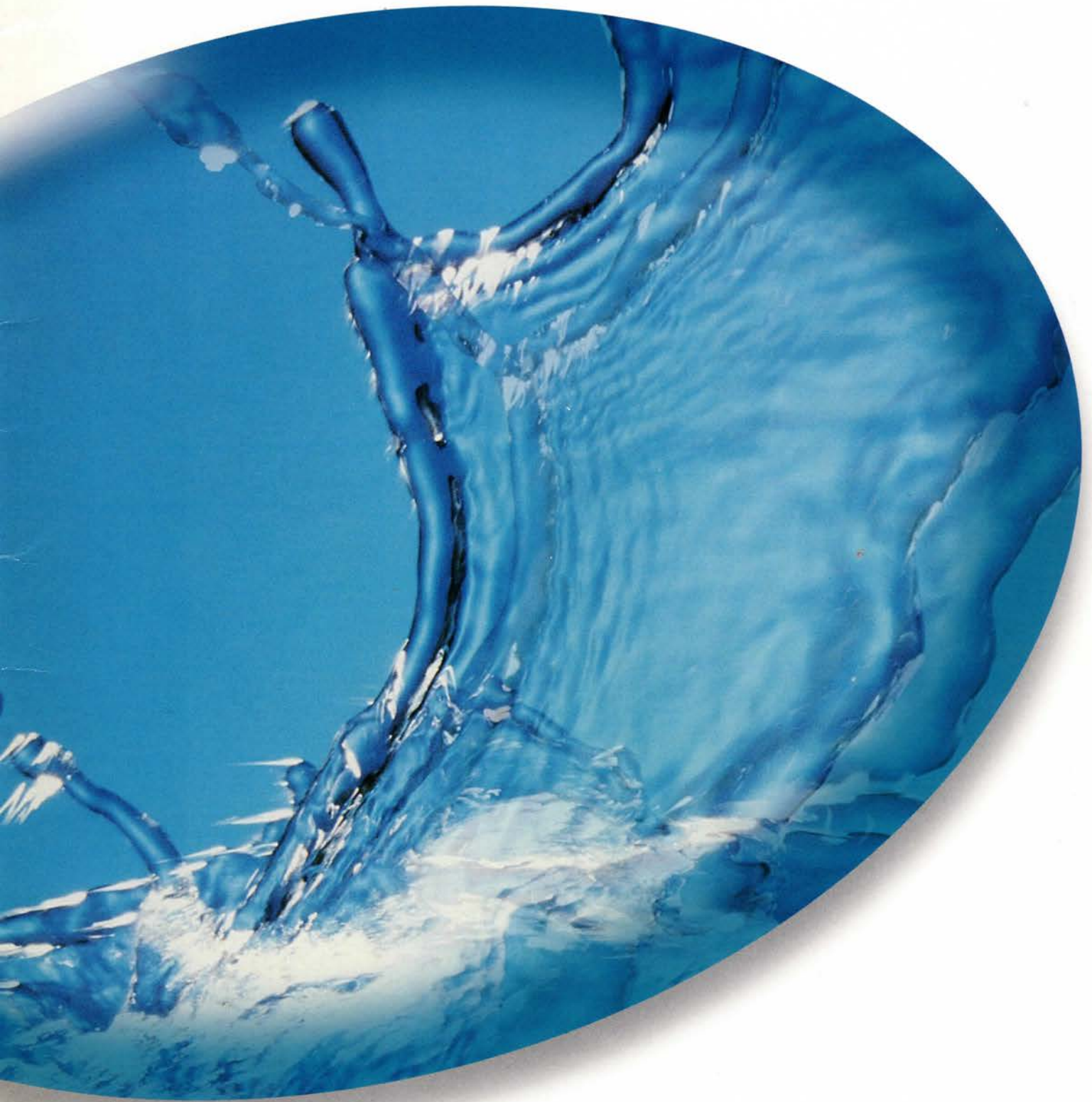
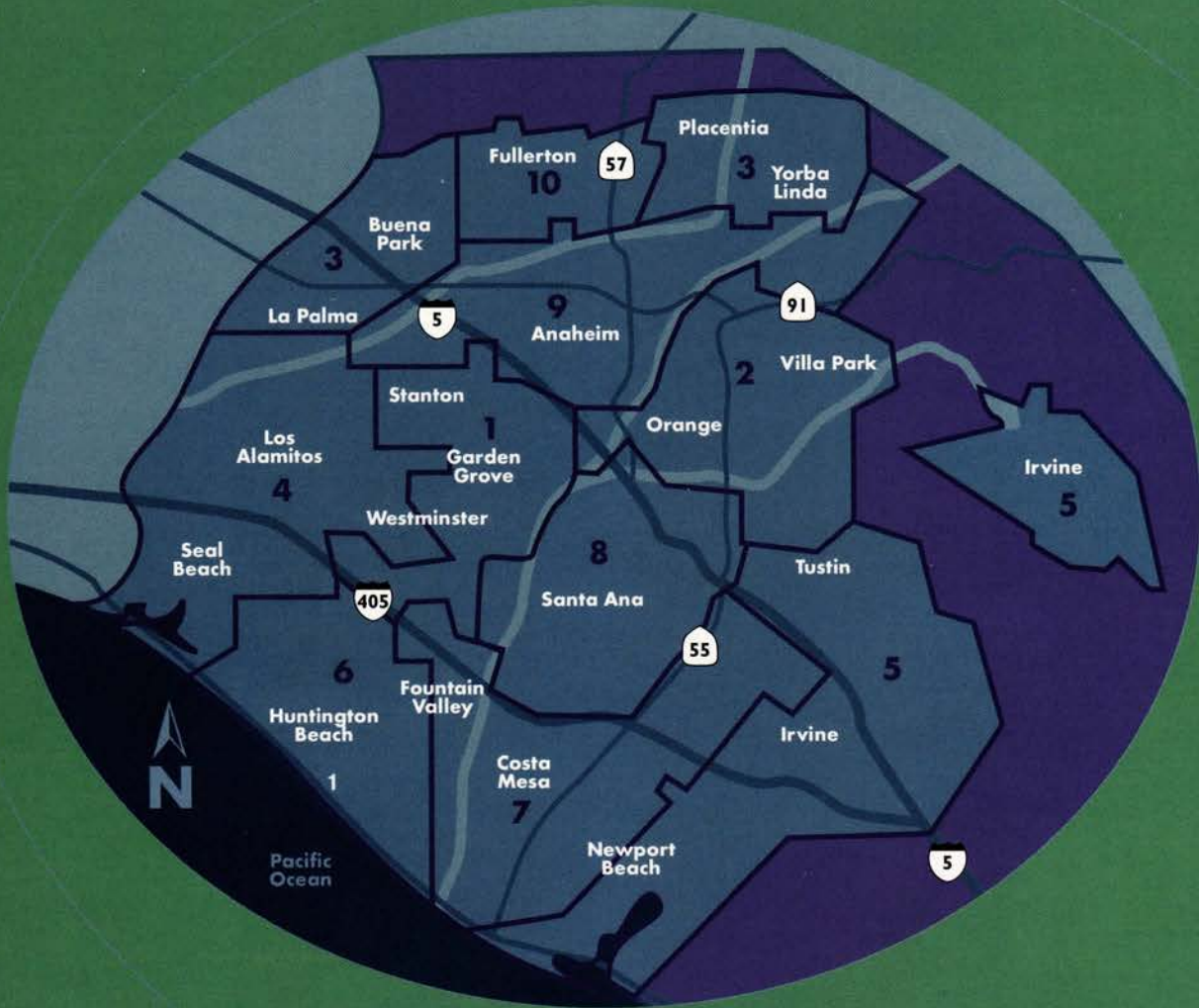


**RELIABILITY & VALUE**  
in a changing industry



**ORANGE COUNTY WATER DISTRICT**  
1999-2000 Annual Report

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Orange County Water District covers 387 square miles, from the Los Angeles County Line in the north to the El Toro "Y" in the south.

Orange County's Most Valuable Natural Resource

**We're Walking On It!**

# Groundwater

It's the high-quality water that makes up more than 60 percent of all water used in Orange County, and 75 percent of the water used in the north and central part of the county.

Orange County's groundwater basin began forming millions of years ago as mountains eroded and ocean sediments filled a deep valley, trapping Santa Ana River water between the layers of accumulated sand and gravel. The deepest aquifers of the groundwater basin still contain pristine water that fell to the earth thousands of years ago. The water Orange County drinks today may have entered the basin one year, 100 years or 1,000 years ago, depending on the location and depth of the well. The groundwater basin holds between 10 million and 40 million acre-feet of water, of which 1.25 million to 1.5 million acre-feet is usable.

Groundwater has always been vital to the lives and livelihoods of Orange County residents. In the 1800s and early 1900s, Orange County's growing agricultural industry thrived because of a reliable, easily obtainable supply of water—water pumped from the ground below. As farmers continued to pump groundwater and divert water from the Santa Ana River for irrigation, they noticed that groundwater levels were falling. Pumps had to be lowered deeper into the ground to pump out the same amount of water, requiring more energy. The question of seawater being drawn into the groundwater basin was of serious concern.

Orange County Water District (OCWD) was formed in 1933 by a special act of the California State Legislature to protect Orange County's rights to water in the Santa Ana River and to manage this important groundwater basin. Since 1933, OCWD has replenished and maintained the basin at safe levels and more than doubled its annual yield.

**Groundwater**

Water within the earth that supplies wells and springs.

**Aquifer**

Underground layers of rock, sand or gravel where water is trapped and stored.

**Acre-foot**

Measurement of water; equals 325,900 gallons (enough water for two Orange County families for one year).

