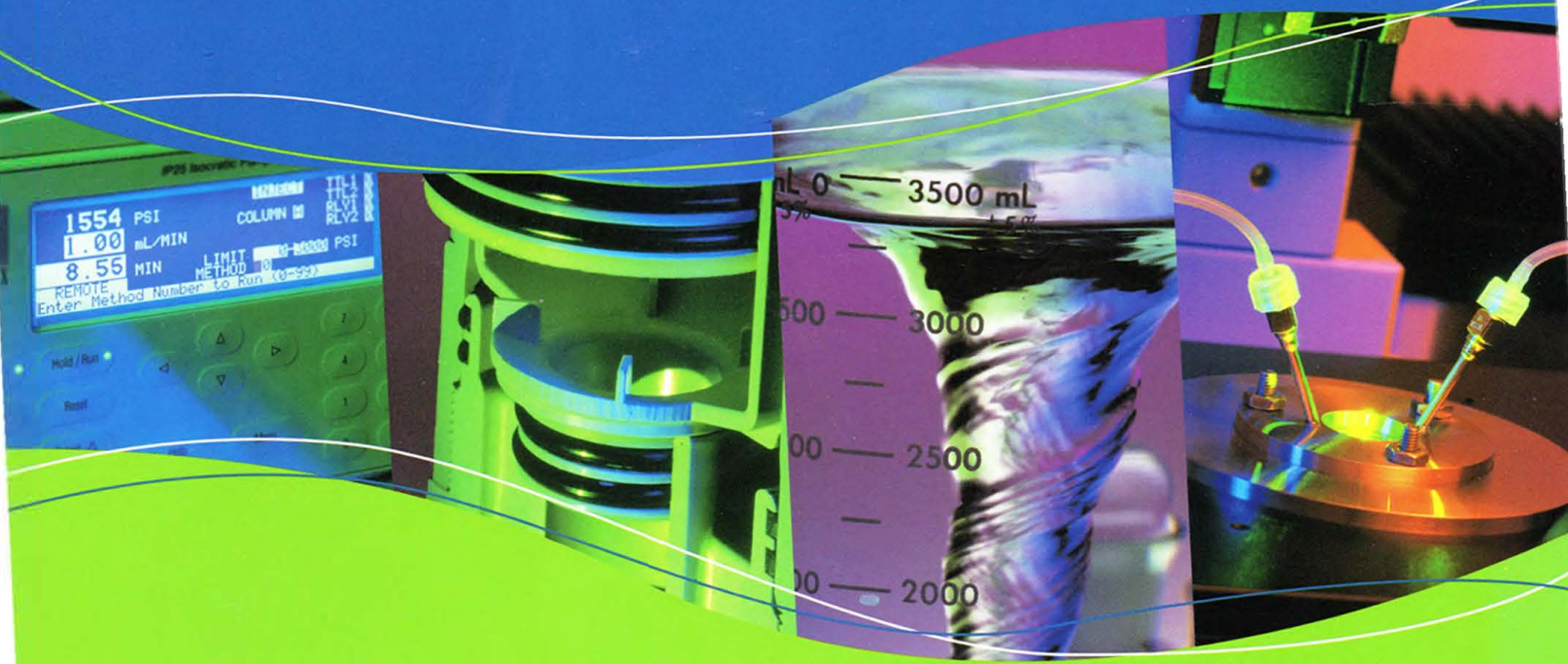
water

the future of
orange county



orange county water district

2000-2001 annual report

mission

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It is the mission of the

Orange County Water District

to provide local groundwater

producers with a reliable,

adequate, high-quality water

supply at the lowest

reasonable cost.

letter from the general manager

No one can guarantee that we won't have droughts or challenges to Orange County's water supply in the future. What we can guarantee is that Orange County's water agencies are planning for the County's long-term welfare and pursuing visionary ways to prevent potential "water-outs."

Less than a year ago, who would have believed that our electrical energy supply would be in jeopardy? Who would have suspected that the leading economic state in the world's leading economic country would have power blackouts like a war-torn or underdeveloped country? As remarkable as it may seem, it happened here in California and it happened here in Orange County. Recently, a respected journalist from a major California newspaper commented on the "energy crisis," saying it was caused by a series of short-sighted decisions based on day-to-day budget considerations without any visionary or long-term planning input. Many say that the water industry could be in the same fix because California has not significantly increased the State's water supply in the last forty years.

No one can guarantee that we won't have droughts or challenges to Orange County's water supply in the future. What we can guarantee is that Orange County's water agencies are planning for the County's long-term welfare and pursuing visionary ways to prevent potential "water-outs."

Metropolitan Water District of Southern California (MWD) provides Orange County with imported water from Northern California and the Colorado River. Faced with possible and known cutbacks in future imported supplies, MWD has been aggressively and proactively initiating groundwater storage projects, water conservation projects, water reuse projects, a new reservoir, and new water transfer projects. MWD has also been investigating new technologies to provide future reliability throughout its Southern California service area, including Orange County. Municipal Water District of Orange County,

MWD's representative for providing imported water to most of Orange County, is engaged in a major study of how to provide future water reliability for the southern part of Orange County, which lacks the abundant supply of groundwater enjoyed by north and central Orange County.

Orange County's retail and city water agencies are also looking ahead to ensure that they can meet Orange County's future water demands from population growth, resulting primarily from our families having families. Agencies like Mesa Consolidated Water District are building water treatment facilities to remove color from high-quality groundwater that has been stained over many years by ancient redwood forests that stood where Orange County's groundwater basin now lies. Orange County cities like Tustin and Orange, and water agencies like Irvine Ranch Water District, have projects to clean up the groundwater basin from past agricultural and industrial practices. All Orange County water agencies are planning and participating in infra-structure improvements and water conservation efforts to ensure that our current and future supplies go farther.

OCWD and the Orange County Sanitation District are moving forward with one of the most visionary water efficiency and reliability projects in the world. The Groundwater Replenishment System will take highly treated sewer water, and through the high-tech membrane technologies of microfiltration, reverse osmosis and ultraviolet disinfection, produce near-distilled quality water to replenish OCWD's groundwater basin. This project will provide water that is drought proof, and the project can be expanded to help meet Orange County's future water needs.



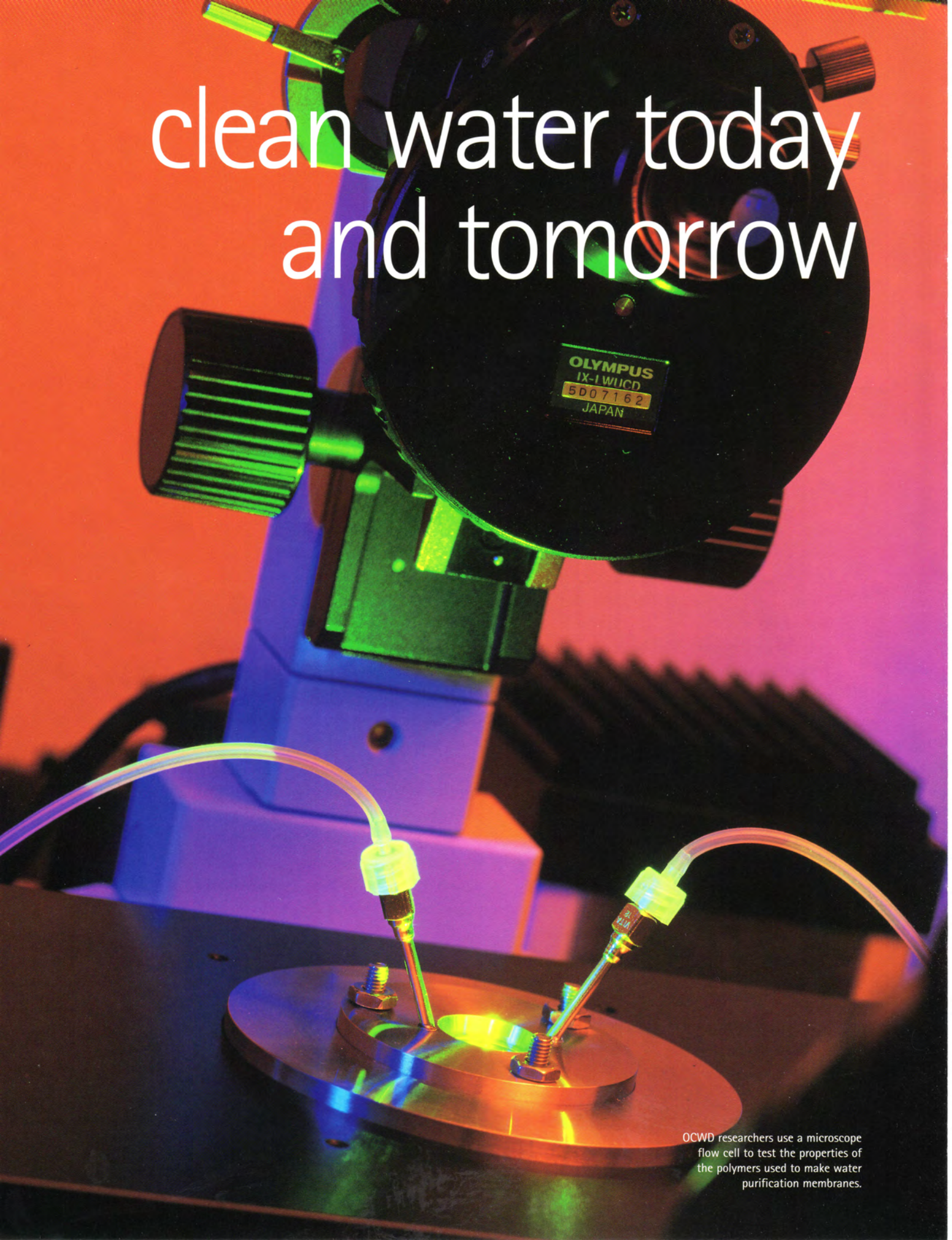
Even in the upper watershed, in the Counties of Riverside and San Bernardino where the Santa Ana River flows en route to Orange County, efforts are underway to clean up groundwater basins, restore habitat and create wetlands. The goal of the Santa Ana Watershed Project Authority (SAWPA)—a group of four upper watershed water agencies and OCWD— is to improve the long-term water reliability of the watershed that includes Orange County.

