



To Quench a Thirst

A brief history of water in the San Diego region

20TH
ANNIVERSARY
EDITION





Hans Doe
1903-1988

**This book was made possible in part by grants from
The Hans and Margaret Doe Charitable Trust.**

A native Norwegian, Hans Doe moved to Vista in San Diego County in 1946 for a career change and became a successful avocado and macadamia nut grower. As a farmer, he understood and respected the importance of water to society.

By 1951, he had become involved in local water politics, and stayed active until just before his death. He was elected to the Vista Irrigation District board, where he served for 33 years (1951-1984). He also served on the Board of the San Diego County Water Authority for 31 years (1956-1987), the Board of the Metropolitan Water District of Southern California for 27 years (1959-1986), and was granted a lifetime membership to the Board of the Association of California Water Agencies after serving two terms (four years) as its president. He served two terms on the State Soil Conservation Commission, chaired the Southern California Water Conference for 10 years, and as an original organizer of the Agua Buena Soil Conservation District, he helped protect Vista from flooding.

Because of his long career in the water industry, he was known as “Mr. Water.” At his behest, the Hans and Margaret Doe Charitable Trust was established in 1990, two years after his death. It supports and promotes water-related education to the people of Vista, San Diego County and California. In the words of the Trust, it operates: “To educate the public regarding the utilization of water resources in the State of California, including the historical development of water resources as well as the planning for present and future development.”

**The San Diego County Water Authority is grateful to the
Hans and Margaret Doe Charitable Trust for its generous contributions.**

Foreword

Throughout my career in public service, few issues have been as important as our environment – and specifically, our water. Growing up in a house without running water, words like ‘water scarcity’ activate a strong reaction in me. As a child, my family carried spring water to our home and used a rain barrel for collecting water. Even though I grew up in Virginia, I did not set my eyes on the ocean until I was 18.

Of course, the focus on water is not unique to me. Generations of San Diegans have developed, treated, managed, and conserved our water supplies so that today, care for water resources is in our collective DNA.

This legacy has had profound impacts, not just in San Diego County but across the nation and around the world. While few may remember this, the San Diego County Water Authority sponsored the first successful low-flow toilet legislation in 1991, setting a standard that was quickly adopted across the country and then internationally. Decades later, it’s impossible to overstate the impact that one visionary action has had to stretch our limited water supplies.

Building upon that success, in 2003, the Water Authority struck a courageous deal to conserve the waters of the Colorado River. While the river is under tremendous stress from the changing climate, the Water Authority’s partnership with the Imperial Irrigation District and others remains a model that highlights a path forward on the river. That approach invests in water conservation while also supporting our farms – and our food supply.

This book is an inspiring account of the efforts that have sustained our community through the wet years, the dry years, and yet more dry years. It follows the story of water from the first peoples through the modern era, and then looks ahead at what’s next. In many ways, San Diego’s story has been intrinsically linked to the search for water.

It’s clear from this account and others that San Diego County’s legacy of leadership will be tested in the years ahead. Today, we face the stark reality that the 20th century climate norms and water delivery systems are insufficient for the 21st century. At the same time, the combination of

inflationary pressures and reliability investments mean water affordability continues to be a critical issue in San Diego and statewide.

To sustain San Diego County’s economy and quality of life, we will need more innovation, more collaboration, more conservation, and more strategic investments. Given our collective history of dedication to these issues, I am confident that the residents of San Diego, the San Diego County Water Authority, and its 24-member agencies will continue to rise to the challenge. ■

Toni G. Atkins

California Senate President pro Tempore



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Preface

Imagine a place that basks in sunshine and warmth and has everything needed to support diverse wildlife and a small population of people. Wild grasses full of grain cover the valleys and hillsides. Fragrances of wild poppies, sage and roses waft in the air. Native grapes and berries hang from vines. Morning breezes flow from the ocean in the West, and an evening breeze blows from the mountains in the East. The temperature is rarely too hot or too cold; there is little worry about food or shelter. Streams flow from artesian springs; willow trees and sycamores line the banks of rivers that flow into a beautiful protected harbor where fish abound. Although the rivers may dry up in the rain-free summer, the people have learned how to store enough water for drinking, bathing and watering their small agricultural plots.¹

This utopian scene may seem like a far-off land compared to the San Diego region today, with its booming population, dense development and farms supported by massive aqueducts that import water from distant mountains and watersheds.

But it's not a distant place; it is the San Diego region as it was just over 300 years ago.

This book tells a story of change, from early times when the few inhabitants managed natural water resources without substantially changing the landscape to more recent times marked by the building of an elaborate network of dams, reservoirs and pipelines that support more than 3.3 million people and a \$268 billion economy. The story has three parts: the first tells how the early residents lived with their local resources; the second, which begins in the 1920s, tells the story of how the region has become heavily dependent on imported water, and the third is just starting. It is the part of the story about how the region will learn to thrive in a changing climate that has turned 20th century norms for water and weather upside down.

We hope this brief history of water development will interest you and inspire you to be a careful guardian of the San Diego region's most basic and essential resource: water.

“The story of humans began at a spring ... It will end when the spring runs dry.”

Fred A. Heilbron, as Vice President of Southern California Mountain Water Company and later Chair of the San Diego County Water Authority²

PART 1



LIVING WITH THE
REGION'S WATER SUPPLY

Introduction

Managing a Region of Extremes

San Diego County lies in the southwestern corner of the continental United States and California. Its boundaries today stretch 70 miles inland from the Pacific Ocean and extend south from Orange and Riverside counties to the Mexican border. In earlier times, the county was larger. It included all of today's Imperial County, touching the Colorado River. It extended north to encompass much of today's Riverside and San Bernardino counties. The region's geography — bounded as it was by a desert, a mountain range and the Pacific Ocean — isolated it from the rest of the continent. This isolation, coupled with its arid climate, impacted the culture and development of the region throughout its history.¹

Limited rainfall and abundant sunshine define the climate. What little rainfall the county receives does not coincide with its need: almost no rain falls during the hot summer. The county's coastal plains receive an average of about 10 inches of rain a year, while the mountains receive an average of 30 inches. Yet the region seldom sees an average year. Instead, yearly precipitation tends to fluctuate greatly from year to year.²

The county is so arid that its entire 4,207 square miles has just seven principal rivers, all of which go dry in the summer. As a result, the county's residents cannot count on them for year-round water. Although the mountains can get ample rain, their steep slopes and proximity to the coast make capturing their runoff difficult.



Historic Old Mission Dam, San Diego River

In the words of William Jennings, a prominent water lawyer in the early 20th century, “It’s hard to stop (the water) and there are very few dam sites.”³

Together, the peculiar geology and hydrology give this region the greatest variability in runoff between the wettest and driest years of any place in the United States. At the low end, runoff may amount to only 5% of an average year, while at the high end, it can be seven times more than the average. One of the driest years on record was 1899–1900, when the El Capitan dam site on the

San Diego River received only 980 acre-feet of runoff. The same site received 200,400 acre-feet in 1915–1916, the year of the Hatfield flood (Chapter 5). This extreme variability makes storage reservoirs a necessity, yet it also makes planning their capacity and building flood-proof dams particularly challenging.