LETTER FROM THE  
GENERAL MANAGER

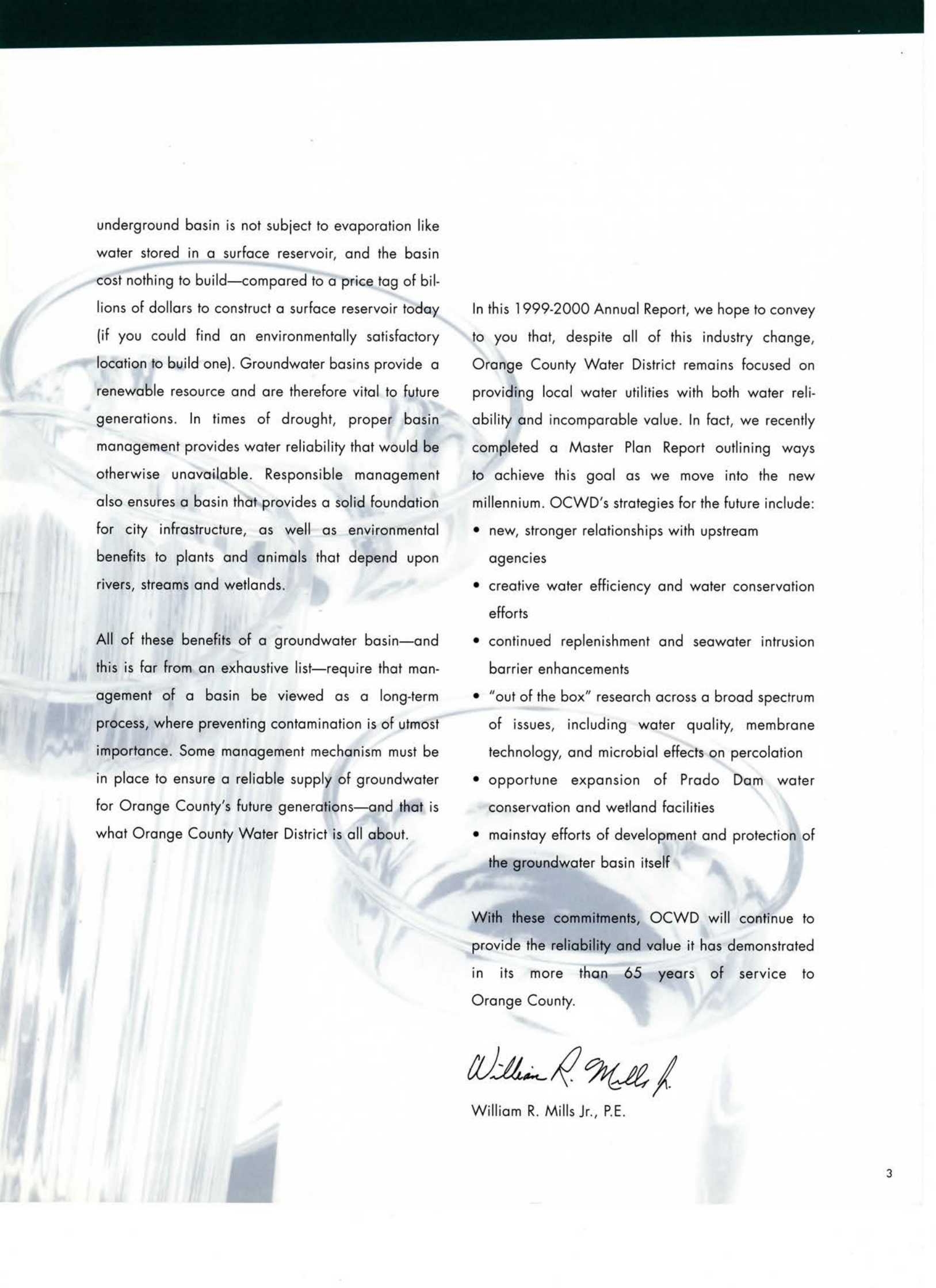


*It is Orange County Water District's  
strongest commitment to provide local  
water utilities with reliability and value  
in today's changing water industry.  
The landscape of today's water industry  
is change, change and more change.*

Wherever we look, we see changes that will affect future water supplies. Water transfers are moving quickly from a debated concept to a real pathway for future privatization of major portions of our water supply as well as agriculture-to-urban water supply augmentation. Imported water—whether from Northern California snow melts passing through the Bay-Delta system, or California's share of salty Colorado River flows—is in a state of flux. State and federal entities have ceased providing any water supply enhancements through large projects, requiring local entities around the state to cope by generating local projects to help improve water reliability. Passage of the 2000 State Water Bond in March validates the trend toward reliance on local projects around the state.

As a growing California population promises to sponge up future water supplies, the noose of supply availability will be further tightened by more restrictive water quality requirements. The current issue with stricter radon requirements is a prime example. Even locally, from ensuring viable habitat for the Santa Ana sucker fish to increased development in the upper Santa Ana watershed, there will be significant changes in Santa Ana River flows—the water lifeline for Orange County. And if all of this is not enough, Orange County's supplier of imported water, Metropolitan Water District of Southern California, is undergoing the largest governance and water rate change in its history. All of this change is forcing a water industry that used to be publicly low-key to be much more proactive in its communication and outreach efforts to ever-changing constituencies.

Let me say a word about groundwater value in Orange County, beyond the simple fact that it costs about one-third the price of imported water. Groundwater is the most undervalued resource in the water community. The process of putting Santa Ana River water into the basin is natural purification that would be extremely costly to replicate. Once in the basin, groundwater can be used without extensive piping networks to transport the water over an area of more than 387 square miles. Water in an



underground basin is not subject to evaporation like water stored in a surface reservoir, and the basin cost nothing to build—compared to a price tag of billions of dollars to construct a surface reservoir today (if you could find an environmentally satisfactory location to build one). Groundwater basins provide a renewable resource and are therefore vital to future generations. In times of drought, proper basin management provides water reliability that would be otherwise unavailable. Responsible management also ensures a basin that provides a solid foundation for city infrastructure, as well as environmental benefits to plants and animals that depend upon rivers, streams and wetlands.

All of these benefits of a groundwater basin—and this is far from an exhaustive list—require that management of a basin be viewed as a long-term process, where preventing contamination is of utmost importance. Some management mechanism must be in place to ensure a reliable supply of groundwater for Orange County's future generations—and that is what Orange County Water District is all about.

In this 1999-2000 Annual Report, we hope to convey to you that, despite all of this industry change, Orange County Water District remains focused on providing local water utilities with both water reliability and incomparable value. In fact, we recently completed a Master Plan Report outlining ways to achieve this goal as we move into the new millennium. OCWD's strategies for the future include:

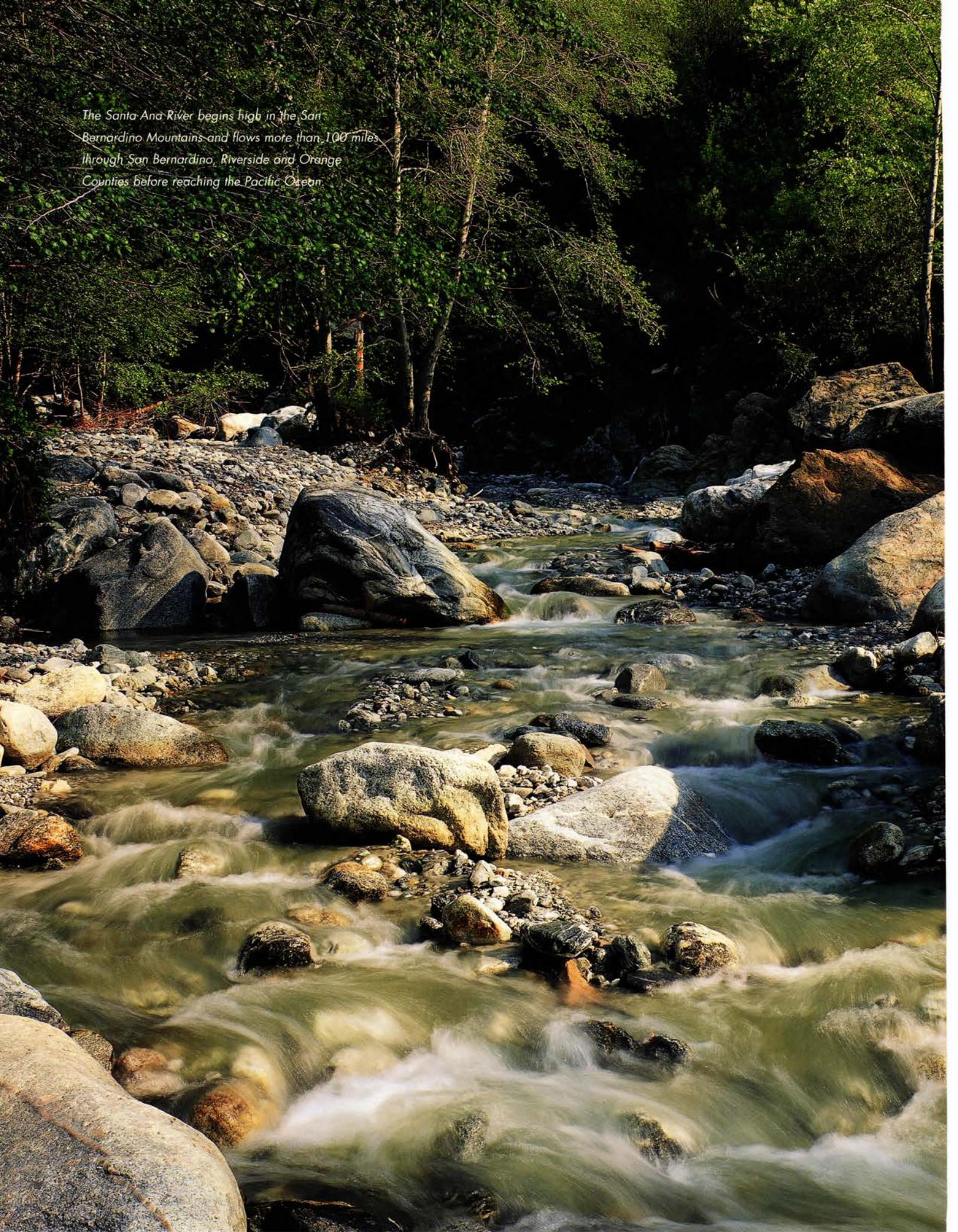
- new, stronger relationships with upstream agencies
- creative water efficiency and water conservation efforts
- continued replenishment and seawater intrusion barrier enhancements
- "out of the box" research across a broad spectrum of issues, including water quality, membrane technology, and microbial effects on percolation
- opportune expansion of Prado Dam water conservation and wetland facilities
- mainstay efforts of development and protection of the groundwater basin itself

With these commitments, OCWD will continue to provide the reliability and value it has demonstrated in its more than 65 years of service to Orange County.