I hope we have shared an important message—not only from this letter, but from this entire Annual Report—that Orange County Water District and its fellow water agencies and organizations are dedicated to ensuring that everything humanly possible is being done to provide a reliable water future for Orange County. This water planning will sustain our enviable lifestyle, our future economy, our environment and the drinking water of our grandchildren's grandchildren. We are here to serve you and we are doing it with efficiency, safety and, of course, vision.

William R. Mills Jr.

William R. Mills Jr., P.E.
General Manager

clean water today and tomorrow



OCWD researchers use a microscope flow cell to test the properties of the polymers used to make water purification membranes.

You Can Trust Your Water's Quality

"Your water meets or exceeds water quality standards." You've probably heard this statement before, but what does it mean? In the United States, all tap water is regulated by the U.S. Environmental Protection Agency (EPA). Some states, like California, choose to oversee their state's drinking water on behalf of the EPA, and the EPA must approve the state program to be as stringent as the federal standards. In California, the California Department of Health Services fills the role of overseeing drinking water standards. You should be pleased to know that generally California has led the nation in implementing regulations to protect our state's drinking water. Over the past decade, federal standards have caught up with many of California's more stringent standards. Water quality standards are called a "maximum contaminant level," or MCL. MCLs are levels at which drinking water is safe. No water in Orange County is served that exceeds any MCLs.

Primary water quality standards are set for contaminants that may present two different types of threats: chronic (can be a threat to health only when ingested over a period of 70 years) and acute (can be a threat to health within a short time of exposure). Standards for acute and chronic threats are based on scientific data that have been well reviewed.

But the nature of a chronic threat requires a thoughtful and thorough method of setting standards. This method starts with an occurrence study to determine how widespread and at what levels a contaminant is found. Next, research is done to estimate and evaluate health effects at different levels of ingestion. Research is also conducted to determine the best type of laboratory analytical method to reliably and consistently detect the contaminant. The available treatment and the cost to remove the contaminant are also considered. When all the data come together, water quality standards for chronic threats are set at a safety level where, for example, after consuming 2 liters of water per day for 70 years, there may be one additional cancer case per one million people.

Drinking water in California is among the most highly regulated and safest in the world.

Secondary water quality standards are not related to health, but to aesthetics, and include elements like minerals that can affect the taste, color and odor of the water.

One example of California leading the nation is in regard to new contaminants of concern. When a new contaminant is found, before the EPA sets an MCL, California sets an "action level" to protect and inform the public. While an action level is not enforceable, the reality is that no water retailer in Orange County would serve its customers water above an action level.

All of these points emphasize the fact that drinking water in California is among the most highly regulated and safest in the world.

≈ On behalf of the local water retailers, OCWD implements a monitoring program to comply with California's requirements for regulated and unregulated contaminants. "Regulated" refers to those contaminants with a maximum contaminant level (MCL) and "unregulated" refers to contaminants that are being studied to determine whether or not they should be regulated.

OCWD's monitoring program looks for a wide range of possible contaminants, including organic (herbicides, pesticides, solvents) and inorganic materials (minerals, salts, metals, color, odor). OCWD conducts monitoring programs on behalf of the local water retailers to meet new monitoring requirements implemented by the California Department of Health Services and the U.S. Environmental Protection Agency. To be on the safe side, health officials are always looking for possible new contaminants.

We're Monitoring and Testing Your Water's Quality



Copper tubes hold water samples used to trace and study the flow of Santa Ana River water through the groundwater basin. OCWD water quality staff crimp the tubes as water flows through to allow no air in the water sample, which is sent to Lawrence Livermore National Laboratory for testing. Studying water flow through the groundwater basin helps OCWD better understand the basin for water quality purposes.

While most of the monitoring programs exist to comply with state and federal requirements, OCWD implements additional monitoring programs for the purpose of groundwater management. These programs are designed to give OCWD an advance warning of potential problems so that corrective action to protect Orange County's water supply can be taken before there is a problem. OCWD worries about water quality so Orange County residents don't have to.



Chemists in OCWD's state-certified laboratory use sophisticated instruments to test groundwater samples and protect public health.

≈ OCWD's state-certified water quality laboratory has been at the forefront of developing testing methods to detect possible new contaminants in drinking water. In the late 1990s, OCWD discovered that the gasoline additive MTBE (methyl-tertiary butyl-ether) had leaked into the ground and into shallow groundwater in some parts of Orange County. Even before MTBE was well known as a water contaminant, OCWD developed a testing method to detect MTBE at very low levels. With so many leaking gasoline stations and underground storage tanks in Orange County, OCWD aggressively monitors for MTBE to detect a problem before it reaches a drinking water well. Fortunately, a thick underground clay layer helps protect most of the groundwater basin from this surface contamination of MTBE.

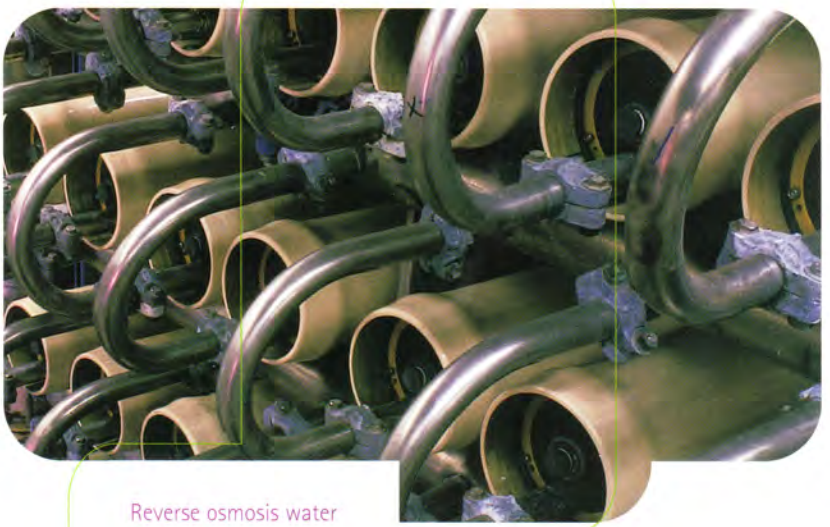
Surmounting Challenges to Provide High-Quality Water

Perchlorate—a new chemical of concern—is another example of OCWD testing well before the state or federal regulatory agencies required it. For all these contaminants, OCWD has not seen a problem to date and is aggressively monitoring the groundwater basin to protect public health and safety.

Making sure the public receives accurate, timely and correct information about the safety of tap water is a continuing challenge for water utilities. Recent movies and news coverage about suspected water contamination can incorrectly fuel fears of unsafe water supplies. Orange County water utilities and other water agencies around the state and across the nation annually report the quality of our highly regulated, safe drinking water supply. In fact, since 1989 the California Department of Health Services has required that local retail water providers report water quality information to their customers. Ten years later, beginning in 1999, the U.S. Environmental Protection Agency required a similar annual water quality report, now called "consumer confidence reports." OCWD's employees and their families drink Orange County's tap water too, and we mutually pledge to serve only water that is safe for all of our families.

Holding Back the Ocean

≈ Seawater contamination of drinking water occurs in Orange County because of underground connections between the ocean and our groundwater basin. When the water level in the basin's aquifers is below sea level, seawater travels inland and contaminates the drinking water supply. To prevent this seawater intrusion, OCWD manages two seawater intrusion barriers. These barriers consist of a series of injection wells that force water underground to create a freshwater dam, keeping the ocean out of Orange County's drinking water supply.



Reverse osmosis water purification membranes at OCWD's Water Factory 21 are the final step in turning wastewater into near-distilled quality water (meeting and surpassing drinking water requirements). This water is injected into the groundwater basin to prevent seawater contamination of Orange County's drinking water. Reverse osmosis water purification systems are used by many bottled water companies to produce their products.

Talbert Barrier

Keeping saltwater out of Orange County's drinking water is no easy task, and it became even more difficult in 2000 because of OCWD's discovery of NDMA (n-nitrosodimethylamine) in two drinking water wells near OCWD's Talbert Seawater Intrusion Barrier. NDMA is a suspected cancer-causing compound found in nature, cosmetics, milk, beer, lunchmeat, and yes—even water. When OCWD found NDMA in the purified injection water used to prevent seawater intrusion, OCWD immediately went to work with health officials to deal with this new discovery.

OCWD adjusted the operation of Water Factory 21, its water purification plant, to reduce NDMA to safe levels in its product water and added ultraviolet light to the treatment process to further reduce NDMA. As a result, OCWD was able to inject only 10,000 acre-feet during 2000. Although this was less than the 17,000 acre-feet that OCWD had planned to inject, it was a significant increase from the 6,000 acre-feet injected in 1999. As Orange County increases its use of groundwater, even more injection water will be needed in the future.