Historically, the storage requirements were often underestimated; floods broke dams all too frequently. To make room for the occasional flood, most reservoirs in the county are sized so they are filled to only about 40 percent of capacity during normal years.⁴ To complicate matters, not all of the rainfall results in runoff. If the yearly average of 10 inches falls in two or three major storms, much of the water runs into streams and makes its way to reservoirs. If, however, that 10 inches falls as frequent sprinkles, which often has been the case, it seeps into the ground and evaporates without producing any real runoff.⁵ In short, securing sufficient water supplies is one of this region’s most formidable challenges, requiring community cooperation and engineering ingenuity not just for a year or even a decade, but for generations. ■

“Water. It’s about water.”

Wallace Stegner, author and professor at Stanford University, when asked about California

Did You Know?

Large amounts of water are measured in acre-feet.

1 acre-foot = 325,900 gallons



An acre-foot covers a football field approximately one foot deep.



It is the amount of water used by three typical households in a year.

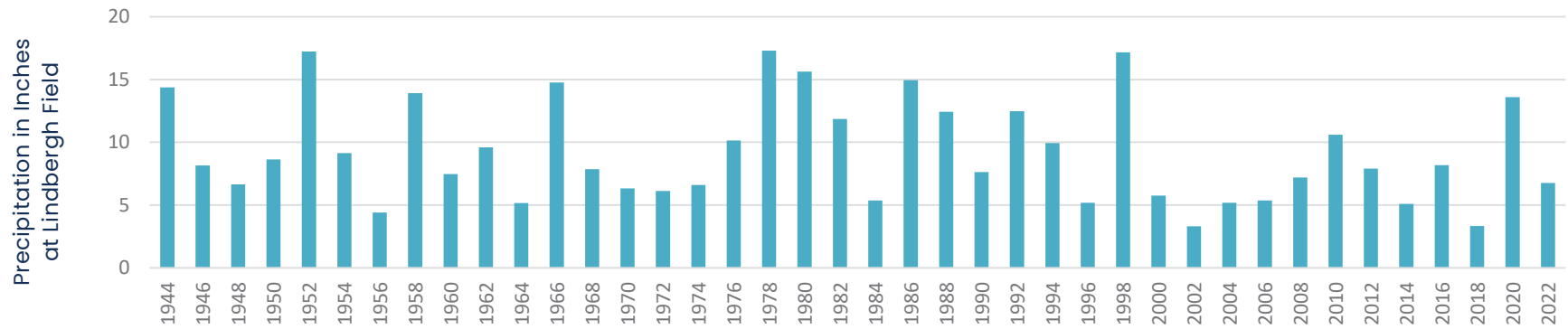


An average person in San Diego County uses 126 gallons per day, or about one-eighth of an acre-foot per year.

San Diego County's Seven Principal Rivers



Average Annual Rainfall in San Diego



Chapter 1

ANCIENT DAYS PRE-1769



Rosa Nejo, carrying an olla (Campo, 1918)

The world in the beginning was a pure lake. The Sky came down upon the Earth. Tu-chai-pai, the Maker, and Yo-ko-mat-is, his younger brother, sat stooped together, bowed down by the weight of the sky. Tu-chai-pai said, “We-hicht, wehicht, we-hicht.” He rubbed tobacco in his hand and blew upon it three times. Every time he blew, the heavens rose higher and higher above their heads.

Then he placed North, South, East and West. The Maker said, “Men are coming from the East and from the West. Now I am going to make hills and valleys and little hollows of water.”

“Why are you making all these things?” asked Younger Brother. The Maker explained, “When men walk back and forth in the world, they will need to drink water or they will die.” So he made little water places for the people. Then he made the forests so they would have wood to burn. He dug in the ground for mud to make the first people, the Indians. He made the Sun and Moon, and then he created nothing more. Still, he was always thinking how to make Earth and Sky better for all the Indians.

*Kumeyaay Story*¹

This is a creation story of the Kumeyaay of San Diego County, whom the later Spanish settlers called Diegueños.

The Kumeyaay were a Yuman-speaking people that included the Iipay bands in the north and the Tipay bands in the southern part of the county. They shared the region with bands of Luiseño, whose traditional territory covered what is now northern San Diego County; the Cahuilla, who lived in the northeastern county and eastward into what is now Riverside County; and the Cupeño, near Warner Hot Springs. For thousands of years, these groups interacted, had a great deal of economic and cultural exchange, and generally lived peacefully.²

As the creation story says, the Maker had indeed made earth and sky good for the people in San Diego County. The geography provided coastal estuaries and a warm, sunny climate. A native grain, now extinct and unidentified, once covered the valleys and hillsides. While rainfall was limited and unpredictable, the coastal plain was “filled to the brim” with fresh groundwater: it overlaid a large artesian system that spurted forth springs and even fountains. There were reeds, rushes and willows for housing, clothing and baskets. Berries, roots, nuts, acorns, big horn sheep, antelope, deer, quail, rabbits and fish provided plenty to eat.³



Pottery “ollas” were native versions of 55-gallon drums.



Mariquita Cuero, showing a method of making ollas (Campo, 1918)

Managing the Land and Water

The indigenous communities, like the Maker in the Kumeyaay story, looked for ways to make their world better for themselves and the surrounding environment — and to help them survive the long droughts. They broadcast seeds for grasses in freshly fired fields that increased the fertility of the grain and reduced the danger of spontaneous fires. They transplanted grapevines, onions, bulbs and tubers. They cleared land for planting and cultivated a network of small agricultural plots in different areas for different seasons. Chaparral plantings on steep slopes reduced erosion and provided food and medicine. Corn, beans and squash were sown near running springs, wet meadows or places dampened by runoff from summer rains.⁴

In addition to land management, the tribes also practiced water management. Groups cooperated to build small dams and levees, diverting water to places where they wanted plants to grow — thus practicing the art of irrigated agriculture, which has played a crucial role in the development of San Diego County. They placed rows of rocks across drainage channels to slow the storm runoff and allow more water to seep into the ground.

Rock alignments on slopes spread out the runoff and trapped fine silt above, making fertile plots for crops. At places where streams narrowed into small rock passages, they placed large boulders and brush to retain water in the wider, upstream portions, creating small bogs and wet meadows. After large storms, people organized to repair any damage to the dams. As a result of these efforts, springs and pools existed in the valleys and water was close to the surface even in dry years.⁵

Editor's Note

This book is intended to provide a historical account of the San Diego region's relationship with water. Some of the views and actions described in the book — particularly regarding Native peoples — do not reflect the Water Authority's values.

Land Acknowledgement

The San Diego County Water Authority recognizes that the San Diego region is built on Kumeyaay, Cahuilla, Cupeño, and Luiseño land, with the unincorporated area of San Diego County being home to 19 Native American reservations represented by 18 Native American Tribal Governments. We recognize the indigenous inhabitants of the region as the original stewards of the county's precious natural resources.

A Time of Turbulence

When Spaniards arrived after long and arduous sea journeys, they were sick, starved, and dehydrated. The Native American people who met them brought them fish and mollusks, and water from the San Diego River.