William R. Mills Jr., P.E.

*The Santa Ana River begins high in the San Bernardino Mountains and flows more than 100 miles through San Bernardino, Riverside and Orange Counties before reaching the Pacific Ocean.*





# Meeting Our Customers' Needs

"The City of La Palma gains real value from OCWD's water quality reporting function. OCWD does all the water quality testing for the City wells, and reports the results electronically to the California Department of Health Services."

Ismile Noorbaksh  
City Engineer/  
Director of Public Works  
City of La Palma



## ORANGE COUNTY'S RELIABLE WATER SUPPLY

### GROUNDWATER PRODUCTION

Local water utilities use wells to pump water from the ground. OCWD's Board of Directors has always operated from a position that there should be enough water for everyone within the basin. This supply-side philosophy has allowed the groundwater basin to support Orange County's wonderful lifestyle.

### ADJUDICATE

In groundwater disputes, a court of law divides groundwater rights. Orange County has the only major groundwater basin in Southern California that is not adjudicated.

### BASIN PRODUCTION PERCENTAGE (BPP)

BPP is the percentage of a local water utility's water demand that is supplied by groundwater. Although OCWD's Board has set a BPP of 75 percent, local water utilities can pump 100 percent of their needs from the groundwater basin by paying the Basin Equity Assessment (BEA). Such flexibility guarantees water utilities the ability to provide water to their customers during periods of varying water availability. This reliability is one of the most valuable aspects of the Orange County groundwater basin.

### REPLENISHMENT ASSESSMENT (RA)

RA is the cost of groundwater per acre-foot. OCWD's price of water is one of the lowest in Southern California.

### BASIN EQUITY ASSESSMENT (BEA)

BEA is the additional fee paid on any water above the 75 percent BPP, making the cost of that water equal to the cost of imported water.

● 1999 marked another year of historically high groundwater production, with local water utilities in Orange County pumping more than 116 billion gallons (356,000 acre-feet) of groundwater out of the basin.

As Orange County has grown, OCWD has had to expand operations and investment in the basin. Over the past two decades, the Basin Production Percentage (BPP) increased from 63 percent in 1979 to 75 percent in 1999. This BPP correlates to an increase in the amount of groundwater produced from 237,000 acre-feet in 1979 to 356,000 acre-feet in 1999.

OCWD continues to invest in and expand the utility of the groundwater basin, improving the reliability of local water utilities' groundwater supply. This expansion of supply continues to take place with only minimal increase in the Replenishment Assessment (RA). While the RA increased from \$30 in 1979 to \$100 in 1999, the cost of supplemental imported water increased from \$98 to \$431 during the same 20 years.

OCWD's goal is to assist all local water utilities in achieving a BPP of 75 percent. One effective method for encouraging this has been OCWD's program to provide water utilities with low-interest loans to build new wells, which increase a water utility's pumping capacity. The program, scheduled to end in May 2001, has financed 22 new wells within OCWD to date, with a total production capacity of 50,000 gallons per minute. During times of drought, this increased groundwater production capacity allows imported water to be conserved for use by south Orange County, which depends on imported water for nearly all of its supply.

With the implementation of new programs and projects, OCWD estimates that groundwater production can increase to nearly 500,000 acre-feet by 2020. OCWD is confident that the basin can yield this amount of water—with continued cost-effective investment in the basin.



● In contrast to the very wet El Niño weather patterns of Winter 1997-98, Orange County received a little more than seven inches of rain—or about half of the normal rainfall for the area—during the most recent water year (July 1998 to June 1999).

Approximately 278,000 acre-feet of water replenished the groundwater basin during the water year. This groundwater replenishment consisted of 234,700 acre-feet of Santa Ana River flows, imported replenishment water purchased from Metropolitan Water District of Southern California and water transfers from San Bernardino and Riverside counties. Several thousand acre-feet were also injected into the Talbert and Alamitos Seawater Barriers. Natural replenishment from rainfall provided an estimated 36,000 acre-feet of additional water.

**PUTTING WATER BACK IN THE BANK**

In 1999, OCWD completed a study of the percolation capabilities of Santiago Creek in Orange. The study found that up to 3,000 acre-feet per year of additional water could be replenished through the creek, saving about \$750,000 in imported water costs.

As part of a historic water transfer agreement, OCWD bought 10,000 acre-feet of inexpensive high-quality groundwater from San Bernardino Valley Municipal Water District in 1999. The transfer helped solve a lingering problem for San Bernardino County—where high levels of groundwater threaten to damage property in the Bunker Hill area—while providing OCWD with another source of replenishment water.



*OCWD engineers regulate the amount of water flowing into each percolation basin using a SCADA (Supervisory Control and Data Acquisition) system, a telemetry system that allows remote control of water levels from computers at OCWD's field office in Anaheim.*

**GROUNDWATER REPLENISHMENT**

By putting water back into the groundwater basin each year, OCWD replenishes the basin. Engineers and geologists at OCWD continue to investigate, develop and implement innovative means to replenish the basin with more water. This innovation has resulted in the development of one of the most sophisticated groundwater replenishment facilities in the nation.

**PERCOLATION**

The natural filtering process of water as it sinks through the ground to replenish the groundwater basin is called percolation.

**SANTA ANA RIVER**

Orange County's groundwater basin is primarily replenished with flows from the Santa Ana River.

**RUBBER DAMS**

Two inflatable rubber dams (7' x 250') steer flows from the Santa Ana River into nine percolation basins on 1,300 acres within the cities of Anaheim and Orange.

**REPLENISHMENT AREAS**

Only in the Anaheim and Orange areas of Orange County does the sandy and coarse-grained soil provide a natural filtration path to the deep aquifers.

**IMPORTED WATER**

Replenishment of Santa Ana River flows is supplemented by imported water from Northern California and the Colorado River. Imported water also provides 25 percent of water utilities' supplies in north and central Orange County, and nearly 100 percent of water utilities' supplies in south Orange County. Metropolitan Water District of Southern California (MWD) is the water importer in Southern California. The Municipal Water District of Orange County is the largest MWD member agency in Orange County.

## OUR MOST RELIABLE SOURCE OF NEW WATER

### WATER FACTORY 21

OCWD operates the longest-running reverse osmosis water purification plant in the nation—Water Factory 21. Since 1976, Water Factory 21 has purified 15 million gallons per day (mgd) of water from the Orange County Sanitation District to beyond drinking water standards. This water is injected into coastal areas to create an underground hydraulic barrier to protect the basin from seawater intrusion. OCWD also operates the Green Acres Project, another water plant that has provided six mgd of water for irrigation and industrial use since 1990.

### ORANGE COUNTY'S LIMITED WATER SOURCES

Orange County's average rainfall of 13 inches per year is not enough to meet the water needs of modern-day Orange County. In addition to Orange County's valuable groundwater basin, imported surface water provides a supplemental source of water.

### ORANGE COUNTY'S POPULATION

While Orange County's population is expected to increase by 500,000-800,000 people by 2020, future supplies of imported water are uncertain—future imported water supplies may actually decrease. Anticipating this eventuality, OCWD has been a leader in the research and implementation of purified water.

### WATER PURIFICATION

The principle of purifying water is not new—the Earth naturally purifies all water through the hydrologic cycle. Using microporous membranes, scientists are now able to speed up and actually improve on the water cycle's process of removing impurities, creating purified water in a shorter period of time.

● Six-story tall ammonia air strippers have made OCWD a very visible landmark in Fountain Valley for the past 25 years. In 1999, OCWD demolished those air stripping towers, which had been part of Water Factory 21. Improvements to the quality of the water arriving at Water Factory 21 made the air strippers unnecessary.

OCWD completed construction of additional pumping and storage facilities for Green Acres water. To fill this additional reservoir, OCWD completed the design and initiated construction of expansion to the Green Acres plant. A separate distribution system (using purple piping) delivers the water to golf courses, parks, freeway greenbelts and industries.

Research and experience gained from 25 years of operating Water Factory 21 and Green Acres give OCWD the knowledge to launch future water reuse projects, including the proposed Groundwater Replenishment System, a visionary water purification project that will produce near distilled-quality water to expand the seawater intrusion barrier and to provide a new source of local, drought-proof water.



*Reverse osmosis membranes at OCWD's Water Factory 21 are the final purification step in turning wastewater into high-quality purified water (meeting drinking water requirements) that can be injected into the groundwater basin to prevent seawater contamination of Orange County's drinking water.*

● The ocean is very important to the Orange County lifestyle and economy. But few Orange County residents are aware of what a challenge it is to keep the ocean out of the drinking water supply.

### *The Talbert Barrier*

To enhance the effectiveness of the Talbert Seawater Intrusion Barrier in Fountain Valley, OCWD constructed two new injection wells in 1999, with three more planned for 2000. OCWD expects to increase injection to 10,000-14,000 acre-feet per year with these new injection wells. Improving the Talbert Barrier will allow coastal water utilities to continue to pump 75 percent of their water needs without damaging the groundwater basin. The Talbert Barrier provides enormous value to local water utilities—without it, seawater would intrude several miles into the basin, contaminating many production wells.