The year 2000 saw the rehabilitation of six seawater barrier injection wells—in operation since the 1970s—to increase their injection capacity. To ensure the wells are still working, OCWD installed automated pressure-reducing valves—to regulate the optimal amount of water injected—at two well sites. Based on the results of those tests, additional wells may be retrofitted with these new valves. OCWD also drilled three new injection wells on the east end of the seawater barrier to provide additional injection capacity. Environmental documents have been filed for two injection well sites planned on the west end of the barrier.

OCWD initiated a small-scale test to simulate the performance of the injection wells. The test will evaluate the reasons that wells become clogged over time, and will examine methods to reduce natural fouling or clogging of the wells over time, which reduces injection capacity.

Alamitos Barrier

The Alamitos Seawater Intrusion Barrier, along the Orange County/Los Angeles County line, grew by nine new injection wells and a pipeline extension to deliver more water to the new wells. Because the underground water flow of this barrier is highly complex, OCWD manages this barrier on a monitoring basis. This means that new wells are added, their effectiveness is measured, and additional injection wells are added on an as-needed basis. The Alamitos Barrier has gradually increased in size since it was first constructed in 1965, and now consists of 44 injection wells—all because Orange County continues to use more groundwater every year.

Ensuring a Clean Groundwater Basin

Orange County's history is one of agriculture turning into industry. Both have contributed to Orange County's growth, and both have contributed to historical isolated pockets of contamination in Orange County's groundwater basin. The remnants of agricultural practices using high-nitrate fertilizers as well as industrial uses of solvents or volatile organic compounds (VOCs) can be found in small parts of our groundwater basin. OCWD takes the monitoring and cleanup of these contaminants very seriously, because cleaning it up today means it won't spread and impact tomorrow's groundwater.

During 2000, OCWD completed feasibility studies to remove VOC contamination originating from solvent spills from industrial areas in Anaheim and Fullerton. OCWD's Board of Directors approved construction of a project to clean up shallow groundwater areas, to begin in spring 2001, which will include monitoring wells, extraction wells and wellhead treatment systems. The project is scheduled to be on line in 2002, and could operate for 20 years to ensure that area of the basin is cleaned up.

To support the investigations of local cities, Santa Ana Regional Water Quality Control Board and the County of Orange Health Department, OCWD has been monitoring for the impact of methyl-tertiary butyl-ether (MTBE), the additive that makes gasoline burn more cleanly. Most of Orange County's groundwater basin has a clay layer that protects the water below from the immediate threat of MTBE, but the long-term threat of this contaminant remains until leaks from underground gasoline tanks are cleaned up.

≈ As more and more people populate the planet, the character of our "natural" water systems is changing. More highly treated wastewater is being returned to streams, lakes and rivers. This is also true in California with the Santa Ana, Northern California and Colorado Rivers that serve Orange County.

We Know It's Safe and It Works!

Because the Santa Ana River is the primary source of replenishment for Orange County's groundwater basin, OCWD is taking the testing of its water quality to a higher level. Since 1996, OCWD has retained a panel of thirteen internationally renowned experts—a who's who in the worlds of water quality, engineering, public health, microbiology and toxicology. This panel has been reviewing research results and providing recommendations for future research as OCWD develops testing and surveys to determine the impact of recharging water from the Santa Ana River into Orange County's groundwater basin to ensure public health and safety.

Called the Santa Ana River Water Quality and Health Study (SARWQH), it represents a major effort by OCWD to continue to ensure the safety of Orange County's drinking water. Results of the study show that groundwater replenished by the Santa Ana River meets all water quality and safety standards—maximum contaminant levels and action levels set by the state and federal government.

As the study progresses, panel members continue to direct research to look at every possible effect on water quality. Study areas that have been completed include hydrogeologic studies to understand rates and direction of underground water movement, nature of water quality, quality of storm water runoff into the river and changes in the characteristics of water of wastewater origin. Especially interesting has been a test to determine the feasibility of using fish as a tool to monitor water quality.

The study will be concluded in 2002, but the panel's recommendations continue to shape OCWD's ongoing water quality monitoring programs.

Groundwater replenished by the Santa Ana River meets all water quality and safety standards.



OCWD diverts more than half of the flow of the Santa Ana River through a constructed wetlands behind Prado Dam. The wetlands creates the perfect environment for the natural removal of nitrates from the river before the water reaches Orange County's groundwater basin.

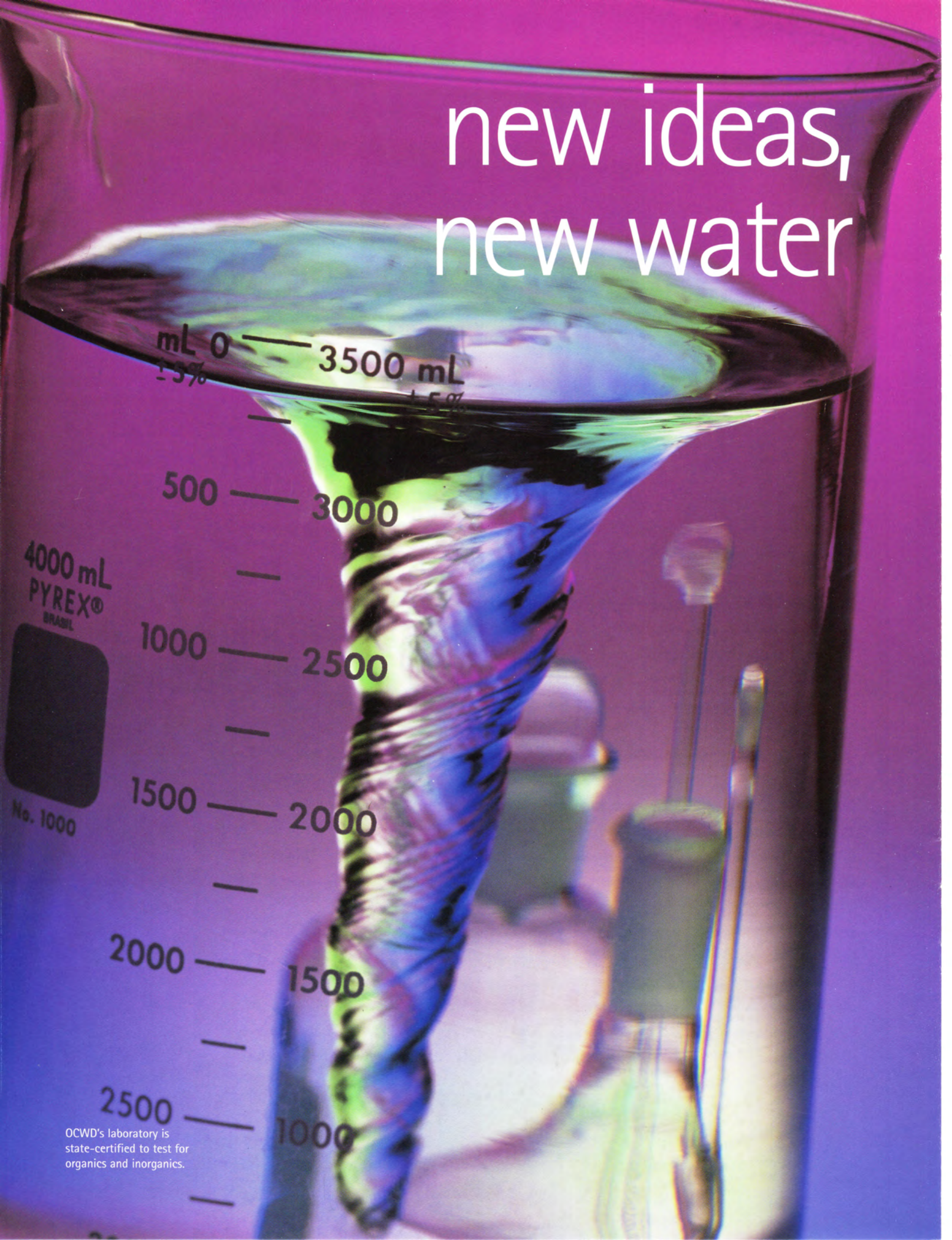
≈ The Santa Ana River is vitally important to Orange County's water supply—about 70 percent of the water used to replenish the groundwater basin comes from the Santa Ana River. But the biggest impacts on Santa Ana River water—both positive and negative—occur upstream of Prado Dam.

Natural Solutions to Man-made Problems

Since 1992, OCWD has been naturally treating Santa Ana River flows by running the water through 500 acres of natural wetlands to take out nitrates that are added in the upper watershed. Nitrates are a result of upstream wastewater discharges to the river as well as current and past agricultural practices.

OCWD's Board of Directors established a goal in 2000 of constructing new wetlands so that all of the day-to-day or non-storm flows of the Santa Ana River can be naturally treated prior to percolation. This past year an area above the current wetlands—which treats 60 percent of Santa Ana River flows—was identified and a feasibility study is underway that could provide an area for new wetlands. Additional investigations are underway to route creeks that feed the Santa Ana River behind Prado Dam through similar wetlands treatment.

During 2000, OCWD led a team of several water agencies, dairy farmers, and environmental groups in a demonstration project to construct engineered wetlands on a dairy in the Chino Dairy Preserve. With a State Clean Water Act grant of approximately $200,000, the engineered wetlands takes dairy wash water that is high in nitrates and naturally treats the water by passing it through a biological film grown at the base of plants in the wetlands. If the demonstration project proves successful, the goal is to transfer this technology to dairy sites around the State of California. Preliminary results indicate that the wetlands—actually on site at a dairy—is effective at removing nitrates.



OCWD's laboratory is state-certified to test for organics and inorganics.

At about one-third the cost of imported water, it's no wonder that local retail water providers pumped more water out of the ground during the 1999-2000 water year than any previous year. As North and Central Orange County's economy and population grow, so does water use. And when the most economical, high quality water is groundwater, it makes sense that local water utilities will seek to optimize its use.