The Spanish settlement, however, was not good for the Native American population. The Native American people built the Spanish missions and pueblos, usually against their will. They carried the tiles on their backs for the Spanish irrigation systems. They died of disease and abuse. By the time the Mexicans transferred the missions to civilian authority in 1833 and the Native American people were free to go their own way, their numbers had declined, and their precious springs, streams and hunting grounds were controlled by privately owned ranchos. When the United States gained California in 1850, the U.S. drafted treaties to set aside tribal lands — but never ratified them. Between 1875 and 1939, eighteen reservations were established for the Native Americans.⁶

Their land, however, was vastly different. The Spanish, Mexicans and Americans had introduced cattle, sheep and goats to the grassy fields. The livestock ate the grasses to the roots and the newcomers did not re-seed the fields. European plants crowded out the native grasses, which were extinct by the mid-1800s. The new landowners

did not practice fire maintenance, or maintain the rock alignments or small dams below the bogs. Erosion resulted; soil fertility declined; and the wet meadows and springs began to disappear.⁷

Today, more than 40,000 Native Americans live in San Diego County. Many of these individuals represent the descendants of the original stewards of the county's precious natural resources. The county has more federally recognized Native American tribes than any other in the United States.



Luiseño huts, or ramadas, at Cabrillo Celebration (1892)

There are four federally recognized tribal groups in San Diego County:

- The **Luiseño**, consisting of four North County bands, as well as the Pechanga Band of Luiseño Indians just north of the county border;
- The **Cáhuilla**, in northeastern San Diego County and extending eastward into the adjacent lands;
- The **Cupeño**, partially relocated in 1903 from the village of Kupa at Warner's Hot Springs on the headwaters of the San Luis Rey River to the La Palma Reservation, and generally located in the northern portion of San Diego County;
- The **Kumeyaay**, comprising 12 bands covering the area throughout the southern two-thirds of San Diego County.

Two additional tribes – the **San Luis Rey Band of Luiseño Indians** and the **Mount Laguna Band of Luiseño Indians** – are based in San Diego County and are active members of the tribal and regional community, although they do not currently hold federal recognition status. All these tribal communities continue to hold and represent the heritage values that are a part of the natural and cultural landscape around us.

Chapter 2

SPANISH MISSIONS 1769 - 1820

His Grace orders as a hold trust upon your conscience ... to administer this concession and royal grant to the water in this arroyo referred to for the common benefit ... who dwell today or in the future in the province of the Mission of San Diego de Alcalá. This concession and the fruits also shall be held as to these children and their children and successors for all time forever...

Spanish Viceroy in Mexico City under the rule of King Charles III to Father Serra, December 17, 1773¹

When Juan Rodriguez Cabrillo explored San Diego Bay in 1542 to search for fresh water, he claimed the land for Spain. The Spaniards, however, were not ready to establish a settlement in an area so remote from Mexico and New Mexico, so they left. Sixty years later, in 1602, Sebastián Vizcaíno returned and noted a good port with an estuary that extended inland, and “sweet and good water” in the sands near the river. With those notations, the Spaniards left again, this time for 165 years.

By 1769, Spain was ready for San Diego. Father Junípero Serra and Gaspar de Portolá arrived by overland trail from Baja California, and Captain Vicente Vila and Juan Perez sailed into what is now San Diego Harbor. Their purpose was to set up a series of Catholic missions — each a day’s horseback ride apart and a day’s ride

from one water source to the next — in preparation for the Spanish settlement of a new colony. The purpose of the missions, according to Spain, was to convert Native Americans to Catholicism and prepare them for life in Spanish society.

To establish missions, however, the Europeans had to find suitable sites for settlement — sites with water.

De Portolá led an expedition inland to identify such sites. Imagine his despair when he wrote, “There was no water.” They had to explore the land slowly “so as to regulate the marches, according to the distance to watering places.” When they failed to find water, they prayed fervently.² The Native American people they encountered steered them to pools and springs, where the explorers noted “well made” pots (ollas) storing water.³

Back at the harbor, another padre, Father Juan Crespí, wrote about the body of water now known as the San Diego River.

We found there a good-sized river which the ships use as a watering station. This river has a very large, broad plain on its banks, which seems to be of very good soil, with many willows, some poplars and some alders ... If the river is permanent it may prove in time to be the best of those discovered in all California.⁴

Later he wrote again with what must have been both disappointment and astonishment:

... [W]e are much troubled because the river, which flows through the plain and which has very good, clear water, as we have observed every day, is diminishing to such a degree that although two weeks ago when we arrived we saw it flowing with an abundant stream, it has now diminished so that it hardly runs at all and they say that they can cross it dry shod. If this continues it will be necessary to look for another place to establish the mission and obtain irrigation.⁵



Father Serra and a companion

Father Serra, The San Diego Historical Society

The Spanish Mission Period



1542

Juan Rodriguez Cabrillo claimed San Diego Bay and surroundings for Spain.

1602

Sebastián Vizcaíno explored the region and found it good for settlement.

1769

Father Junípero Serra founded the Mission at Presidio Hill in San Diego.



1773

Mission San Diego de Alcalá moved to Mission Valley.

1784

Ranchos were established.

1791

Presidio soldiers began farming at the foot of Presidio Hill (later known as the pueblo of San Diego and Old Town).

1798

Mission San Luis Rey founded in what is now Oceanside.



1813

Construction completed on the Old Mission Dam (Padre Dam).



Mission San Diego de Alcalá, Cave Coutts drawing (1846)

The “Upside-Down” River

Father Crespí was soon to observe that the San Diego River became an “upside-down river.” As a later resident explained, “It runs upside down in the summer with the sand on top.”⁶ The fathers dug wells in the sands of the riverbed and carried their drinking water in skins up to the slope where they established Mission San Diego de Alcalá on Presidio Hill.

The first order of business for the mission was to produce food, since it was too remote to import even bare essentials. Having come from Spain’s arid climate, they knew the importance of planting crops near a reliable water supply ... which proved to be a nerve-wracking, trial-and-error experiment in San Diego. The first

year, the mission planted wheat in the bed of the San Diego River. A flood washed out all the seeds. The second year, they planted farther from the banks. Little rain fell that summer and the water never reached the fields.

By 1773, they had grown tired of bringing water up to Presidio Hill and they were cultivating fields farther upriver where there seemed to be more rain. The priests moved their mission six miles upstream to the eastern end of today’s Mission Valley, leaving the military fort behind on the hill. This new location was the site of an existing Kumeyaay village called Nipaguay. Father Serra wrote, “The place is much more suitable for a population on account of the facility of obtaining the necessary water and on account of the vicinity of good land for cultivation.”⁷



Missions of California

- | | |
|---|--------------------------------------|
| 1 San Francisco de Solano (1823) | 12 San Luis Obispo de Tolosa (1772) |
| 2 San Rafael Arcángel (1817) | 13 La Purísima Concepción (1787) |
| 3 San Francisco de Asís (1776) | 14 Santa Inés (1804) |
| 4 San José de Guadalupe (1797) | 15 Santa Bárbara (1786) |
| 5 Santa Clara de Asís (1777) | 16 San Buenaventura (1782) |
| 6 Santa Cruz (1791) | 17 San Fernando Rey de España (1797) |
| 7 San Juan Bautista (1797) | 18 San Gabriel Arcángel (1771) |
| 8 San Carlos Borromeo de Carmelo (1770) | 19 San Juan Capistrano (1776) |
| 9 Nuestra Señora de la Soledad (1791) | 20 San Luis Rey de Francia (1798) |
| 10 San Antonio de Padua (1771) | 21 San Diego de Alcalá (1769) |
| 11 Mission San Miguel Arcángel (1797) | |

Harnessing the Water Supply

Droughts and food shortages continued to plague the mission. In 1792, the missionaries built a canal to bring water from springs to Mission Valley. Still, that was not enough. In 1803, they hunted for a place to build a dam. Upstream at Mission Gorge, they found a convenient outcrop of bedrock where water flowed over the surface rather than through sand. There they built the county's first masonry dam, which is now called Old Mission Dam or Padre Dam, to hold water and release a reliable, year-round flow.