## **PROTECTING OUR DRINKING WATER FROM THE OCEAN**

### *The Alamitos Barrier*

Ten new injection wells were constructed in 1999 to increase seawater protection at the center and eastern end of the Alamitos Seawater Intrusion Barrier, which is located along the Orange/Los Angeles county line near the ocean. With most of the expansion occurring on the Orange County side, OCWD expects to increase its water purchases at the Alamitos Barrier to 2,400 acre-feet per year when the new wells are put into operation. The OCWD Board of Directors approved a plan to supplement the imported water being injected with purified water.

### **THE PACIFIC OCEAN**

Orange County's groundwater basin is hydraulically connected to the Pacific Ocean, and seawater intrusion is a factor in basin management.

### **THE TALBERT BARRIER**

The Talbert Barrier is a series of 23 injection wells along Ellis Avenue in Fountain Valley. Water purified at Water Factory 21 is injected into the ground to create a hydraulic barrier that keeps seawater out of the groundwater basin.

### **THE ALAMITOS BARRIER**

Jointly managed by OCWD and the County of Los Angeles, the Alamitos Barrier protects the coastal area of the groundwater basin along the Orange/Los Angeles county line.

## PROTECTING THE SOURCE

### GROUNDWATER MONITORING

OCWD's monitoring wells act as "eyes" throughout the basin and a forward defense to safeguard water quality. The water quality department implements an aggressive monitoring program to protect and evaluate basin conditions. Quality and safety of water is the primary concern, and OCWD is on the leading edge of monitoring the basin for chemicals that may be of concern in the future.

### WATER QUALITY TESTING LABORATORY

OCWD's state-certified laboratory for organic and inorganic testing provides real value to local water utilities by testing all groundwater for the preparation of state- and federal-mandated water quality reports. All water users receive an annual Consumer Confidence Report from their water utility, and this information comes from tests performed at OCWD's lab.

### WETLANDS

OCWD owns and manages 2,150 acres behind Prado Dam in Riverside County for natural nitrate purification of half the flow of the Santa Ana River before it reaches percolation basins in Anaheim.

### PRADO DAM

OCWD's water conservation agreement with the U.S. Army Corps of Engineers allows water to be stored behind Prado Dam. After a storm passes, captured storm water can be released at a controlled rate that allows optimal percolation into the groundwater basin. Without this conservation agreement, fresh water worth millions of dollars would be lost to the ocean every year.

● Orange County commuters drive by them every day, oblivious to their presence. They are the 646 wells providing more than 1,200 sampling points—from which OCWD took more than 13,000 water samples in 1999. The scheduling and sampling of local water utilities' wells for compliance with state drinking water regulations is a logistical challenge for OCWD, but provides great value to water utilities. It would be more costly for water utilities to do the tests themselves or to outsource the tests.

As groundwater production increases, generally the need for additional samples and tests also increases. To meet this growing demand, OCWD completed an expansion project in 1999 to add 1,000 square feet of additional working space to the laboratory. The lab also acquired new equipment, including four new high-performance water testing instruments. OCWD's chemists use these and other instruments to test for new contaminants to very low detection levels.

During 1999, the laboratory processed 313,000 analyses to meet OCWD's water quality analytical needs and to ensure that the public receives the safest and highest quality groundwater.

OCWD's wetlands behind Prado Dam naturally removed 290 tons of nitrate from the water during 1999, converting it to harmless nitrogen gas. Since wetlands treatment continues to be a highly cost-effective method for cleaning water, the Board of Directors made the commitment to build additional wetlands to treat 100 percent of the flow of the Santa Ana River.

OCWD funded research in 1999 to evaluate the feasibility of increasing the amount of water that can be safely conserved behind Prado Dam, which will save even more fresh water for Orange County. As part of the existing water conservation program, OCWD removed 50 acres of the invasive plant *Arundo donax* from Prado Basin and replanted native vegetation on 40 acres.

OCWD's recovery program for the endangered least Bell's vireo songbird (an environmental mitigation requirement) has been extremely successful. Vireo population has increased from a low of 19 breeding pairs in 1986, to 224 breeding pairs in 1999. Instrumental to the recovery of the vireo has been OCWD's continuing removal of parasitic cowbirds.



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

● Everyone has 20/20 hindsight. But responsible groundwater management requires 20/20 foresight. With the real need to predict the effects of increased pumping on the basin, OCWD built a model of the groundwater basin in 1994. This single-layer model allowed OCWD hydrogeologists to run various future scenarios—both pumping additional water out and percolating or injecting water into the basin—to predict future water levels. It has been a valuable tool in the management of the basin.

OCWD began the development of a three-layer transient or dynamic model that would be more flexible, more powerful and provide additional information.

### OCWD'S COMPUTERIZED GROUNDWATER FORECASTER

In 1999, OCWD continued the task of developing and calibrating the three-layer transient or dynamic groundwater model to allow for seasonal and other varying conditions. Using MODFLOW, a groundwater modeling software program developed by the U.S. Geological Survey, and OCWD's own Water Resources and Management System (WRMS), OCWD input thousands of data points into the model to describe the groundwater basin. This new groundwater model—scheduled to be on-line in 2000—will allow hydrogeologists to more accurately simulate groundwater conditions and help OCWD increase the reliability of the groundwater basin by showing the effect a changed condition would have on the basin. The model could be used to predict the effect on the basin of various groundwater decisions or projects.

With OCWD's complete three-layer model, local water utilities will gain great value from more accurate planning for future pumping and basin management programs.

#### WATER RESOURCES AND MANAGEMENT SYSTEM (WRMS)

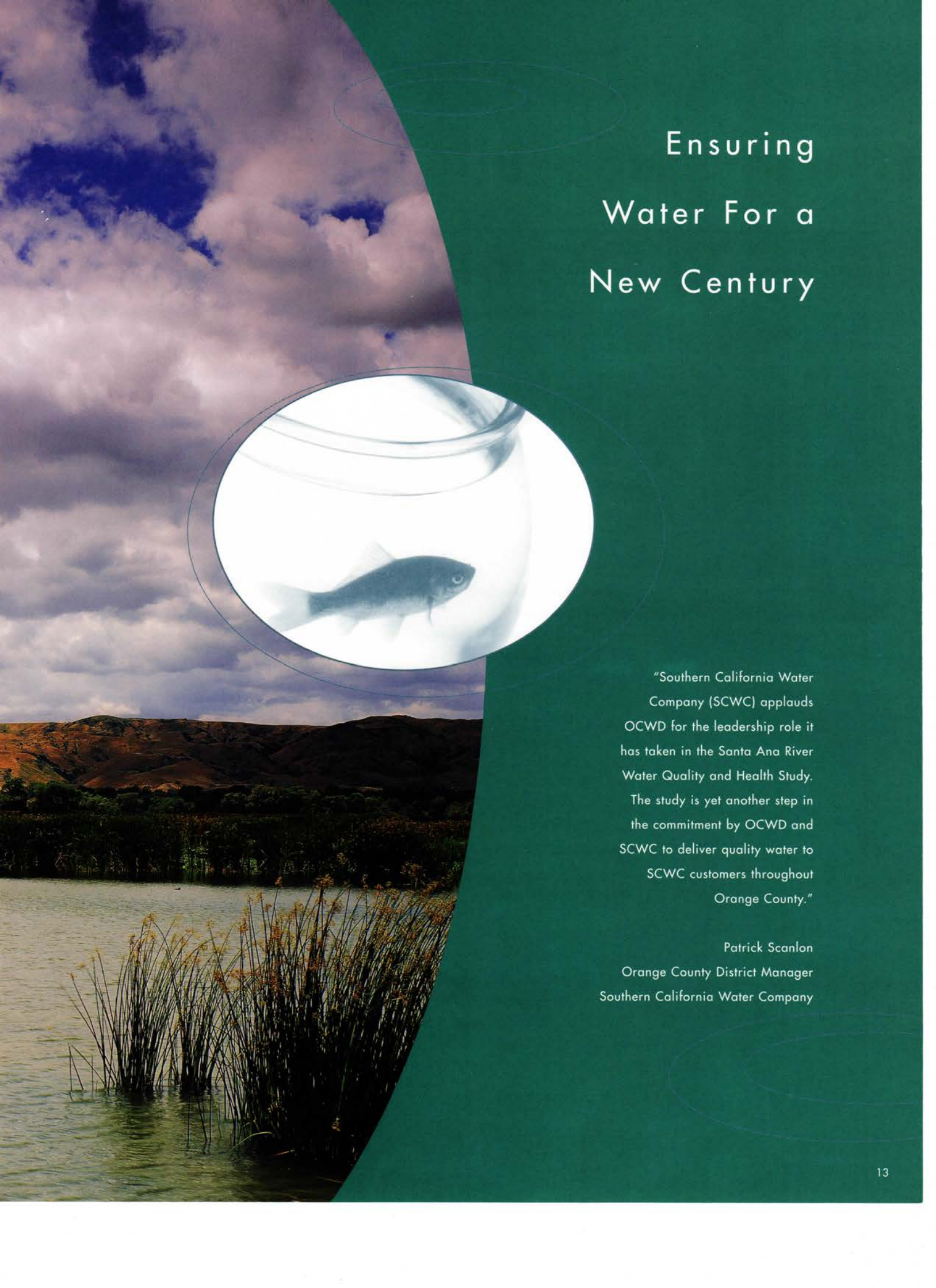
Recognizing the need to organize billions of pieces of groundwater data, OCWD developed a data management tool called WRMS. Information extracted from WRMS has saved local water utilities millions of dollars in water quality and other basin management costs.

#### THREE-LAYER TRANSIENT OR DYNAMIC GROUNDWATER MODEL

While the groundwater basin is actually composed of hundreds of aquifer layers, a new model is being developed that divides the basin into three general regions (the previous model grouped the many layers into only one layer). "Transient" refers to the model's dynamic ability to track fluctuations in water levels over time (the previous steady-state model viewed water conditions as never changing).