Our Growing Thirst

During the water year that ran from July 1999 until June 2000, groundwater use in Orange County reached an all-time record of 384,000 acre-feet, or 125 billion gallons. The eight percent increase over the previous year's groundwater use can be attributed to Orange County's expanding population and economy, to the relatively low rainfall received during the year, and to new wells and pumps that came on line during the year.

For the first time ever, average groundwater use exceeded 75 percent of water demand within OCWD. To assist local water utilities in maximizing their use of this economical supply, OCWD sponsors projects to increase pumping capacity. OCWD's program to provide water utilities with low-interest loans to build new wells has been very effective. The program, which ended in May 2001, has financed 28 new wells to date, with a total production capacity of 70,000 gallons per minute.

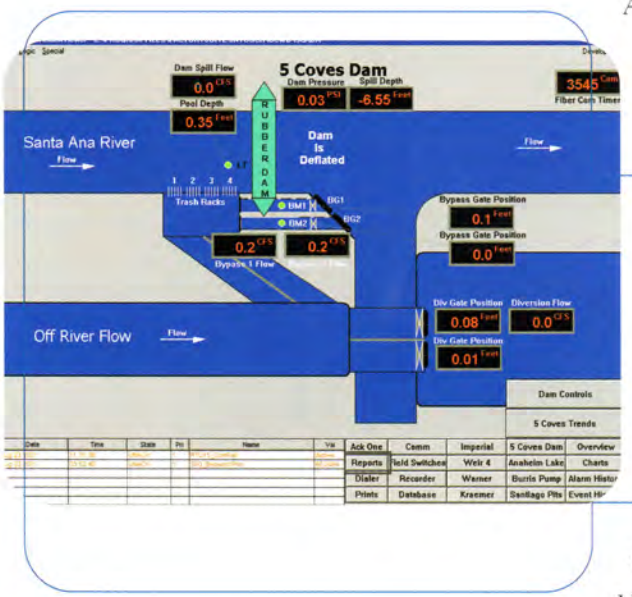
Current projections show that, with proper management programs, groundwater pumping could increase to 480,000 acre-feet per year by 2020. There are challenges ahead to meeting this future water demand. But with continued investment in cost-effective capital improvement projects, OCWD is confident that the groundwater basin can stay ahead of demand and continue to provide a reliable, high-quality water supply.

With continued cost-effective capital improvement projects, OCWD is confident that the groundwater basin can stay ahead of demand.

Saving for a Not-so-rainy Day

≈ From July 1999 through June 2000, the last water year, arid Orange County received a little more than eight inches of rain. The normal rainfall for the region is about thirteen inches.

During the same water year, OCWD replenished approximately 317,000 acre-feet of water. This groundwater replenishment consisted of 194,000 acre-feet of Santa Ana River flows, augmented by imported replenishment water purchased from Metropolitan Water District of Southern California. Several thousand acre-feet was also injected into the Talbert and Alamitos Seawater barriers. Natural replenishment from rainfall provided an estimated 77,000 acre-feet of additional water.



Using a computer, OCWD operators are able to divert water from the Santa Ana River to various percolation basins in Anaheim and Orange. Water filtered through the ground under OCWD's percolation basin replenishes Orange County's groundwater basin.

OCWD has entered into a contract with San Bernardino Valley Municipal Water District to bring water into Orange County for replenishment from the Bunker Hill area of San Bernardino, where high groundwater threatens to damage property.

For the past two years, OCWD's Replenishment Enhancement Working Group has met to generate new, practical ideas to cost-effectively increase OCWD's groundwater replenishment capacity. Dr. Herman Bouwer, one of the world's leading water percolation or recharge experts, provides advice and counsel to the group.

OCWD successfully tested a new underground system, called the Subsurface Collection and Recharge System (SCARS), to get water into the groundwater basin. The system consists of an array of standard and perforated pipes that move water underground from an area that does not percolate well to an area where it does percolate well—where the underground environment allows water to easily filter into the deep aquifers. The genius of the system is that it allows for normal aboveground use of the land—for example, a park, parking lot or other use—while percolation is going on below. The success of this project could provide OCWD with more flexibility in the future to find additional ways to put water into the groundwater basin to meet Orange County's ever-increasing water needs.

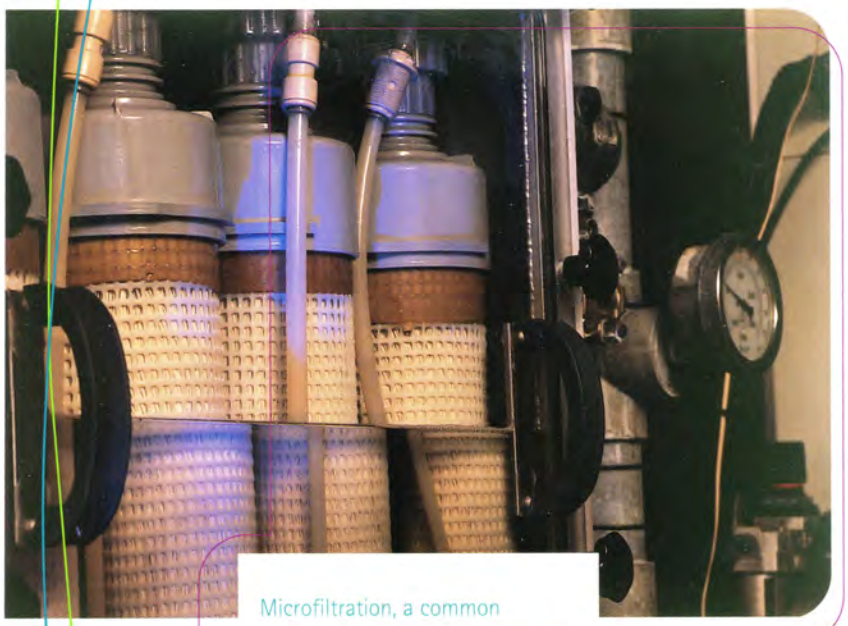
Other areas of replenishment research include chemical and computer analyses of the processes and ingredients that make up the clogging layer that develops over time at the bottom of percolation ponds. Depending on the amount of clay, silt and other material in the Santa Ana River, a hard, two-inch clogging layer of material develops at the bottom of the lakes, slowing down the amount of water seeping into the deep aquifers. A new Santa Ana River laboratory is planned to be operational at OCWD's Anaheim field headquarters in 2001. Methods to reduce the clogging layer will be the major focus of the laboratory's research efforts.

Finally, OCWD continues to look for areas for new percolation ponds along the Santa Ana River in Anaheim and Orange. To conduct a percolation test of an area of District-owned land in Orange, OCWD excavated a test pond to find out whether the land would provide a conduit to the deep aquifers. The results indicated that an engineering study to determine the feasibility of the project was warranted. Because the land was leased to the River Trail Stables, a parallel effort is underway to find a new location for the stables, possibly in the Prado Dam area.

Setting the Mark for the World

≈ Year 2000 was a milestone year for the nation's largest membrane water purification project. In March 2000, the passage of California's Proposition 13 brought $37 million to help fund this project. The Groundwater Replenishment System is a water purification project that will take highly treated sewer water and—using microfiltration, reverse osmosis and ultraviolet disinfection processes—create near distilled quality water to help lower the mineral content of the area's groundwater and meet future increased water needs. On March 28, 2001, in a historic decision, the Boards of Directors of the Orange County Water District and the Orange County Sanitation District (OCSD) overwhelmingly voted to move forward and to begin detailed design of the first Phase of the Groundwater Replenishment System to produce 78,000 acre-feet per year of purified water.

Another major project landmark was the completion of the Groundwater Replenishment (GWR) System's project development phase. Literally thousands of project details were assessed and defined in terms of cost and implementation. Every part of the project was evaluated, from the water purification process to the conveyance system that will transport the water to an OCWD percolation basin in Anaheim. Other important factors addressed were the location of additional injection wells to expand the size of the seawater intrusion barrier, the site layout for the advanced treatment facility on the current campuses of OCWD and OCSD, the computer monitoring and control systems and staffing for the project. In the end, a large thirty-one-volume document was created that contains the 30-percent design drawings and technical specifications to be used for the final design of the GWR System. The project staff also received nearly all the permits required for the project.



Microfiltration, a common purification method for medicines, food products and beverages such as fruit juices, is now being brought to the water treatment industry. The hollow membranes (they look like tiny hollow straws) inside each vessel pretreat the water before the final purification stage of reverse osmosis. Water is pushed through microscopic pores in the sides of the membrane tubes, leaving contaminants on the outside of the membrane.

A water quality study requested by the City of Anaheim was also completed. The study was conducted by some of the nation's leading water quality experts and found that the water produced by the Groundwater Replenishment System is as good as any other water supply available to Orange County for replenishing its groundwater basin.

In the fall of 2000, public outreach was stepped up, giving the public opportunity to comment on the project prior to the vote to continue with final design. Four public workshops were held in strategic locations throughout the county and backed by both advertisements in major and neighborhood Orange County newspapers and over 60,000 postcards and letters to voters, homeowner associations and medical doctors. The workshops provided the public an opportunity to learn more about the project and to provide feedback to both agencies. Attendees came away from the workshops with a greater understanding of the needs for and benefits of the Groundwater Replenishment System.