Unfortunately, too much of the released water percolated into the sandy riverbed between the dam and the mission. Over the next decade, the mission built a tile flume two-feet wide and one-foot deep on a bed of cobblestones and cement — the county's first aqueduct! Crews also built a settling basin with sand traps to clear the water before it entered the flume. A four-inch sluice (a gate to control the flow of water) off the flume powered a gristmill for grinding grain. Irrigation ditches led to fields of imported olive and pepper trees. As agriculture flourished, the mission became a thriving enterprise.⁸

By that time, Mission San Diego de Alcalá was no longer alone. A total of 21 missions were connected by El Camino Real (the Royal Road), each with walled gardens, palm trees, fountains, olive groves, vineyards and orchards.⁹ In addition to the missions, the Spaniards established ranchos (communally operated farms) and pueblos (communally operated towns).

In 1784, the first ranchos were set up at today's National City and Chula Vista near Otay Mesa. They served to assert physical control over the greater region and supply agricultural goods for the mission.¹⁰ In 1791, soldiers started farming at the foot of Presidio Hill, at the site where the pueblo of San Diego was established in 1823, which is now called "Old Town."

San Luis Rey: King of the Missions

The largest and most elaborate mission was north of San Diego de Alcalá near today's Highway 101 in Oceanside. Mission San Luis Rey de Francia, founded in 1798, had a church designed to hold scores of worshippers and an intricate water works system that was worthy of its title, King of the Missions.

The mission diverted water from the San Luis Rey River system to a storage reservoir. Pipes from the reservoir led to a fountain where the inhabitants could draw their drinking water. A charcoal filter cleaned the water. From the fountain, the water ran to a bathhouse and then to a pool for laundry. From there, the water ran into gardens and was lifted by waterwheels to higher-ground orchards. Before it was released into fields, it powered five granaries and a sawmill. As an ultimate sign of power, wealth, and technical sophistication, there was even a faucet in the church.¹¹

This system not only shared the water wealth, but also showcased the abundance derived from careful management and recycling of a limited precious resource.

Water for the Common Good

The water works at San Luis Rey Mission reflected the value the Spaniards placed on water in an arid land. Life in Spain had stressed the importance of water for the survival of a

community. In fact, water was too important to be left to the control of individuals. It was controlled by a royal authority and distributed according to the good of the community. Everyone in the community was entitled to water, and no one was entitled

to waste it. In San Diego County, these principles applied directly to the missions. The missions typically built a water supply and an irrigation system before building a church or housing. Everyone who was to receive their benefits was to work on them.¹²

Chapter 3

THE MEXICAN PERIOD 1821 - 1848

World events seemed to pass the San Diego region by in the early 1800s. The Spanish authorities were preoccupied with a growing rebellion in Mexico and they largely ignored the under-populated northern outpost, California.¹ In Mexico, revolutionary troops were fighting against the Spanish government and eventually won independence from Spain in 1821.

In the San Diego area, however, the transition from Spanish to Mexican control was peaceful. Daily life and customs changed only gradually. The soldiers and their families stationed on Presidio Hill began to view their little settlement on the bay as a permanent civilian town. In 1822,

they began building homes on the flat lands west of the hill and that settlement eventually came to be known as “Old Town.”²

After Mexico became a republic in 1824, it opened California’s ports to ships from the United States for the hide trade. The principal customers were shoe manufacturers from Boston, which provided the only real contact with the U.S. That trade gave San Diego more revenue than any other port in California, and San Diego eventually became a center of social and political life. Still, the U.S. knew virtually nothing about California. Daniel Webster, a senator from Massachusetts, thought the San Francisco Bay was nice, but reportedly would not pay a dollar for the rest of California.³

Mexico began breaking up mission lands by distributing large land grants for ranchos involved in the cattle-grazing operations that supported the lucrative hide trade. The 8,824-acre San Dieguito Rancho is now known as Rancho Santa Fe. The richest grazing ground of the San Diego Mission became the 48,799-acre El Cajon Rancho. Rancho Tia Juana covered the area from south of San Diego Bay to the Mexican border. The biggest of them all, Rancho Santa Margarita y las Flores, had 113,440 acres and extended from the coast of today’s Oceanside north to Orange County and inland to Fallbrook. As people moved from the city to the ranchos, the population of the city of San Diego dropped from 500 in 1834 to only 150 in 1841.⁴

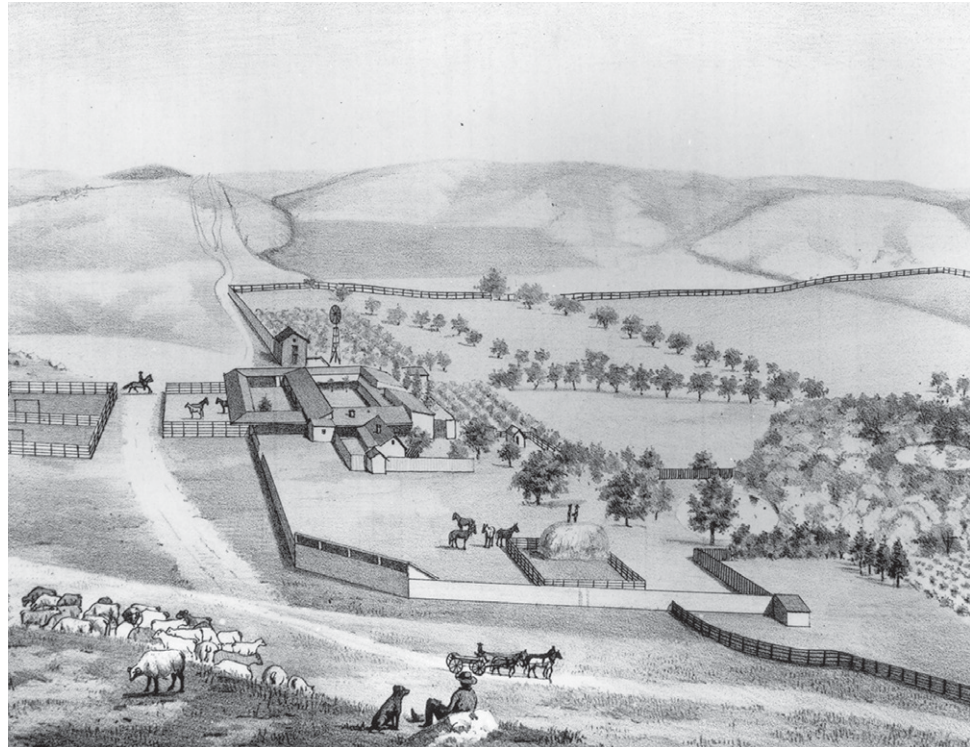
“Wherever there was water there was a rancho, from the coastal mesas, which are cut here and there by the intermittent streams of California, to the broad upland valleys, which are enriched by mountain snows.”