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





# Ensuring Water For a New Century

"Southern California Water Company (SCWC) applauds OCWD for the leadership role it has taken in the Santa Ana River Water Quality and Health Study. The study is yet another step in the commitment by OCWD and SCWC to deliver quality water to SCWC customers throughout Orange County."

Patrick Scanlon  
Orange County District Manager  
Southern California Water Company

### **OCWD'S MASTER PLAN REPORT**

Over the years, OCWD has completed several planning studies. The 1999 Master Plan Report takes a long-term look at basin requirements to the year 2020.

### **GROUNDWATER PLANNING**

OCWD has continually shown great vision in planning for the future. Its commitment to groundwater management has not only benefited local water utilities in Orange County, but has ultimately been an example to other groundwater management agencies throughout California, across the United States and around the world. As local water utilities and their customer bases grow and change, OCWD will be ready to meet their future water needs.

## **OCWD'S ROAD MAP FOR THE FUTURE**

● The maxim, "If you don't know where you're going, you'll probably end up someplace else," is very applicable to groundwater management. Recognizing the need for long-range planning, OCWD completed a comprehensive Master Plan Report in 1999. After an exhaustive effort of research and analysis, the Report concluded that OCWD can continue its supply-side philosophy—protecting the basin for future generations while increasing annual groundwater production.

Specific significant conclusions and recommendations from the Report include:

### **Groundwater production and replenishment**

OCWD can generally maintain a 75 percent Basin Production Percentage (BPP) well into the future with an estimated \$212 million in capital improvement projects to mitigate current and projected impacts caused by increased basin production.

### **Reliability**

Sufficient water supplies will be available to OCWD in the future to replenish, protect and maximize the use of the basin.

### **Financial considerations**

OCWD has the financial capability to issue additional long-term debt to fund future projects that will allow maintenance of the 75 percent BPP; however, the Replenishment Assessment (RA) will need to increase to fund projects that provide additional groundwater.

### **Coastal conditions**

Increased production from the basin will require coastal mitigation measures. More than \$100 million in capital projects has been included in the Master Plan Report to improve coastal conditions.

### **Water quality**

To counteract salinity buildup in the basin and improve the overall quality of water in the basin, OCWD should consider implementing the Groundwater Replenishment System. In conjunction with this project, OCWD should closely monitor activities in the upper Santa Ana River watershed to ensure that upstream activities do not degrade the quality of river flows.



OCWD's tradition of innovation is nowhere more evident than in a cutting-edge solution to Orange County's future water supply and water quality needs. In the past year, the Groundwater Replenishment (GWR) System—a proposed visionary water purification project—has moved forward with great positive momentum.

In March 1999, the Boards of Directors of both OCWD and Orange County Sanitation District (OCSD) unanimously certified the GWR System's Environmental Impact Report. Following certification, a team of three engineering firms began the project development phase of the project. The OCSD Board unanimously approved its own Strategic Plan, which incorporated OCSD's participation in the GWR System project.

The project has received significant attention from outside agencies that recognize the applicability of this technology to many other communities. The Bureau of Reclamation has authorized \$20 million, and the U.S. Environmental Protection Agency has provided \$500,000 in funding. Funding for the GWR System was also included in the 2000 State Water Bond, which voters approved in March. GWR System water can be produced using about one-half the energy that is required to bring an equal amount of imported water to Orange County. Recognizing the energy efficiency of the project, the California Energy Commission has provided a grant of \$700,000.

### SAFE AND COST-EFFECTIVE NEW WATER

As the project planning and detailed project cost analysis continued, outreach to the community increased. During this past year, more than 150 face-to-face presentations were made to community leaders, community groups and business organizations. A new video, brochure and newsletter were developed to aid in this active outreach program. The GWR System has received support from a broad spectrum of individuals and organizations representing environmental, agricultural and urban interests.



*A high-tech membrane technology used in the manufacture of food and medicine, microfiltration has just recently been introduced to the water purification industry. Microfiltration membranes will provide the first phase of water purification for the Groundwater Replenishment System.*

### THE GROUNDWATER REPLENISHMENT SYSTEM

Building on more than 20 years of experience in water purification, the Groundwater Replenishment (GWR) System is a joint project with the Orange County Sanitation District (OCSD), and is one of the most visionary projects ever conceived in the California water industry. The GWR System is a proposed water purification project that will take highly treated wastewater currently sent to the ocean by OCSD and, through advanced treatment with micro-filtration, reverse osmosis and ultraviolet disinfection, produce near distilled-quality water.

**REPLENISHMENT  
ENHANCEMENT  
WORKING GROUP**

Faced with increasing annual withdrawals from the basin to meet growing water needs, OCWD must find new, cost-effective and creative ways to increase its percolation capabilities. To continue to provide local water utilities with high-quality, inexpensive groundwater, OCWD has a group of engineers, geologists and scientists continually testing technologies and ideas that have the potential to provide additional reliable groundwater.

**FINDING NEW  
WAYS TO  
ACCELERATE  
PERCOLATION  
RATES**

● “It’s never been done before” has never stopped OCWD from pioneering new methods to improve groundwater management. With the counsel of Dr. Herman Bouwer, one of the world’s leading percolation experts, OCWD continued the efforts of the Replenishment Enhancement Working Group to analyze current replenishment facilities and practices with the goal of increasing future yields. A host of possible cost-effective and productive projects continue to be researched, tested and implemented.

In 1999, upon detailed investigation, OCWD staff determined that a fine-grained silt layer existed under part of the off-river percolation system. OCWD constructed a percolation trench—a long trench excavated out of the river bottom—to break through a confining layer of silt. After testing a pilot-scale trench, OCWD concluded that a full-scale percolation trench would indeed enhance off-river percolation. The value of additional water percolated into the basin will pay for the project in less than one year.

A patent is under consideration on a portable percolation meter developed by an OCWD scientist. The meter, which is placed at various points on the bottom of a percolation basin, can measure and record percolation rates via computer. Armed with this information, OCWD can improve percolation areas by installing specially constructed percolation columns. Percolation columns bypass clay layers and increase percolation rates where installed.

OCWD is planning a Percolation Enhancement Research Laboratory to be located at the percolation facilities in Anaheim. This lab will allow researchers to study actual on-site conditions that affect percolation and groundwater replenishment.

● OCWD faces unique issues in providing groundwater to a growing population. Research conducted at OCWD focuses on problems unique to Orange County.

During 1999, research efforts concentrated on membrane research as well as on bacteria that naturally remove nitrates from water (biological denitrification). A pilot-scale sulfur-based denitrification plant has been operating at a City of Garden Grove test well for more than a year, with very positive results. In addition to optimizing the design of the plant, scientists are working on cost comparisons for this form of large-scale treatment. Natural biological denitrification has the significant potential benefits of low cost, no by-products and worldwide applicability.

### CUTTING-EDGE RESEARCH FOR CUTTING-EDGE IDEAS

While this past century has used chemical processes to treat water, the next generation of water purification is membrane filtration. OCWD has been a pioneer in membrane technologies to purify water. Over the past several years, OCWD scientists have developed two new kinds of membranes for purifying water that may be patented. Constantly seeking to improve the reverse osmosis process, OCWD is currently searching for a membrane composition that will resist chlorine, allow water to pass over the membranes faster, and screen out salts with less energy. These new membranes will increase the effectiveness and economy of Water Factory 21 and eventually the Groundwater Replenishment System.



*The pilot-scale sulfur-based denitrification plant in Garden Grove tests the feasibility of using specially developed bacteria to "eat" nitrates from groundwater before sending the water to businesses and residences.*

#### **MEMBRANE RESEARCH AND DEVELOPMENT**

Membrane technology is the future of water purification around the world. One of the ultimate goals of OCWD's membrane research is to reduce the cost of water purification through improved technology.

#### **BIOLOGICAL DENITRIFICATION**

OCWD has developed a new denitrification process where harmless bacteria have been identified that "eat" nitrates from the water.

## **ANCIENT REDWOOD FORESTS LEAVE THEIR MARK**

### **COLORED WATER**

More than eight million acre-feet of Orange County's groundwater basin is "colored water," a pristine, low-mineral water that looks like diluted iced tea. Stained by ancient redwood forests, the water's color makes it aesthetically unacceptable for household use.

### **AGE OF COLORED WATER**

Carbon dating of Orange County's colored water shows that it entered the basin a minimum of 8,700 years ago, near the end of the last Ice Age.

### **MESA/OCWD COLORED WATER PROGRAM**

In 1989, OCWD and Mesa Consolidated Water District began researching methods to remove the color from this valuable water supply using ozone oxidation, biologically active filtration and chloramine disinfection.

● High-quality colored water is too valuable a resource to ignore. OCWD is part of the team that helped bring Mesa Consolidated Water District's colored water treatment facility to ground breaking in 1999. Mesa Consolidated Water District is the first local water utility to build a full-scale facility to treat colored water: the 5,000 gallon-per-minute (gpm) facility will be on-line in Fall 2000 with additional phases planned to expand the facility to 10,000 gpm. OCWD provides value to water utilities by assisting them in developing cost-effective water sources like this locally available colored water resource.

Also during 1999, OCWD continued working with Irvine Ranch Water District and the City of Huntington Beach to treat their high-quality colored water to maximize the use of the basin.

● The Santa Ana River Water Quality and Health (SARWQH) study is yet another example of OCWD's commitment to ensuring water quality and safety for local water utilities and their customers. Although the SARWQH study is scheduled to be completed in 2002, preliminary results from the study verify that water pumped out of the basin after being percolated from the Santa Ana River is high quality water that meets all drinking water standards. To continue to ensure public health, in the next few years the SARWQH study will transition from the intensive study activities currently taking place to long-term, permanent monitoring that is based on recommendations from the SARWQH findings.

One of the long-term monitoring tools being considered is genetically developed fish that would change color in response to certain constituents in the water.