As the state of California began to feel the impacts of a severe energy crisis brought about by factors such as market deregulation, lack of forward planning, few new power generation facilities, and a shortage of natural gas, Groundwater Replenishment System planners were able to demonstrate the project's energy savings over importing water from areas outside Orange County. The energy savings for Phase I of the project—78,000 acre-feet per year of new water—would be about 140 million kilowatt hours, or enough energy savings to serve about 21,300 Orange County homes for one year. The Groundwater Replenishment System is a model of the type of forward thinking and planning that should be part of the State's future energy and water programs. The project also continued to receive Federal financial support in the form of an additional $2 million from Congress.

≈ Located as it is in arid Southern California, Orange County would be a desert without man's intervention in the water supply. As families grow and more businesses move into Orange County, water agencies must find ways to encourage the people of Orange County to use less water today so there will be an ample supply for the future.

Along with the Municipal Water District of Orange County, Orange County Sanitation District and Anaheim Public Works Department, OCWD participates in a Water Use Efficiency and Conservation Steering Committee to help coordinate conservation and water efficiency efforts of Orange County water agencies.

Waste Not, Want Not

As part of this steering committee, OCWD has committed to replacing thousands of older toilets in Orange County homes with new ultra low-flow toilets through 2005. The program provides toilets—valued at $120 each and highly rated by consumer groups—to residents free of charge. This program will save 1,275 acre-feet of water per year, which will result in a cost savings of $190,000 to OCWD each year. Old toilets are crushed, recycled and used as road fill.

In addition, OCWD spearheaded a Hotel/Motel Water Efficiency Program in Orange County that provides water conservation cards to place in guest rooms. With the support of the Municipal Water District of Orange County, Metropolitan Water District of Southern California, Orange County Sanitation District and several retail water agencies, over 70 percent of Orange County hotels and motels—equating to more than 30,000 guest rooms—participate in this type of conservation program today.

The program—provided free of charge to Orange County hotels and motels—offers guests the option of using their towels and bed linens more than once during their stay. Benefits of this program include saving thousands of gallons of water every year, reducing energy costs incurred during the wash cycle, reducing labor costs and decreasing the amount of detergents used and therefore released into the environment.

More than 70 percent of Orange County's hotels and motels are participating in OCWD's or their own conservation program.

Will Our Predictions Come True?

≈ Pumping patterns cause groundwater levels in various parts of the basin to rise and fall. OCWD staff completed the development and application of OCWD's groundwater flow model in December 2000 to help track the impacts of these changes on retail groundwater users. The computer model breaks down the basin into three-dimensional units like building blocks. It will help hydrogeologists to more accurately simulate potential future groundwater flow conditions and help OCWD increase the reliability of the groundwater basin by showing the effect a changed condition would have on the basin. In anticipation of increased groundwater pumping demands by 2020, this model will help OCWD plan for future pumping and basin management programs to ensure maximum protection and yield from the basin.

Using MODFLOW, a groundwater modeling computer software program developed by the U.S. Geological Survey, and OCWD's own Water Resources Management System, the three-layer groundwater computer model will track fluctuations in the water flow during changing conditions in the groundwater basin. The previous, less detailed groundwater models grouped many layers of the basin into one layer. The new model uses three separate layers to represent the shallow, principal and deep aquifers in the basin. The top layer includes the uppermost 200 feet of the basin; the middle layer represents the principal layer where nearly 90 percent of basin groundwater production occurs; and the bottom layer represents the deep aquifer, which includes zones containing colored water in the coastal areas of the basin. Wells placed strategically throughout the basin are able to monitor and record changes to the basin from various natural and human-induced stresses—like droughts and pumping. This information then becomes part of the data for the model so that the changes can help predict future water movement in the basin.

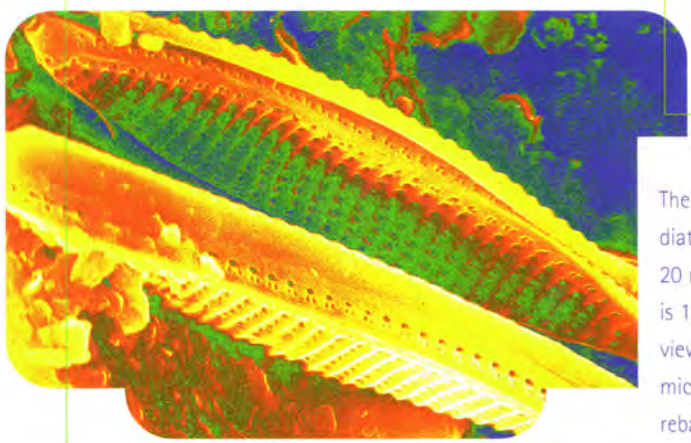
As its next modeling priority, OCWD staff will develop and simulate various "drought" scenarios under a range of pumping and overdraft conditions. Following these modeling evaluations, OCWD staff will begin calibrating and refining the model's accuracy.

The groundwater model will help OCWD plan to ensure maximum protection and yield from the basin.

Uncharted Territory

≈ OCWD's water resources and technology department had a new beginning in 2000 with a directive from the Board of Directors to aggressively pursue outside funding for research activities. New grants totaling more than $300,000 were obtained. Staff also developed the MicroMemAnalytical.com website to provide specialized membrane analysis for private companies.

For several years, OCWD has been developing methods to detect the sources of ocean contamination. Developing molecular-biological (genetic) techniques to detect and identify waterborne disease-carrying bacteria was one of the major research efforts for 2000. With the causes of most waterborne illnesses requiring more research, OCWD experts believe molecular biology will allow direct measurement that was not previously possible of disease-causing bacteria. Once developed, these same techniques may also be used to detect and measure bacteria that, while not harmful to humans, may indicate water polluted by animals like dairy cows or seagulls.



The skeletons of microscopic diatoms—a form of algae that is 20 microns in length (one micron is 1/1000th of a millimeter)—are viewed through a scanning electron microscope. The diatoms act like rebar that holds silt together to form a clogging layer on the bottom of OCWD's percolation basins, slowing percolation. OCWD is looking for ways to effectively slow the formation of this clogging layer, allowing increased percolation.

The second major research activity has been a review of the performance of new water purification reverse osmosis membranes. Like the incredible advancement in microchip technology, the field of water purification using membrane technology is rapidly growing. With funding from the Desalination Research Innovate Partnership—a group of seven water agencies, University of California at Los Angeles and University of California at Riverside—OCWD evaluated a new chlorine-resistant reverse osmosis membrane. Chlorine-resistant membranes are important to the future of treating wastewater.

OCWD has become well known for its molecular modeling of water purification membranes. Molecular modeling is "virtual reality"—staff can create and test a proposed membrane polymer using a computer and investigate its potential properties in a lab before a membrane is even produced.

≈ Two years ago, OCWD patented an important part of an experimental, submersible vehicle similar to a pool cleaner. The Basin Cleaning Vehicle (BCV)—an underwater vehicle the size of a car—will continuously clean the bottoms of the percolation facilities, increasing the percolation rate of the lakes.

OCWD's New Navy

Each year, more water comes down the Santa Ana River and percolates into the groundwater basin through OCWD's percolation lakes in the areas of Anaheim and Orange. The Santa Ana River carries tons of silt, sand and clay. The silt is filtered out at the bottom of the lakes during the percolation process, creating a "clogging" layer that builds up and becomes hard like concrete when dry. This layer dramatically reduces the amount of water seeping into the groundwater basin.

In the current method of restoring percolation, water from the river is diverted away from a lake and the lake is allowed to dry out. Once the lake is completely dry, bulldozers enter the lake and scrape its sides and bottoms to remove the clogging layer. Not only has this been time consuming, but the amount of water that can percolate into the groundwater basin is reduced because the lake is empty for a period of about five weeks.



After the Basin Cleaning Vehicle enters a lake, the patented hood separates sand from silt, returning the sand to the lake bottom and sending the silt ashore via an umbilical hose for eventual use as landfill.

The BCV, now in its third prototype, is guided by a global positioning satellite and can enter the water on its own. The tracks on the bottom of the vehicle help the BCV move along a predetermined path at the bottom of the lake. As it moves, it vacuums up the sand, silt and clay on the bottom of the lake. Inside the vehicle, the silt and clay are separated from the sand. The sand is returned to the bottom of the lake while the silt and clay are pumped ashore for reuse as land fill.

Using the BCV will improve the percolation rate in a specific basin by nearly 30 percent, replenishing 22,640 acre-feet per year of additional water (enough water for 45,000 Orange County families and saving local water utilities as much as $5 million to $6 million each year in imported water costs). The BCV represents a major effort to increase the amount of Santa Ana River water we can put into the groundwater basin using our existing percolation ponds. It is a significant effort to ensure a future reliable water supply for local water utilities.