Richard R. Pourade, author of *The Silver Dons*⁵

Thirsty Ranchos

The larger ranchos of the Mexican era began a trend for intensifying the land use and agriculture that demanded ever more development of the meager water resources. Local water supplies were impounded, pumped and diverted to where they were needed. Soon, ranchos claimed just about every spring and perennial stream. For the most part, however, these water-rich locations were already occupied by Native American rancherías (villages), which were forced to relocate to ever-drier lands.⁶

During this period, Southern California struggled through a severe 10-year drought, interrupted only by a flood in 1825. As pumping and diversions continued, the water table dropped and the springs dried up. Today, there are few, if any, traces left of the region's once numerous artesian springs, most of which are so long dry that most current residents are unaware they ever existed.⁷



Rancho Guajome, east of Oceanside (lithograph, 1883)

The Missions' Demise As the ranchos increased in prominence, the missions declined. They had partially fulfilled their "mission" of establishing a Spanish Catholic community in this distant land. Mexico shifted the missions to secular control in 1842. Shortly thereafter, Mission San Diego de Alcalá, the former center of Spanish culture in Mission Valley, was in disrepair and ruins. Another intended "mission" was not fulfilled, however. The missionaries had planned

for the Native Americans on the missions to inherit the buildings and enough land and water to assure their well-being. Only a few Native American pueblos were actually established, including the small towns of San Dieguito, San Pasqual and Las Flores from Mission San Luis Rey.⁸ Nevertheless, the missionaries left a legacy of communal water law that would eventually shape the way water was distributed throughout the county.

The Beginning of San Diego's Water Disputes

The pueblo of San Diego began with an independent municipal government. It was later incorporated under the laws of Mexico in 1834. Those laws, which were derived from

Spanish law, became pivotal in San Diego's 20th century water disputes. Under Spanish and Mexican law, the inhabitants of pueblo lands and ranchos were entitled to a certain amount of land for their use and benefit. These land rights included water rights, since land without water is worthless in arid climates.

Townsppeople from San Diego took advantage of their right to the water of the San Diego River. They drew their drinking water from the river — or from under it when it ran upside down — and they planted gardens in Mission Valley using water from the river for irrigation.

Old Town — Early view from Presidio Hill (1869)



1 Casa de Juan Antonio Aguirre | 2 Casa de Jose Antonio Estudillo | 3 Casa de Juan Bandini | 4 Little Brick Court House | 5 Colorado House | 6 Franklin House
7 Residence of James W. Robinson (also known as the "Railroad Block"), later renamed the Rose Building when owned by Louis Rose, and then the Masonic Hall.

The End of the Mexican Era

Mexico ceded California and the southwest territory to the United States following the U.S.-Mexican War (1846-1848), with the Treaty of Guadalupe Hidalgo. Again, despite bloodshed elsewhere, the changeover in the San Diego region was generally peaceful. Former Mexican citizens stayed on for the most part, although many of them lost title to all or part of their land.

As part of the treaty, San Diego took claim to 47,323 acres of pueblo land from Mexico — the largest tract of land claimed by any city in California.⁹ The treaty specifically referred to the historical land and water rights of the pueblo. Eventually, the city would pay great attention to that language (Chapter 6). In the beginning, however, the new Americans had to deal with more immediate water supply problems.



The first house of Juan Osuna, Rancho Santa Fe (1927)

The first house of Juan Osuna, The San Diego Historical Society

San Diego's Mexican Period

1821

Mexico won independence from Spain.



1822

Town or "pueblo" (later to be called "Old Town") was developed at the base of Presidio Hill.



1824

Mexico became a republic and distributed large land grants. Hide traders with Boston shoemakers were the only real contact with the U.S.

1834

The population of the town of San Diego was 520, and 7,294 Native Americans were counted in the region. The town of San Diego received pueblo status.



1841

Town population dropped to 150 as people received land grants for ranchos.

1842

Missions were secularized.

1846

U.S.-Mexican War began (U.S. fought Mexico for control of Texas, New Mexico, Arizona and California).

Chapter 4

EARLY AMERICAN PERIOD 1848 – 1870s

In 1846, while the Americans were still fighting the Mexican War for control of California, Captain Samuel F. Dupont raised the 27-star American flag over the town plaza of San Diego and declared, “A more miserable and naked sight I never saw.” He must have wondered what his country was fighting for. Nevertheless, others saw possibilities.

Another army officer, Major Canby, followed the San Diego River upstream past the ruined mission and found the dam and aqueduct still in fair shape. He thought that at least 300 to 400 people could live in Mission Valley!¹ Most of the county’s water supply, however, was still meager.

The people in the backcountry got by with small-scale, privately installed irrigation ditches, wells and windmills. The townspeople bought water by the bucket and barrel from private water vendors who hauled it from the river, stored it in cisterns and delivered it by wagon. Some homes channeled rainwater from their roofs into private cisterns.² In 1850, when California became the 31st state, San Diego County stretched from the Colorado River to the coast and from the Mexican border to today’s San Bernardino County. Within a month, the City of San Diego incorporated. The original city census counted just 650 residents.³

“We boiled it; we screened it; we boiled it again; and then we drank something else.”

Standing joke about the City of San Diego’s well water, 1873⁴



Water works, tower and wagon at southwest corner of First & B Streets



San Diego street scene, Fifth Street south of Broadway (1890)

A City Takes Flight

As the American period began, the county's economy was shifting away from ranchos to commercial ventures in the new "city" of San Diego. Civic leaders saw the need for a municipal water supply, perhaps using water from the mountains. With so few inhabitants, however, the city had no money for such a massive undertaking. Unfortunately for the city, the Butterfield Stage Coach line did not reach it, passing instead through the Warner Hot Springs area in the north of the county. San Diego waited eagerly for a link to the transcontinental railway to break its isolation and bring more people. The Civil War in 1860s stalled railway expansion, and the economy of the San Diego region remained slow.⁵

After the Civil War, the pace of economic development and population growth quickened. In 1867, Alonzo E. Horton, a "Connecticut Yankee" who had settled in San Francisco, saw San Diego's harbor and thought it must be "heaven on earth." He thought the existing town near the plaza was a bit shabby, however, and decided to develop a new subdivision, which he called "Horton's Addition." As people moved in, they began calling the new area "New Town" and the existing area "Old Town."⁶ Thus began the trend of developing land to attract more people — and needing more water to keep them there.