## THE SCIENCE BEHIND NATURAL FILTRATION

### NATURAL FILTRATION

Since time began, all life has used the same water that exists today. With a population of six billion people, man has augmented nature's water cycle through various water purification processes. The result is that the surface water that flows into Orange County—whether from the Santa Ana River, Northern California or the Colorado River—contains some portion of wastewater that has been treated for reintroduction into the environment.

### SANTA ANA RIVER WATER QUALITY AND HEALTH (SARWQH) STUDY

Recognizing the changing character as well as the value of Santa Ana River water (estimated at \$60 million per year), OCWD initiated the SARWQH study in 1994, drawing on the top water experts from around the nation. The goal of the SARWQH study is to understand and verify the high quality and safety of water that naturally percolates through the ground and into the deep aquifers.



OCWD regularly takes samples from more than 600 drinking water and monitoring wells. The samples taken here will be sent to several laboratories to provide data for the SARWQH study.

**OCWD'S  
YELLOW  
SUBMARINE**

**CLOGGING LAYER**

Every year, water coming down the Santa Ana River brings tons of silt, very fine sand and clay. A significant amount of silt travels to the percolation basins, where the sandy bottoms filter it out. As silt builds up, it creates a clogging layer that dramatically slows down the rate that water percolates into the ground.

**PERCOLATION RATE**

When the rate at which water percolates into a basin decreases to a certain level, OCWD must empty the basin, dry it out, and use earth-moving equipment to scrape and remove the silt layer from the bottom of the basin. This imperfect procedure stops all water replenishment for the duration of the process.

**BASIN CLEANING VEHICLE (BCV)**

The BCV is a one-of-a-kind, experimental submersible vehicle that can best be described as a swimming pool cleaner for lakes. The BCV removes the clogging layer while the lake remains full of water and continues to replenish the basin. The vehicle moves along the bottom of a basin in a predetermined pattern using global positioning system (GPS) tracking and computerized navigation. As it moves, it vacuums up sand and the silt that forms a clogging layer at the bottom of the lake. Inside the vehicle, silt is separated from sand. The sand returns to the bottom of the lake to aid in future percolation and the silt is pumped ashore for reuse as land fill.

● Within an urban environment like Orange County, the land available for percolation is severely limited. To maximize the use of current percolation facilities, OCWD continues to perfect the unique technology of the Basin Cleaning Vehicle (BCV). In 1999, OCWD patented a portion of the BCV and continued extensive testing to verify the potential of the vehicle. Several modifications will be incorporated into a new, improved vehicle.

OCWD's conservative estimates project the BCV to improve the percolation rate of a specific basin by 30 percent, replenishing 22,640 acre-feet per year of additional water (providing enough water for 45,000 Orange County families and saving local water utilities \$5.6 million per year in imported water costs). The BCV represents a major effort to increase the replenishment of the groundwater basin, ensuring a future reliable water supply for local water utilities.



*After the Basin Cleaning Vehicle enters a lake, the patented hood will separate sand from silt, returning the sand to the lake bottom and sending the silt to a collection basin via an umbilical hose.*

● Integral to effective groundwater management is conveying to consumers the concept of using less water today so that there will be a reliable supply tomorrow. OCWD, in conjunction with the Orange County Sanitation District (OCSD), the Municipal Water District of Orange County (MWDOC) and the City of Anaheim Public Works Department, helped form the Water Use Efficiency and Conservation Steering Committee to coordinate conservation and water efficiency efforts of participating Orange County water agencies.

As part of the steering committee, OCWD participated in an ultra low-flow toilet program to replace 55,000 Orange County toilets per year for the next five years. Thanks to contributions from OCWD and OCSD, this new program provides toilets—highly rated by consumer agencies and valued at \$120 each—to residents at no charge. OCWD kicked off the program by hosting the first toilet giveaway event, where 1,500 toilets were given to north and central Orange County residents in four hours. This conservation program will save about 1,275 acre-feet of water per year, which will result in a cost savings of approximately \$190,000 to OCWD each year. More than 15,000 toilets were distributed in 1999. The old toilets were crushed for recycling as road fill.

## REDUCING FUTURE DEMANDS

During 1999, OCWD also launched a countywide hotel/motel water conservation program with participation from Metropolitan Water District of Southern California, MWDOC and OCSD. Through this program, hotel guests are offered the option to reuse their towels and bed linens during multiple-day stays. This simple practice provides several benefits, including saving thousands of gallons of water every year, reducing labor costs and decreasing the amount of detergents used and therefore released to the environment. More than 150 out of 400 Orange County hotels and motels—equating to more than 17,000 guest rooms—have taken advantage of this program and requested OCWD's free water conservation cards to place in their guest rooms.

### CHANGES IN THE WATER INDUSTRY

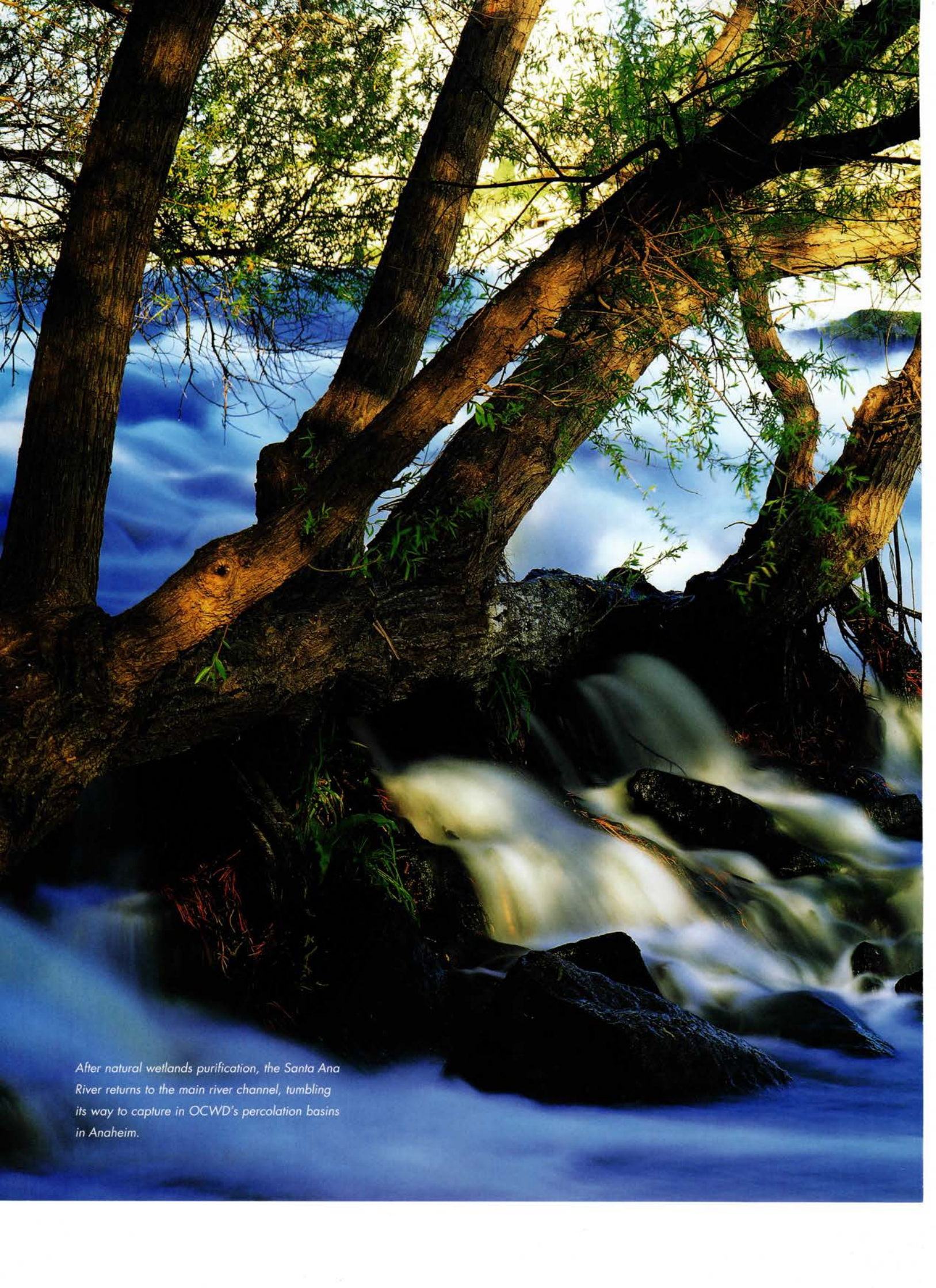
In the past several years, the water industry has experienced substantial changes. Societal support for massive state and federal water projects is waning. In the future, more emphasis will be placed on underground storage, water purification, water transfers and reducing future demands by better water efficiency and conservation.

### WATER EFFICIENCY

For years, OCWD has given discounts to local water utilities to encourage them to install low-flow showerheads and toilets within their service areas. OCWD also encourages water utilities to participate in the Best Management Practices (BMPs) for Urban Water Conservation.

### BEST MANAGEMENT PRACTICES (BMPs)

BMPs are a series of water conservation measures ranging from drip irrigation to higher fees for high-volume water users.