Old Resources Show New Capability

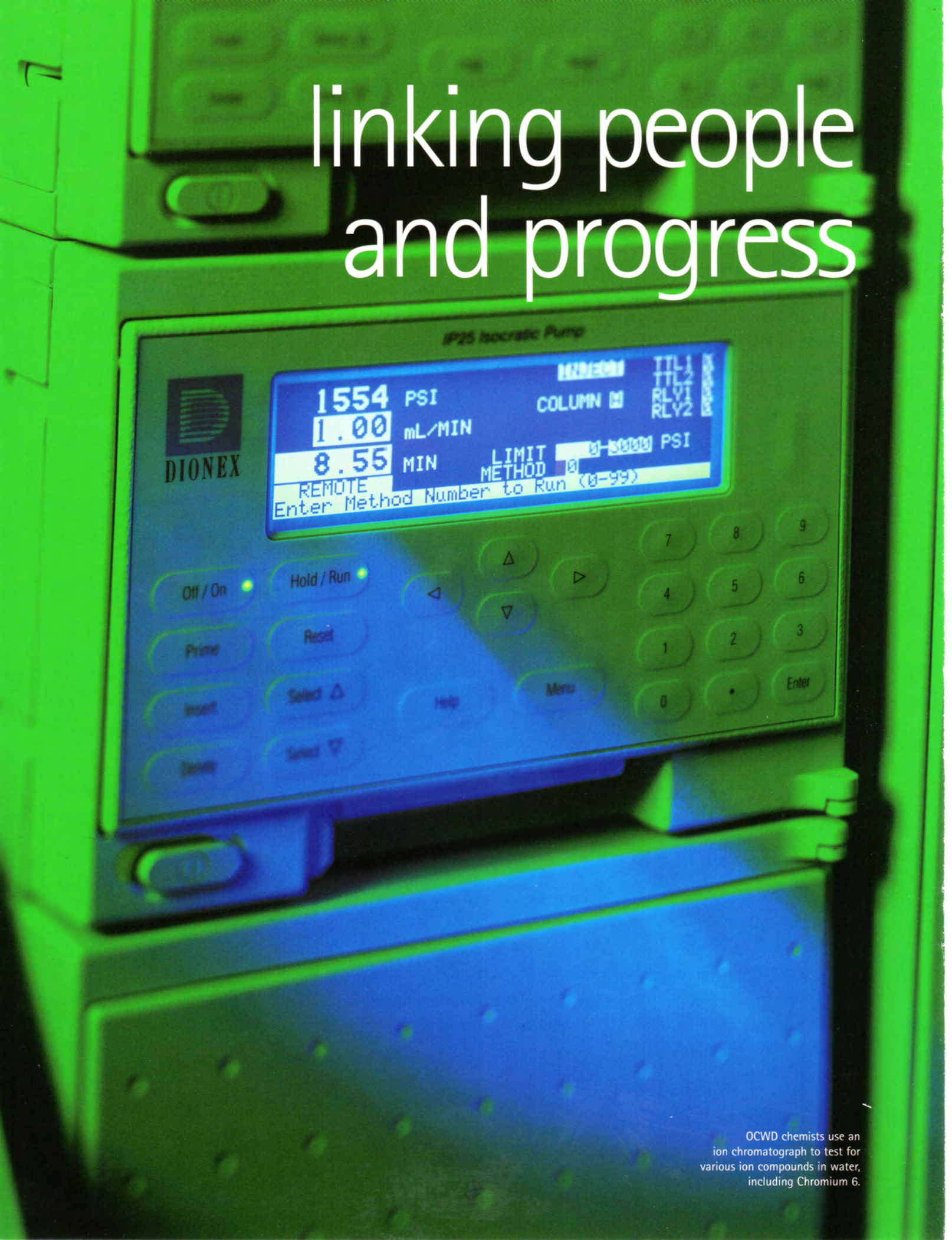
In an urban environment like Orange County, the land available for percolation is extremely expensive and severely limited. Geology shows that a protective clay layer covers much of the groundwater basin. Fortunately, areas of Anaheim and Orange have sandy soil that allows water to be captured from the Santa Ana River and naturally filtered and purified while refilling the groundwater basin.

After studying different locations in Orange County, results showed that Santiago Creek in Orange has the capability to percolate water. In fact, the study showed that up to 3,000 acre-feet of additional water could be replenished through the creek each year, saving about $750,000 in annual imported water costs. Using an existing replenishment system pipeline that passes near Santiago Creek, a simple modification was made to the pipe to allow water to be periodically discharged into Santiago Creek for replenishment.

In April 2000, the pipeline modification was completed. OCWD will use Santiago Creek both as an additional basin replenishment area during times of extreme rainy conditions and also during the cleaning of other replenishment basins when water needs to be diverted temporarily.

Areas of Anaheim and Orange have sandy soil that allows water to be captured from the Santa Ana River and naturally filtered and purified while refilling the groundwater basin.

linking people and progress



OCWD chemists use an ion chromatograph to test for various ion compounds in water, including Chromium 6.

Working Together for a Better Tomorrow

With a philosophy of cooperation, outreach and partnering, OCWD is able to carry out many successful community water education efforts. Whether hosting the nation's largest Children's Drinking Water Festival, or countywide water conservation projects like the free ultra low-flow toilet giveaway program or the hotel and motel water conservation program, the benefits of these projects seem to expand exponentially when more and more partners become involved.

A team of local government agencies including U.S. Fish and Wildlife Service and water agencies in Riverside and San Bernardino Counties came together to begin developing a plan for the recovery of the Santa Ana sucker fish, which was recently listed as a threatened species. The effort will hopefully lead to a plan to help restore the fish's dwindling population. A preliminary study conducted by the Orange County Flood Control District, the Los Angeles County Public Works Department and OCWD found that the quality of Santa Ana River water did not appear to be a factor as much as non-native predatory fish and a lack of rocky bottom areas, which are the preferred fish habitat for reproduction.

In addition to working with the Santa Ana Watershed Project Authority (SAWPA) on the State Water Bond that provided $37 million in grant funding for the Groundwater Replenishment System, OCWD was involved in SAWPA's completion of the first Chino Desalter. Desalters are water treatment plants that take undesired minerals and other materials out of the water. A second desalter has been initiated to clean up the Chino groundwater basin, which will eventually provide cleaner groundwater to the Santa Ana River at Prado Dam.

Working with the Irvine Ranch Water District (IRWD), the U.S. Navy and the City of Irvine, the Irvine Desalter Project was moved even closer to reality in 2000. Progress was made with the Department of the Navy to ensure support for groundwater cleanup, and IRWD and OCWD finalized their plans for the optimum treatment plant to address remediation of the portion of the groundwater basin underlying Irvine. Final plant design is scheduled for 2003, and startup and testing of the new water treatment facilities could take place in 2005.

OCWD provides support to the Orange County District Attorney's office in its efforts to expedite cleanup actions for the gasoline additive MTBE (methyl-tertiary butyl-ether) by the responsible petroleum industry firms at gasoline spills that threaten Orange County's groundwater supplies. Similar cooperation is provided to the Santa Ana Regional Water Quality Control Board in its efforts to ensure that dairies in the Chino Dairy Preserve are environmentally responsible with their wastes. OCWD also works with State and Federal legislators, the Association of California Water Agencies and others to ensure safe levels of certain contaminants in drinking water, like arsenic and radon.

Working with the National Groundwater Foundation, OCWD and the Blue Planet Foundation sent a ninth-grader from Acaciawood School in Anaheim to the National Groundwater Foundation's 2000 Youth Summit on Environmental Health. The student gained valuable information on protecting soil, water, air and habitat that she will share with her community.

≈ OCWD continued its tradition of active outreach and education to Orange County's community through press releases and media tours, water news summaries to legislative aides, community classes on Orange County's water supplies, booths at community events, tours of the Santa Ana River watershed and Northern California, tours of the Southland's largest constructed wetlands, and water purification plant and facility tours.

OCWD's Award-Winning Community Outreach

In May 2000, OCWD continued its partnership with the Disneyland Resort to present the award winning and nation's largest Children's Drinking Water Festival.This year's Festival grew to more than 5,000 students, teachers and parents, more than 50 organizations and agencies, and more than 150 citizen volunteers participating in the event. What continues to make the Festival such a success is the unique and innovative methods used to teach the students. Students learn about water because they're doing hands-on activities and having fun. They're involved, they're challenged, and they're excited. There is no other place children have access to more than fifty environmental experts in such a fun and energizing atmosphere. Results from the student's entries in the "What I Learned at the Festival" contest continue to show an increase in knowledge and understanding of the environment, water and local water resources. And more than 90 percent of the teachers who brought their classes to the Festival indicated that they would definitely bring their students back and feel it is a valuable learning experience. As a result, the Festival was honored in 2000 with the Orange County Environmental Award in the Government category.



More than 5,000 students, teachers, parents, presenters and volunteers participated in the 2000 Festival. The Festival—held each spring for Orange County third- and fourth-graders—features interactive displays and activities on the environment, water cycle, groundwater and surface water protection, wetlands preservation, recycling, pollution prevention and water treatment, distribution and conservation.

The Blue Planet Foundation

≈ With Orange County's growing population and future limits on imported water supplies, OCWD realizes that it is critical to teach the community about the value of protecting and conserving water resources to help ensure a healthy environment and sustain our economy. Through creative programs and interactive exhibits, we can not only inform, but also empower Orange County residents to protect our groundwater. This is especially true with children who are at an age where we can fuel their natural sense of wonder about the world around them and spark their innate desire to protect its resources.