Even with limited water supplies, some San Diego citizens started creating lush landscapes. In 1869, a homeowner dug a well in his yard, installed a windmill and created the first irrigated garden for a private home in the city. A fad had begun. Horton followed suit with a garden that the newspaper heralded as "the most imposing edifice in San Diego, [taking water from] a never-failing well of pure water on the premises [which is] carried all over the building by means of machinery."⁷

In 1873, the City of San Diego sank a new well, but citizens were repulsed by its poor quality. Some used its water for bathing, but none used it for drinking. Townswoman Hattie Dougherty described the brackish water at the corner of Twelfth and K: "When you put soap in it and tried to mix it, it turned into a kind of chalk." She described the hubbub that ensued when her brother-in-law dug a well on J Street between 14th and 15th streets that yielded sweet water. "People came for blocks to carry water ... You could see them going in all directions in the morning, carrying a bucket of fresh water to drink."⁸ Water was 25 cents a bucket — a private in the U.S. Army earned only \$13 a month.⁹

In spite of the dubious water quality, the city's early water supply relied on wells. The city looked forward to the day when it could impound water from the San Diego River, which still offered the best quality. In anticipation, the townspeople began to protest against settlements along the river because they interfered with this potential permanent supply of good water. The town trustees listened and they "resolved that all permanent water within the limit of the City be reserved for public use in general."¹⁰



Two women viewing Sweetwater Dam (1895)

In the early 1870s, the first private water company was formed in the City of San Diego: the San Diego Water Company. Under contract to the city, it dug 12 wells in the San Diego River, pumped the water to a 75,000-gallon open reservoir in University Heights and piped it downhill to individual homes. Soon after, another well was sunk in Pound Canyon near 11th Avenue and A Street and pumped to two reservoirs.¹¹

These wells and reservoirs seemed to provide an inexhaustible supply of water for any city that might be built.¹² “There is sufficient water to meet the demands of the population when San Diego has grown to be a large city,” the Chamber of Commerce pronounced. “The San Diego Water Company has solved the problem satisfactorily. The wells are now completed and they are prepared to supply good artesian water in unlimited supply.”¹³ The city’s population had just passed the 2,000 mark.

The Backcountry Creates its Water Supply

Meanwhile, another 2,000 people lived in the backcountry, where cattle ranching remained the main economic activity through the 1870s. All too often, however, the cattle succumbed to drought.

Many ranchers started raising sheep instead, but the sheep died, too. The ranchers’ need for water was acute.

As early as 1853, some farmers throughout the region started making the transition from dry land farming and ranching to irrigated agriculture — and lucrative citrus crops. In 1862, 25,000 orange trees were imported from Mexico. In 1873, Brazilian naval orange trees arrived. With the prospect of large profits from citrus crops, farmers scrambled to develop local water supplies for irrigation. First, they used up their surface supplies and then they drilled ever deeper for groundwater.¹⁴

A pair of enterprising brothers stepped in to fill the increasing demand for water in the backcountry. They organized the Kimball Brothers Water Company in 1869, bought rights to the Sweetwater River and then built a reservoir with a 90-foot-high dam and distribution pipes. Their water supply spurred the development of National City and Chula Vista.¹⁵

To the north, similar enterprises were developing. For example, in 1853, an agricultural canal was built to divert water from the San Dieguito River system to the San Pasqual Valley near today’s Escondido.

The San Pasqual Water District built a second canal in 1887 to connect the valley to a potential dam site at Pamo Valley (which was never built).¹⁶ This developing water supply and delivery system would later spawn several dams and reservoirs that the City of San Diego would acquire in the 1920s.



Laying water pipe (1911)



Sweetwater Dam (Undated)

City and Backcountry Need More Water

At the dawn of the 1880s, the county had a water supply company for the city and several for the backcountry. They served different constituencies: urban/domestic users and agricultural irrigators. As the county population grew with the coming of the railroad and the “boosterism” that followed, each constituency needed more water.

To meet growing needs, water development began in earnest. It started a transition from depending on well water to impounding river water in the mountains. With this larger-scale development in the 1890s, urban and agricultural interests began to clash. The next few decades were characterized by dueling water companies and overblown promises for water delivery, as well as the usual extreme cycles of drought and flood.

The Early American Days



1848

End of the U.S.-Mexican War; California (including San Diego) became a U.S. military province.

1850

California became the 31st state.



1854

Irrigated agriculture developed in the San Pasqual Valley and elsewhere.

1862

First citrus crops planted in San Diego County.

1867

Horton's Addition founded at New Town.

1869

Irrigated landscaping for private homes began; Kimball Brothers Water Company formed to build Sweetwater Dam and Reservoir.



1870

Census figures showed the county population at 4,324, with 2,300 in the City of San Diego. San Diego Water Company supplied water to the city.

Chapter 5

CREATING WATER COMPANIES 1870s - 1920s

When the railroads came to San Diego — first the Southern Pacific in 1877 and Santa Fe in 1885 — the county thought it had arrived. Now it could rival Los Angeles and San Francisco in power and prestige. Real estate boomed and people flooded into the county. In the period from 1870 to 1887, the population of the City of San Diego grew from 2,300 to 40,000. Then the bubble burst.

Farmers wanted to grow more highly profitable citrus crops, like they were doing in Orange County to the north. However, the water demands of citrus farming overwhelmed small water companies. William Jennings, the future attorney for the Water Authority, grew up on his family’s farm near Lakeside. He wrote, “A good farm depended on having a good water supply and with ... very few water distributors of any kind, everyone was

dependent upon their own ability to develop water.”¹ Being a farmer in San Diego County in those days also meant being a dam builder, and the unpredictability of the rainfall made such engineering nearly impossible. Jennings’ father never built his dams high enough because he could never predict the ferocious flooding that sometimes occurred.

City folk, in the meantime, wanted green lawns and tree-lined streets. The San Diego Water Company was unprepared to meet the demand. With no planning tools in place for dealing with growth, the land boom went “bust” in the 1880s and the population plummeted from 40,000 in 1887 to a more manageable 16,000 in 1890. By that time, several new and larger water companies had been formed, paving the path for the county’s modern water supplies.



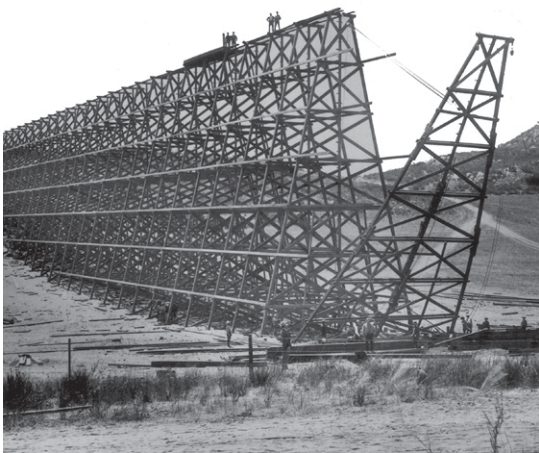
Fourth Avenue and Elm Street
following the real estate collapse (1887)

“There is probably no greater duty that can be undertaken by a man or men than in the creation of a pure and wholesome water supply for mankind.”