*After natural wetlands purification, the Santa Ana River returns to the main river channel, tumbling its way to capture in OCWD's percolation basins in Anaheim.*

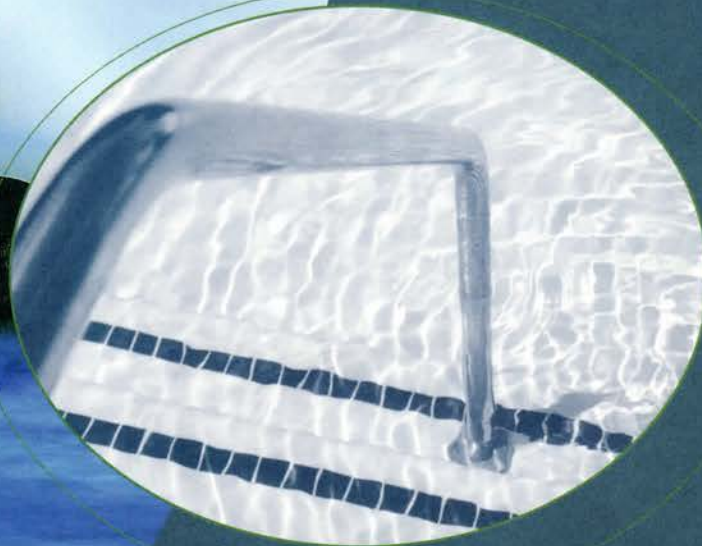




# Building Partnerships

"Mesa Consolidated Water District's program to treat colored groundwater received tremendous support and assistance from OCWD, both technically and financially. We're very pleased with the success of Mesa's colored water treatment program: it will provide our customers with a continued source of local, reliable, high-quality water."

Karl Kemp  
General Manager  
Mesa Consolidated Water District



## **WORKING TOGETHER FOR A RELIABLE GROUNDWATER SUPPLY**

### **AGENCY/GOVERNMENT RELATIONS**

OCWD works closely with local water utilities and cities, as well as with state, regional and national government and water agencies, to effectively represent and protect the interests of groundwater basin users. This includes various services for local water utilities, from representation to local and state health departments and the U.S. Environmental Protection Agency for water quality regulations, to working on legislation that affects water supply.

### **LOCAL WATER UTILITY RELATIONS**

OCWD holds monthly meetings with local water utilities to discuss current and future activities.

● Successful partnering and strong relationships with other agencies and stakeholders have been vital to OCWD's continued success as a groundwater manager. Major progress was achieved in 1999 on the cleanup program for groundwater contamination from the former El Toro Marine Corps Air Station in Irvine. OCWD worked with Irvine Ranch Water District and the City of Irvine to develop a publicly acceptable cleanup plan that is now awaiting approval by the Department of the Navy in Washington, D.C.

During 1999, the local water utilities' 10-member Technical Advisory Committee worked diligently to provide input on both the annexation issue and the Master Plan Report. Their recommendations were key to the Board's final decision to retain the current annexation policy, which allowed pending applications from Irvine Ranch Water District, Yorba Linda Water District and the City of Anaheim to proceed.

Water quality issues addressed this past year included chlorine disinfection byproducts, the gasoline additive MTBE and naturally occurring radon in groundwater. More than 15 pieces of legislation were addressed, and a significant and successful effort was expended to incorporate basin and watershed needs into the 2000 State Water Bond, passed by voters in March.

OCWD worked actively with the Regional Water Quality Control Board to encourage pollution prevention by upstream dairies and to help institute tighter discharge regulations. Agreements currently being negotiated with the U.S. Army Corps of Engineers may allow more water to be stored behind Prado Dam for future percolation into the groundwater basin. OCWD worked with the Santa Ana Watershed Project Authority to encourage regional watershed planning, and with the Metropolitan Water District of Southern California on groundwater storage contracts. Issues affecting OCWD's continued assurance of water rights to the Santa Ana River were brought before the State Water Resources Control Board.

● Benjamin Franklin once said, “When the well’s dry, we know the worth of water.” OCWD is striving to communicate the value of water to Orange County so the well never goes dry.

In 1999, OCWD launched several new community education and outreach initiatives that are designed to reach a broad range of audiences. Throughout the year, local residents learned about Orange County’s water resources during “Orange County Water 101,” an introductory water issues course taught throughout OCWD’s service area. As part of Water Awareness Month activities, OCWD sponsored its first annual Open House. More than 500 community members participated in the event, which provided an opportunity for the surrounding neighbors to learn more about OCWD.

OCWD introduced its new mascot, Ginny Groundwater. Ginny made a big splash at community and school events by helping OCWD tell the story of groundwater protection and conservation to children throughout the county.

## AN INFORMED PUBLIC IS AN UNDERSTANDING PUBLIC

Cable television stations and libraries from around Orange County provided special information programs—developed and distributed by OCWD—on OCWD and the Groundwater Replenishment System.

In April, OCWD and Disneyland Resort sponsored the nation’s largest Children’s Drinking Water Festival. More than 4,500 students, teachers and parents representing 17 cities attended this two-day educational event. The students learned about water, pollution prevention, conservation and the environment through “interactivities” that included creating aquifers with ice cream, visiting the center of the earth in the Earth Balloon, and discovering what happens to “goopy garbage” by building their own landfill.



*OCWD’s mascot, Ginny Groundwater, helps teach children about the importance of protecting and conserving Orange County’s most valuable natural resource—its groundwater basin.*

### OCWD OUTREACH

Every year, more than 2,000 people from around the world visit OCWD’s facilities at Water Factory 21, the Anaheim replenishment facilities and Prado wetlands. Every year, more than 35 million people are exposed to information about OCWD and other water issues through OCWD’s active media relations program.



*It is only during and after major rain events that the Santa Ana River completes its long journey from the mountains to the ocean at Huntington Beach. During dry weather, the river is dry south of Anaheim because all of the water has settled into the groundwater basin.*

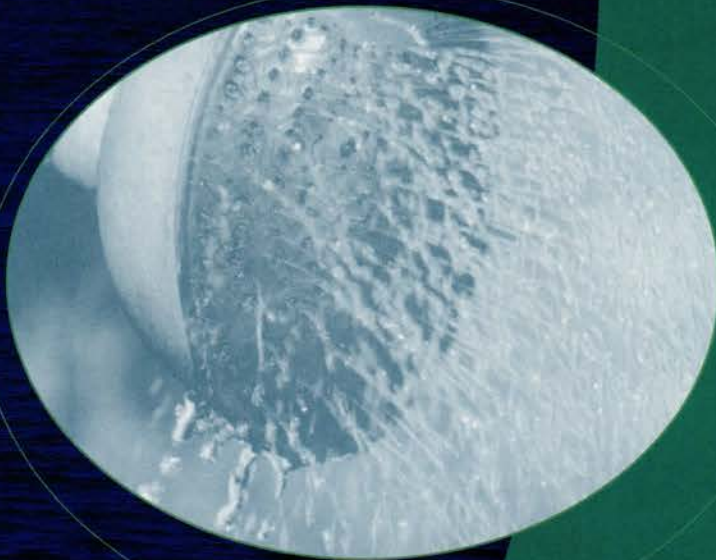


# Promoting Fiscal Responsibility

"The City of Santa Ana built three new production wells under OCWD's Conjunctive Use Well Program to improve system reliability.

By providing low-interest loans, OCWD helped Santa Ana increase its production capacity by more than 9,000 acre-feet per year—enough water for 18,000 families."

Thom Coughran  
Water Resources Manager  
City of Santa Ana



**ORANGE COUNTY  
WATER DISTRICT -  
A GOOD INVESTMENT**

● OCWD is one of only three 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 excellent management practices, competitive price advantages and prudent reserve levels. OCWD was the first Orange County agency to have its ratings reinstated by both Moody's and Standard & Poor's following the 1994 Orange County bankruptcy.

During 1999, Moody's upgraded OCWD's bond rating from aa3 to aa2 for fixed rate debt, based on OCWD's competitive price advantage, the continued excellent performance of OCWD's current bonds

and OCWD's outstanding management. Standard & Poor's reaffirmed its AA fixed rate rating and indicated a willingness to consider an increase in OCWD's rating to AA+ in fiscal year 2000.

In 1999, OCWD replaced its Letter of Credit bank with Bayrische Landesbank, one of three remaining AAA banks in the world. As a result, Standard & Poor's and Moody's upgraded OCWD's variable rate COP (certificate of participation) and commercial paper programs to AAA.

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

1100 MAIN STREET, SUITE C  
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 29, 2000. In our report dated May 24, 2000, 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 24, 2000

**Orange County Water District**

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

For Year Ended February 29, 2000

	Governmental Fund Types			Totals (Memorandum Only)		
	General	Special Revenue	Debt Service	Capital Projects	2000	1999
<b>Revenues:</b>						
Tax revenue	\$ 806,143	-	9,633,406	-	10,439,549	9,670,438
Replenishment assessments	17,000,000	5,770,449	10,000,000	500,000	33,270,449	30,364,047
Basin equity assessments	-	3,514,101	-	-	3,514,101	2,223,813
In-lieu revenue	-	3,389,717	-	-	3,389,717	1,323,469
Investment revenue	133,237	1,665,277	542,528	1,078,231	3,419,273	2,715,736
Other interest	526	-	271,143	795,224	1,066,893	1,507,977
Rents and royalties	573,743	-	-	-	573,743	562,085
Facility revenue from other agencies	1,725,628	-	-	-	1,725,628	1,269,190
Project reimbursement revenue	27,683	-	-	2,186,828	2,214,511	608,030
Orange County bankruptcy recovery	1,680,056	741,967	2,959,700	4,754,371	10,136,094	-
Other revenues	76,403	17,235	-	2,902,906	2,996,544	1,672,085
<b>Total revenues</b>	<b>\$ 22,023,419</b>	<b>15,098,746</b>	<b>23,406,777</b>	<b>12,217,560</b>	<b>72,746,502</b>	<b>51,916,870</b>
<b>Expenditures:</b>						
<b>Current:</b>						
Salaries and benefits	\$ 10,832,018	137,097	-	1,692,654	12,661,769	12,206,617
Services and supplies	8,480,299	2,682,349	-	521,419	11,684,067	8,704,888
Water purchases	-	11,875,006	-	-	11,875,006	3,776,709
Capital outlay	-	-	-	11,020,344	11,020,344	14,643,361
<b>Debt service:</b>						
Principal retirement	-	-	30,640,758	-	30,640,758	11,732,578
Interest and fiscal charges	-	-	11,254,457	-	11,254,457	11,004,772
<b>Total expenditures</b>	<b>\$ 19,312,317</b>	<b>14,694,452</b>	<b>41,895,215</b>	<b>13,234,417</b>	<b>89,136,401</b>	<b>62,068,925</b>
Excess of revenues over (under) expenditures	2,711,102	404,294	(18,488,438)	(1,016,857)	(16,389,899)	(10,152,055)
<b>Other financing sources (uses):</b>						
State loan proceeds	\$ -	-	-	380,577	380,577	2,476,050
Bond proceeds	-	-	24,737,669	18,201,530	42,939,199	-
Commercial paper proceeds	-	-	-	3,275,000	3,275,000	15,000,000
Operating transfers in	-	39,046,965	-	15,381,817	54,428,782	5,000,000
Operating transfers out	(3,820,457)	(4,854,234)	(5,897,918)	(39,856,173)	(54,428,782)	(5,000,000)
<b>Total other financing sources (uses)</b>	<b>\$ (3,820,457)</b>	<b>34,192,731</b>	<b>18,839,751</b>	<b>(2,617,249)</b>	<b>46,594,776</b>	<b>17,476,050</b>
Excess of revenues and other financing sources over (under) expenditures and other financing uses	(1,109,355)	34,597,025	351,313	(3,634,106)	30,204,877	7,323,995
Fund balances at beginning of year	\$ 5,121,832	28,217,947	17,181,861	23,420,751	73,942,391	66,618,396
Fund balances at end of year	\$ 4,012,477	62,814,972	17,533,174	19,786,645	104,147,268	73,942,391