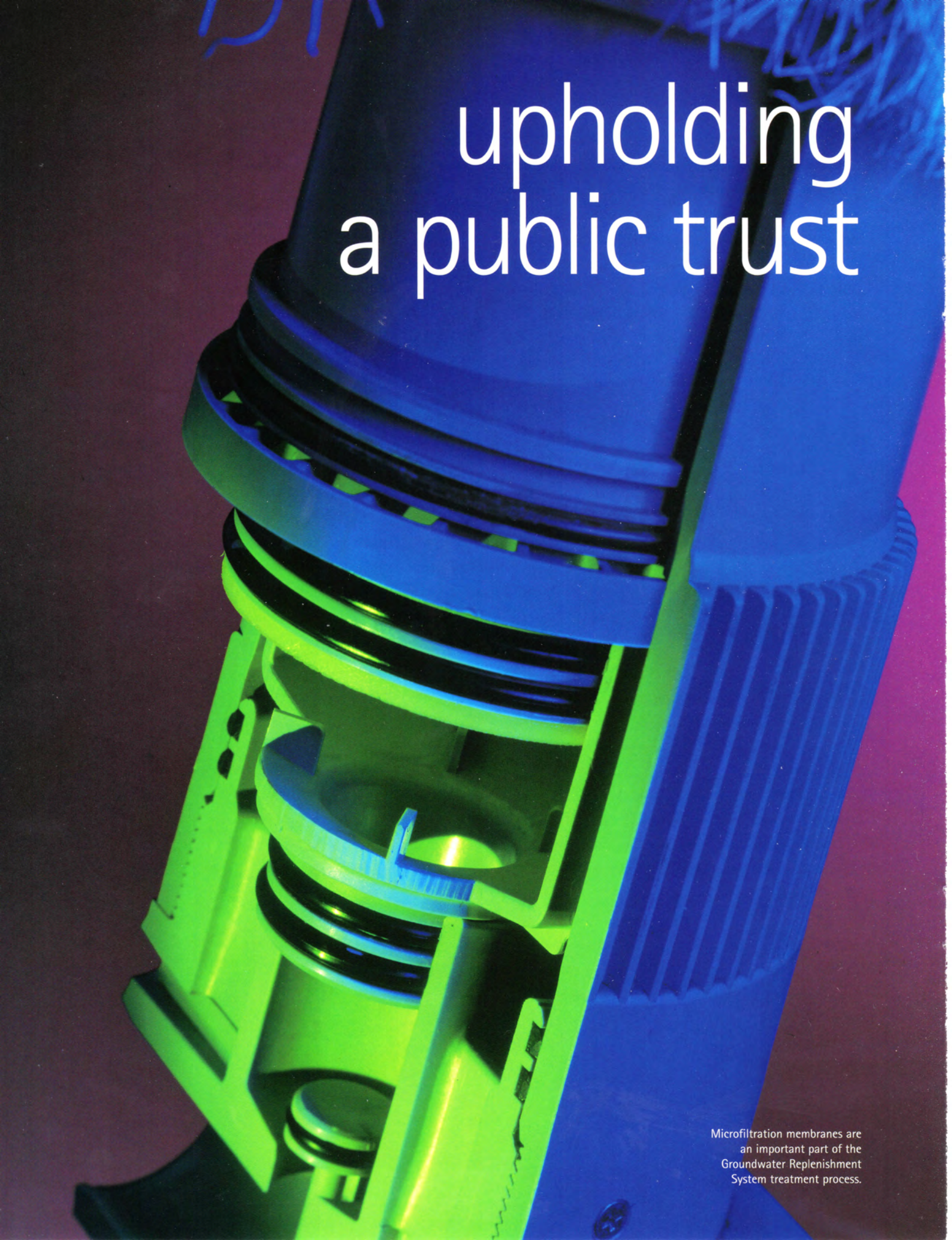
> It is critical to teach the community about the value of protecting and conserving water resources to help ensure a healthy environment and sustain our economy in the future.

This year OCWD became a major partner and the principal sponsor of the Blue Planet Foundation, a nonprofit environmental organization committed to protecting the environment, water supplies and especially, groundwater. This new partnership has enabled OCWD and the Blue Planet Foundation to expand their work with local community organizations and businesses to reach a broader audience with their innovative education programs on groundwater protection and water conservation.

Together OCWD and Blue Planet Foundation have increased the involvement and support of our local community in groundwater education programs. For example, during this year over $200,000 in grants, contributions and corporate sponsorships were received to implement groundwater education and public outreach projects. Some of the accomplishments include distributing more than 80,000 groundwater protection and water bookmarks to forty-one Orange County libraries (with funding from The Boeing Company); and providing 145 sixth-grade students the opportunity to participate in the Learning to Be WaterWise™ technology-based conservation education program (funded through a grant from the Metropolitan Water District of Southern California).

By continuing to build creative outreach programs tailored to the different segments of our community, OCWD can increase water awareness, improve local water quality, and realize our goal of educating these future water consumers to conserve our water supplies and protect our groundwater.

upholding a public trust



Microfiltration membranes are an important part of the Groundwater Replenishment System treatment process.

During the 2000-01 fiscal year, OCWD's reserve portfolio significantly outperformed the Local Agency Investment Fund managed by the State Treasurer. The portfolio—approximately $100 million—was managed internally by staff. The average rate of return for OCWD's portfolio was 6.53 percent.

To complement the increased earnings on the liability side of the balance sheet, OCWD's borrowing costs declined. OCWD has both variable rate Certificates of Participation and Commercial Paper programs in place. The interest rate that OCWD paid on this debt declined throughout the year, with debt trading as low as 1.5 percent. The combination of higher earnings and lower borrowing costs continues to keep groundwater costs lower.

OCWD is one of only four water agencies in the state of California to hold the prestigious AA/aa credit ratings from the rating agencies of Standard & Poor's and Moody's. OCWD retains high credit ratings because of its large groundwater reserves, excellent management practices, competitive price advantages and prudent financial reserve levels.

The higher credit ratings achieved by OCWD provide benefits to local water utilities because of the substantially lower interest payments OCWD will make on its current debt service, as well as lower bank fees for any future debt. Water utilities realize a tremendous savings in the cost of groundwater through OCWD's excellent credit ratings.

CONRAD AND ASSOCIATES, L.L.P.

CERTIFIED PUBLIC ACCOUNTANTS

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IRVINE, CALIFORNIA 92614
(949) 474-2020
Fax (949) 263-5520

Board of Directors
Orange County Water District
Fountain Valley, California

Independent Auditors' Report

We have audited, in accordance with generally accepted auditing standards, the general purpose financial statements of the Orange County Water District, as of and for the year ended February 28, 2001. In our report dated May 4, 2001, we expressed an unqualified opinion on those general purpose financial statements.

In our opinion, the information set forth in the accompanying condensed financial statements is fairly stated, in all material respects, in relation to the general purpose financial statements from which it has been derived.

Conrad and Associates, L.L.P

May 4, 2001

Orange County Water District

Combined Balance Sheet – All Fund Types and Account Groups

February 28, 2001

Assets and Other Debits	General	Special Revenue	Debt Service	Capital Projects	Trust and Agency
	Governmental Fund Types				Fiduciary Fund Type
Assets:					
Cash and investments	$ 3,799,248	57,056,303	1,304,193	23,921,610	34,655,072
Restricted cash and investments	-	-	5,506,577	-	-
Accounts receivable	434,618	1,783,204	-	453,136	91,300
Taxes receivable	-	-	495,246	-	-
Interest receivable	-	610,430	-	171,307	-
Loans receivable	-	-	-	-	1,214,112
Notes receivable	-	-	-	24,133,271	-
Due from other funds	68,545	58,179	-	320,347	1,065,547
Due from other governments	34,000	-	-	1,909,487	-
Deposits	5,786	-	-	151,763	-
Inventory	136,847	-	-	-	-
Prepaid items	66,956	-	-	-	-
Property, plant and equipment	-	-	-	-	-
Other debits:					
Amount available in debt service fund	-	-	-	-	-
Amount to be provided for payment of general long-term debt	-	-	-	-	-
Total assets and other debits	$ 4,546,000	59,508,116	7,306,016	51,060,921	37,026,031
Liabilities, Equity and Other Credits					
Liabilities:					
Accounts payable	$ 1,108,008	2,955,969	21,145	923,123	-
Accrued liabilities	718,717	-	-	-	-
Deposits payable	-	-	-	-	4,296,401
Retentions payable	-	45,186	-	93,600	-
Due to other funds	-	386,919	-	60,152	1,065,547
Other liabilities	-	-	-	-	-
Deferred revenue	-	720,000	-	24,502,070	-
Commercial paper	-	-	-	-	-
Certificates of participation	-	-	-	-	-
Loans payable	-	-	-	-	-
Other long-term debt	-	-	-	-	-
Total liabilities	1,826,725	4,108,074	21,145	25,578,945	5,361,948
Equity:					
Fund balances					
Reserved	1,924,608	1,139,518	7,284,871	8,285,948	31,664,083
Unreserved - designated	794,667	54,260,524	-	17,233,975	-
Unreserved - undesignated	-	-	-	(37,947)	-
Total equity	2,719,275	55,400,042	7,284,871	25,481,976	31,664,083
Other Credits:					
Investment in fixed assets	-	-	-	-	-
Total liabilities, equity and other credits	$ 4,546,000	59,508,116	7,306,016	51,060,921	37,026,031

Account Groups		Totals (Memorandum Only)	
General Fixed Assets	General Long-Term Debt	2001	2000
-	-	120,736,426	130,835,163
-	-	5,506,577	7,480,699
-	-	2,762,258	5,114,336
-	-	495,246	556,314
-	-	781,737	-
-	-	1,214,112	1,255,394
-	-	24,133,271	24,486,277
-	-	1,512,618	1,330,838
-	-	1,943,487	817,391
-	-	157,549	138,670
-	-	136,847	171,037
-	-	66,956	69,563
317,123,892	-	317,123,892	303,730,042
-	7,284,871	7,284,871	17,533,174
-	227,732,563	227,732,563	234,407,397
317,123,892	235,017,434	711,588,410	727,926,295
-	-	5,008,245	6,362,259
-	-	718,717	517,009
-	-	4,296,401	3,586,174
-	-	138,786	302,367
-	-	1,512,618	1,330,838
-	-	-	108,177
-	-	25,222,070	24,486,277
-	-	-	2,175,000
-	221,170,000	221,170,000	227,195,000
-	12,816,801	12,816,801	13,969,359
-	1,030,633	1,030,633	8,601,212
-	235,017,434	271,914,271	288,633,672
-	-	50,299,028	60,727,569
-	-	72,289,166	74,835,012
-	-	(37,947)	-
-	-	122,550,247	135,562,581
317,123,892	-	317,123,892	303,730,042
317,123,892	235,017,434	711,588,410	727,926,295