Fred A. Heilbron,
Vice President of Southern California
Mountain Water Company, 1910²

Entrepreneurial Planning and Innovation

The first major water company was formed in 1886, inspired by Theodore Van Dyke. Van Dyke was, among other things, a writer and artist from Minnesota who loved to hike in the mountains. He came to the San Diego area for health reasons and realized the incredible impact a reliable water supply would have on the region. While hiking in the Cuyamaca Mountains, he envisioned a large lake that could feed water into the lowlands and the City of San Diego. He organized a group of investors to form the San Diego Flume Company and build the Cuyamaca Dam on Boulder Creek in the headwaters of the San Diego River. At first, the company faced ridicule because the system seemed utterly excessive. Yet time was on its side. It was not long before even this impressive water project could not meet the demand for water.



Construction of Los Cocheros "Sweetwater" Trestle (1887)

The most famous feature of this water project was a remarkable wooden flume, a unique and wondrous engineering achievement of its time, consisting of many trestles over ravines hundreds of feet long, as well as tunnels and siphons.

Water was released from Cuyamaca Dam, where it ran 18 miles down Boulder Creek to a diverting dam at its confluence with Boulder Creek and the San Diego River, upstream of today's El Capitan Reservoir. At the diverting dam, the water entered the flume, which was 6 feet wide and 16 inches high. It ran approximately 33 miles down the south side of the river to El Cajon Valley and into La Mesa, where the water flowed into the La Mesa Ditch and then through pipes to the City Heights area of San Diego. The exact length changed over the years with route alterations. Later repairs also added some height to the flume so it could carry up to 18



Flume at east side of Chocolate Creek (1887-1888)

inches of water. Eucalyptus Reservoir and a small diverting dam in Grossmont were added in 1892 to provide storage at the end of the flume line. Later, the La Mesa Ditch carried water from the storage area in Eucalyptus Reservoir to a larger storage reservoir formed by the La Mesa Dam (now covered by Lake Murray) and then into the city's water main system.³

Along the way, the flume supplied farmers served by local water districts. Ranchers built connecting pipes to their own storage reservoirs and a gauge box measured how much water they used.⁴ The flume ran directly through the Jennings' farm. Jennings recalled:

It was a rickety-appearing wooden structure. Because it was entirely a gravity flow, it was built on contours and it went up every canyon and back down the other side of the canyon except where we had a real long canyon reach. At those places, the builders had built a skeleton trestle that carried the flume across to the other side. The water was always deep enough in the flume and it was running at a rate so you could launch a small raft in it and run it downhill. All the kids in the county that lived along the flume spent a great deal of their idle time either riding in the flume or swimming in the water.⁵

While the children delighted in the flume's recreational opportunities, San Diego residents rejoiced in receiving "pure mountain water." The city staged a celebration the day the water arrived; nozzles on street corners sprayed fountains 125 feet high.⁶

John D. Spreckels



The San Diego Flume Company sold water to the city until its president, Joseph W. Sefton, became locked in a feud with two prominent businessmen, John D. Spreckels and E. S. Babcock, who were determined to develop their own water supply for the city.⁷ They united several small water companies to create the Southern California Mountain Water Company in 1894. Spreckels was a millionaire sugar magnate whose family dominated financial and political life in San Diego. Now he was building the largest irrigation project in the United States, starting with Lower Otay Dam and Reservoir in 1897. Over the next decade, the Southern California Mountain Water Company began building the Morena and Barrett Dams on Cottonwood Creek, a tributary of the Tijuana River. It also began building the Dulzura Conduit, a flume connecting the Barrett and Cottonwood water supplies to Lower Otay Reservoir, which was in turn connected by the Otay Pipeline and the Bonita Pipeline to the city's water distribution system.

Enthusiasm and Exaggeration

A century ago, large dams were a sign of progress and prowess, and people celebrated them as “titanic miracles of engineering.”⁸ With its Southern California Mountain Water Company and San Diego Flume Company, San Diego County was the nation's dam-building hub — and proud of it. By 1923, every major drainage system in the county, except the Santa Margarita in the north, included at least one reservoir.⁹

Spreckels owned *The San Diego Union* and he used the newspaper to promote his Mountain Water Company's projects and to deride those of his competitor, the San Diego Flume Company. His water company also published the book *The Story of Water in San Diego* in 1909, which contained breathless descriptions of the “stupendous” water works as a

“miracle beneficent.” The book gushed over the Morena Dam: “Here, in this awful rift the dam is building — as if the pygmy, Man, defied the Titan, Nature.” It claimed Morena would hold enough water for seven years without a drop of rain, while New York City only had storage for six months. “What this means to the future of San Diego it would be impossible to overestimate ... No other city 50 times her size has anything comparable with this great water system, not half a dozen cities on earth have anything better.”¹⁰



Crossing the San Diego River at the foot of Eagle Peak Grade (1907)
Ed Fletcher, driver; George Marston, front seat; John Nolen, back seat



Opening day of the San Diego Flume Company (1888)

Hatfield the Rainmaker and the 1916 Flood

Rainmakers were held in great esteem by the Kumeyaay in the days before the Spaniards. At the beginning of the 1900s, rainmakers still were called upon in desperate times. Despite all the magnificent new dams in the county, the county was held hostage by a 10-year drought. Along came Charles M. Hatfield, the rainmaker. He mixed two dozen secret chemicals (in a formula he took to his grave), aged the concoction, poured it into pans and placed it on top of towers. There, the formula evaporated and brought rain – according to Hatfield. The odors from this formula were said to resemble limburger cheese. Skeptics said the stink was so bad that nature sent rain in self-defense.

In December 1915, the city of San Diego hired Hatfield for \$10,000 on a “no rain, no pay” basis with the promise that he would fill Morena Reservoir. He placed his potion in the mountains around the reservoir. From January 15 to 20, 1916, rain poured across the county, with more than 17 inches falling in the mountains. The San Diego River rose six feet and covered Mission Valley under a mile-wide raging flood from cliff to cliff. The Tijuana River washed away a colony at Little Landers, just

north of the Mexican border. Roads and bridges were wiped out throughout the county.

People wanted Hatfield to stop making rain, but the City Council refused to pay him because Lake Morena was not full. The San Diego Union wrote that the value of the water in the reservoirs offset a hundred-fold the damage to property. “[T]he runoff into reservoirs will also continue giving the city and the county a wealth of water for future use and bringing with it the happiness and prosperity that is only possible through such a bountiful water supply.”¹¹

Hatfield vowed to earn his pay and fill the reservoir, so he continued his rainmaking activity. From January 25 to 30, it rained another 14 inches in the mountains. The flooding damaged the Sweetwater Dam by breaking new abutments to the original dam, and utterly swept away Lower Otay Dam, demolishing everything below.

Bridges, railroads and highways were gone and 14 people died. The Fallbrook railway station and station master’s house were carried away down the Santa Margarita River. In the San Luis Rey Valley, a historic adobe bell tower fell off the Pala Mission

church. The San Diego Union lamented that the telephone line was washed out before Hatfield could be ordered to turn off his rainmaking plant.

Hatfield never collected his fee because he refused to sign a contract assuming responsibility for the damage. Historian Thomas Patterson wrote, “Scars permanently changed the contour of the hills ... Springs previously unknown to the backcountry flowed for years afterwards.”¹² The county has never recorded a wetter two-week period before or since. Perhaps Hatfield really did make it rain, or perhaps this was just a great coincidence. Because his secret formula was buried with him, no one will ever know for sure.¹³



Rainmaking tower of Charles Hatfield (1916)

The county has never recorded a wetter two-week period before or since.