**Orange County Water District**

**Combined Balance Sheet - All Fund Types and Account Groups**

February 29, 2000

	Governmental Fund Types				Fiduciary Fund Type
	General	Special Revenue	Debt Service	Capital Projects	Trust and Agency
<b>Assets and Other Debits</b>					
Assets:					
Cash and investments	\$4,303,845	63,789,602	9,509,439	19,588,297	33,643,980
Restricted cash and investments	-	-	7,480,699	-	-
Receivables	715,128	3,351,254	556,314	25,452,292	1,337,333
Due from the County of Orange	-	-	-	-	-
Due from other funds	59,075	-	-	-	1,271,763
Due from other governments	29,239	-	-	662,201	125,951
Deposits	6,295	-	-	132,375	-
Inventory	171,037	-	-	-	-
Prepaid items	1,677	67,886	-	-	-
Property, plant and equipment	-	-	-	-	-
Other Debits:					
Amount available in debt service fund	-	-	-	-	-
Amount to be provided for payment of long-term debt	-	-	-	-	-
<b>Total assets and other debits</b>	<b>\$ 5,286,296</b>	<b>67,208,742</b>	<b>17,546,452</b>	<b>45,835,165</b>	<b>36,379,027</b>
<b>Liabilities, Equity and Other Credits</b>					
Liabilities:					
Accounts payable	\$ 754,410	4,247,185	13,278	1,347,386	-
Accrued liabilities	517,009	-	-	-	-
Due to other funds	-	59,075	-	-	1,271,763
Deposits payable	2,400	-	-	-	3,583,774
Retentions payable	-	87,510	-	214,857	-
Other liabilities	-	-	-	-	108,177
Deferred revenue	-	-	-	24,486,277	-
Commercial paper	-	-	-	-	-
Certificates of participation	-	-	-	-	-
Loans payable	-	-	-	-	-
Other long-term debt	-	-	-	-	-
<b>Total liabilities</b>	<b>\$ 1,273,819</b>	<b>4,393,770</b>	<b>13,278</b>	<b>26,048,520</b>	<b>4,963,714</b>
Equity:					
Fund balances:					
Reserved	1,271,321	67,886	17,533,174	10,439,875	31,415,313
Unreserved - designated	2,741,156	62,747,086	-	9,346,770	-
<b>Total equity</b>	<b>\$ 4,012,477</b>	<b>62,814,972</b>	<b>17,533,174</b>	<b>19,786,645</b>	<b>31,415,313</b>
Other Credits:					
Investment in fixed assets	-	-	-	-	-
<b>Total liabilities, equity and other credits</b>	<b>\$ 5,286,296</b>	<b>67,208,742</b>	<b>17,546,452</b>	<b>45,835,165</b>	<b>36,379,027</b>

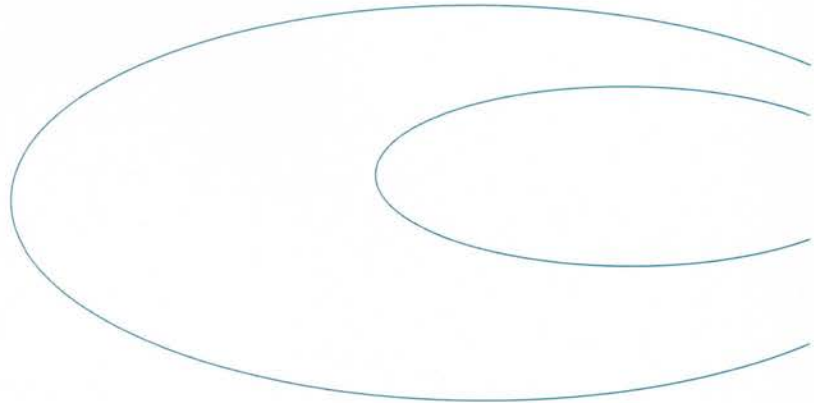


Account Groups		Totals (Memorandum Only)	
General Fixed Assets	General Long-Term Debt	2000	1999
-	-	130,835,163	92,303,925
-	-	7,480,699	2,588,381
-	-	31,412,321	28,914,915
-	-	-	10,878,524
-	-	1,330,838	228,545
-	-	817,391	1,907,348
-	-	138,670	19,067
-	-	171,037	163,091
-	-	69,563	17,546
303,730,042	-	303,730,042	290,847,443
-	17,533,174	17,533,174	14,243,643
-	234,407,397	234,407,397	221,253,590
303,730,042	251,940,571	727,926,295	663,366,018

-	-	6,362,259	4,246,343
-	-	517,009	580,153
-	-	1,330,838	228,545
-	-	3,586,174	3,813,349
-	-	302,367	25,323
-	-	108,177	82,020
-	-	24,486,277	26,310,785
-	2,175,000	2,175,000	22,200,000
-	227,195,000	227,195,000	189,305,000
-	13,969,359	13,969,359	14,631,807
-	8,601,212	8,601,212	9,360,426
-	251,940,571	288,633,672	270,783,751

-	-	60,727,569	49,446,539
-	-	74,835,012	52,288,285
-	-	135,562,581	101,734,824

303,730,042	-	303,730,042	290,847,443
303,730,042	251,940,571	727,926,295	663,366,018



**Groundwater Production**  
**Water Year 1998-1999\***  
**By Local Water Utility**  
(Acre-feet)

	Domestic Use	Irrigation Use	Total
Anaheim, City of	59,531	-	59,531
Buena Park, City of	12,475	-	12,475
East Orange County Water District	622	-	622
Fountain Valley, City of	7,777	42	7,819
Fullerton, City of	24,727	24	24,751
Garden Grove, City of	28,433	-	28,433
Huntington Beach, City of	26,688	-	26,688
Irvine Ranch Water District	21,199	77	21,276
La Palma, City of	2,481	-	2,481
Mesa Consolidated Water District	17,562	-	17,562
Newport Beach, City of	12,569	-	12,569
Orange, City of	24,889	151	25,040
Orange County Water District	2,746	-	2,746
Orange Park Acres Mutual Water Co.	711	-	711
Santa Ana, City of	36,962	-	36,962
Seal Beach, City of	3,186	-	3,186
Serrano Water District	1,347	-	1,347
Southern California Water Company	22,092	-	22,092
Tustin, City of	11,899	-	11,899
Westminster, City of	10,939	-	10,939
Yorba Linda Water District	10,108	101	10,209
Other Operators	8,545	8,292	16,837
Total Groundwater Production	347,488	8,687	356,175

\*Water year begins July 1 and ends June 30.

## Awards

Williams R. Mills Jr.  
General Manager  
Orange County Water District  
1999 Leadership in Engineering Award for  
Water Resources  
Institute for the Advancement of Engineering, Inc.

Steven R. Conklin  
Associate General Manager of  
Engineering and Construction  
Orange County Water District  
1999 Government Engineer of Merit  
American Society of Civil Engineers, Orange County

Sharon Lien  
Public Affairs Specialist  
Orange County Water District  
1999 Edith Stevens Groundwater Education Award  
National Groundwater Foundation

Finance Department  
Orange County Water District  
Certificate of Achievement for Excellence  
in Financial Reporting  
Government Financial Officers Association

Insurance Department  
Orange County Water District  
Special Recognition for achieving a low ratio of  
"Paid Claims and Case Reserves" to  
"Deposit Premiums" in the Liability Program  
Association of California Water Agencies Joint Powers  
Insurance Authority

Children's Drinking Water Festival  
Orange County Water District Groundwater  
Guardian Team  
1999 Water Efficiency Award  
California Water Awareness Campaign

Human Resources Department  
Orange County Water District  
Signature Award  
Profit Sharing/401(k) Council of America

Public Affairs Department  
Orange County Water District  
PROTOS Award of Excellence for Media Relations  
Public Relations Society of America

## Board of Directors

Irv Pickler, President  
Division 9

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

John V. Fonley, Second Vice President  
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Division 5

Wes Bannister  
Division 6

Kelly E. Rowe  
Division 7

Thomas E. Lutz  
Division 8

Jan M. Flory  
Division 10

In Memory of  
H. George Osborne  
1915-1999



**ORANGE COUNTY WATER DISTRICT**

10500 Ellis Avenue  
Fountain Valley, CA 92708

P.O. Box 8300  
Fountain Valley, CA 92728-8300

(714) 378-3200  
(714) 378-3373 Fax  
[www.ocwd.com](http://www.ocwd.com)