Orange County Water District

Combined Statement of Revenues, Expenditures and Changes in Fund Balances - All Government Fund Types

For Year Ended February 28, 2001

	Governmental Fund Types				Totals (Memorandum Only)	
	General	Special Revenue	Debt Service	Capital Projects	2001	2000
Revenues:						
Tax revenue	$ 439,014	-	10,269,131	-	10,708,145	10,439,549
Assessments	16,593,796	10,873,597	-	10,000,000	37,467,393	36,660,166
Basin equity assessments	-	2,612,094	-	-	2,612,094	3,514,101
Investment revenue	247,922	3,665,778	992,632	2,005,524	6,911,856	4,486,166
Rents and royalties	651,512	-	-	-	651,512	573,743
Facility revenue from other agencies	1,971,090	-	-	-	1,971,090	1,725,628
Project reimbursement revenue	-	-	-	4,743,700	4,743,700	2,214,511
Orange County bankruptcy recovery	-	-	-	-	-	10,136,094
Other revenues	210,982	61,201	26,023	2,032,494	2,330,700	2,996,544
Total revenues	$ 20,114,316	17,212,670	11,287,786	18,781,718	67,396,490	72,746,502
Expenditures:						
Current:						
General government	6,449,986	-	-	5,608,116	12,058,102	8,783,704
Water production	11,887,918	21,130,943	-	2,317,420	35,336,281	28,397,168
Basin improvement	3,269,614	-	-	5,708,162	8,977,776	7,240,868
Replacement/refurbishment	-	3,628,753	-	-	3,628,753	2,819,446
Debt service:						
Principal retirement	-	-	9,448,442	-	9,448,442	30,640,758
Interest and fiscal charges	-	-	12,087,647	-	12,087,647	11,254,457
Total expenditures	$ 21,607,518	24,759,696	21,536,089	13,633,698	81,537,001	89,136,401
Excess of revenues over (under) expenditures	(1,493,202)	(7,547,026)	(10,248,303)	5,148,020	(14,140,511)	(16,389,899)
Other financing sources (uses):						
State loan proceeds	-	-	-	95,885	95,885	380,577
Bond proceeds	-	-	-	-	-	42,939,199
Commercial paper proceeds	-	-	-	-	-	3,275,000
Operating transfers in	200,000	11,658,179	-	5,288,221	17,146,400	54,428,782
Operating transfers out	-	(12,158,179)	-	(4,988,221)	(17,146,400)	(54,428,782)
Total other financing sources (uses)	$ 200,000	(500,000)	-	395,885	95,885	46,594,776
Excess of revenues and other financing sources over (under) expenditures and other financing uses	(1,293,202)	(8,047,026)	(10,248,303)	5,543,905	(14,044,626)	30,204,877
Fund balances at beginning of year, as restated	4,012,477	63,447,068	17,533,174	19,938,071	104,930,790	73,942,391
Fund balances at end of year	$ 2,719,275	55,400,042	7,284,871	25,481,976	90,886,164	104,147,268

Groundwater Production

Water Year 1999-2000*

By Local Water Utility

(Acre-Feet)

	Domestic Use	Irrigation Use	Total
Anaheim, City of	60,245	-	60,245
Buena Park, City of	14,405	-	14,405
East Orange County Water District	758	-	758
County of Orange	132	-	132
Fountain Valley, City of	8,620	-	8,620
Fullerton, City of	26,047	32	26,079
Garden Grove, City of	29,907	-	29,907
Huntington Beach, City of	25,429	-	25,429
Irvine Ranch Water District	30,617	70	30,687
La Palma, City of	2,609	-	2,609
Mesa Consolidated Water District	17,909	-	17,909
Newport Beach, City of	13,945	-	13,945
Orange, City of	26,611	173	26,784
Orange County Water District	5,521	-	5,521
Orange Park Acres Mutual Water Co.	431	-	431
Santa Ana, City of	38,420	-	38,420
Seal Beach, City of	3,406	-	3,406
Serrano Water District	2,278	-	2,278
Southern California Water Company	22,572	-	22,572
Tustin, City of	11,730	-	11,730
Westminster, City of	11,255	-	11,255
Yorba Linda Water District	10,685	190	10,875
Other Producers	9,764	9,608	19,372
Total Groundwater Production	373,296	10,073	383,369

* Water year begins July 1 and ends June 30.

Awards

Orange County Water District
For its Prado Basin Conservation Programs
Received the Recognition Award
From the Santa Ana River Watershed Group

Phil Anthony, Director
For helping form the regional system of representation between Orange County and San Diego for the Association of California Water Agencies
Received the Leadership Award
From the Water Advisory Committee of Orange County

OCWD Groundwater Guardian Team
For its Orange County Children's Drinking Water Festival
Received the Orange County Environmental Award, Government category
From the Discovery Museum of Orange County

OCWD Groundwater Guardian Team
For its Orange County Children's Drinking Water Festival
Was a finalist for the Clair A. Hill Award in the Innovations category
Association of California Water Agencies

Public Affairs Department
For its NDMA Crisis Management Plan
Received the WateReuse Award
From the WateReuse Association

Purchasing/Finance Department
For obtaining a high score on standardized criteria measuring innovation, professionalism, productivity and leadership attributes of the purchasing function
Received the Excellence in Procurement Award
From the National Purchasing Institute

Finance Department
For excellence in financial management through innovation, continuing education and professional development of members
Received the Outstanding Financial Reporting Award
From the California Society of Municipal Finance Officers

Board of Directors

Jerry King, President
Division 5

Kathryn L. Barr, First Vice President
Division 1

Lawrence P. Kraemer, Jr., Second Vice President
Division 3

Denis R. Bilodeau
Division 2

Philip L. Anthony
Division 4

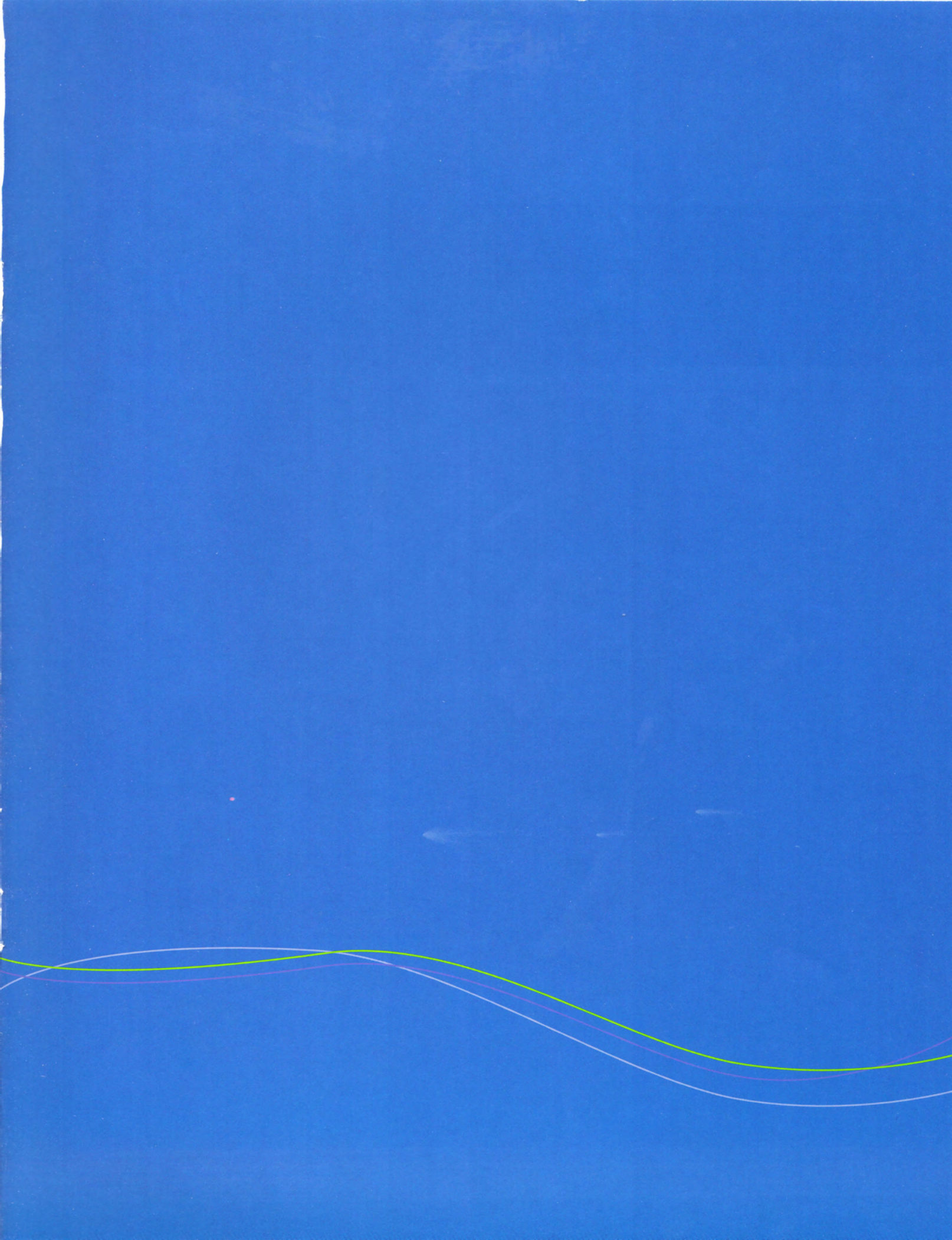
Wes Bannister
Division 6

Jan Debay
Division 7

Brett Franklin
Division 8

Irv Pickler
Division 9

Jan Flory
Division 10





Orange County Water District
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