Morena Dam also attracted the attention of the national magazine *Harper's Weekly*. In the issue of January 8, 1898, H. H. Gardiner raved that the dam was a new wonder of the world and would “not only furnish water to the City of San Diego, but would also ‘reclaim’ over 100,000 acres of farm or ranch land that are now absolutely worthless.”

This claim was in fact exaggeration. The water from Morena Reservoir would irrigate only 6,000 acres, not 100,000, when completed. Furthermore, it held only 5 billion of its 15 billion-gallon capacity until the devastating “Hatfield flood” of 1916.¹⁴

Urban & Agricultural Water Uses

During this time, the City of San Diego was organizing municipal ownership of its water supply. In 1901, it formed the Consolidated Water Company. The new company bought the entire delivery system of the San Diego Water Company and that portion of Southern California Mountain Water Company’s delivery system that was within the city. The financial burden of those investments prevented the company from buying any new water supply assets for more than 10 years. In the meantime, the city bought water from the Flume Company, but when a prolonged drought hit the county, the Flume Company could not deliver the

promised water. It lost both credibility and good will, and the city began buying water wholesale from Mountain Water Company.

Just before World War I, the city bought the Cottonwood and Otay systems from Southern California Mountain Water Company (Upper and Lower Otay, Morena, Chollas and the then-incomplete Barrett Dam and Dulzura Conduit). It was not until 1909, though, that the city could sell bonds to raise enough cash to complete the Barrett Dam and Dulzura Conduit and to undertake the ambitious El Capitan Dam.¹⁵

Meanwhile, in 1910, two businessmen, Edward Fletcher and James Murray, bought the San Diego Flume Company and formed the Cuyamaca Water Company. Fletcher came to San Diego from Massachusetts to seek his

fortune and he eventually became known as the “water seeker” for leading the push to develop water systems in the north of the county. He said, “Water is king and the basis of all value in the county is water.”¹⁶

At this time, a water-related urban-rural shift began to take place. Fletcher believed that irrigated agriculture should hold firm against the ever-more demanding claims of cities. Under his leadership, the Cuyamaca Water Company, which began as a supplier to the city, was now supplying the agricultural backcountry. On the other hand, Spreckels’ Southern California Mountain Water Company, which began as a collection of small irrigation companies, was mainly focused on providing water to the City of San Diego. Fletcher and Spreckels became rivals, with the city caught in the middle.



Damaged bridge at Old Town after the 1916 flood

Water in the North

The main dam in the northern part of the county, Escondido Dam on Escondido Creek, dated back to 1895. (It was later rebuilt and re-named Wohlford.) Fletcher controlled a dam site at the future Lake Hodges and he helped convince the Santa Fe Railroad to finance the construction of Hodges Dam in 1918, as well as a distribution line to the coast. The railroad owned land from Del Mar to Carlsbad that became more valuable as water became available for colonies.

The Lake Hodges system was owned by a new subsidiary of the railroad, the San Dieguito Mutual Water Company, with Fletcher as president. This company organized the Santa Dieguito and Santa Fe irrigation districts and sold water to them under contract. The City of San Diego was soon interested in buying some of the Lake Hodges water, but the Santa Fe Railroad did not want its subsidiary selling water to a city. Instead, Fletcher acted as a middleman for the water sales to the city.

By 1926, the city needed more water, and it wanted to buy the San Dieguito water system. Spreckels wrote in his newspaper that buying this system would solve San Diego's water supply problems. Fletcher opposed that plan, however. He urged the people of the irrigation districts to "free" themselves of "city domination and act for themselves." Eventually, an entirely different company, the San Diego County Water Company, bought the system.¹⁷

The San Diego County Water Company was formed to develop Lake Henshaw in the San Luis Rey watershed — with Fletcher as a director. Built in 1922, Lake Henshaw supplied water to Escondido Mutual Water Company and Vista Irrigation District, with little left over for the City of San Diego. The Lake Henshaw system was acquired by the Vista



Lake Hodges Dam with spillway (c. 1920)

The City of San Diego still needed more water and was claiming water rights to the San Diego River. The city filed for a dam site on the river. Fletcher proposed a dam site he owned at Mission Gorge. This time, Spreckels used his newspaper to turn public opinion against Fletcher's proposal and lobbied instead for a dam farther north at El Capitan, a site that Fletcher's Cuyamaca Water Company also owned.

According to historian Carl Courtemanche, the battle over water acquisition was controlled by political machinations that completely confused the city's population. The power elite believed the common people could not be entrusted with decisions about water development,

but they could be entrusted with paying for the projects.¹⁹

In 1924, after a long and confusing debate, the city chose Spreckels' project at El Capitan over Fletcher's at Mission Gorge. By then, the city of San Diego was involved

in another long battle with the Cuyamaca Water Company over its pueblo rights to the San Diego River. Fletcher made several offers to sell the Cuyamaca Water Company to the city, but again and again Spreckels discouraged the purchase. In the end,

Fletcher sold the company to the La Mesa, Lemon Grove and Spring Valley Irrigation District. The irrigation district acquired ownership of 10,000 acre-feet of water per year in the El Capitan Reservoir, allowing it to abandon the expensive maintenance of

Major Water Providers in San Diego County

1869

Kimball Brothers Water Company Supplied by the Sweetwater Reservoir on the Sweetwater River. Sold water to irrigators.

1873

San Diego Water Company First water company in the City of San Diego. Sold water from the San Diego River to the city's urban and domestic use.

1886

San Diego Flume Company Formed by Theodore Van Dyke and others to sell water impounded in the Cuyamaca Mountains to the City of San Diego. Bought by Edward Fletcher and James Murray in 1910 and renamed Cuyamaca Water Company.

1894

Southern California Mountain Water Company Formed by Adolph B. Spreckels and E. S. Babcock, uniting several small water companies into the largest irrigation system in U.S. at the time. Later promoted urban water use.

1901

Consolidated Water Company Formed by the City of San Diego, as the first municipally owned water system. Bought water from San Diego Flume Company and Southern California Mountain Water Company.

1910

Cuyamaca Water Company Formed after Edward Fletcher and James Murray bought the San Diego Flume Company. Promoted the use of water for irrigation. Assets purchased by La Mesa, Lemon Grove and Spring Valley Irrigation District, which became an operating district in 1926. Renamed Helix Irrigation District when it annexed El Cajon Valley in 1956 under Harry Griffen's direction. Renamed Helix Water District in 1973, as the former agricultural area became totally urban.

1918

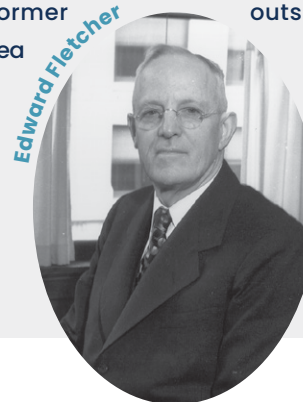
San Dieguito Mutual Water Company Built Hodges Dam and Reservoir.

1920

San Diego County Water Company Formed to build Lake Henshaw and Henshaw Dam.

1944

San Diego County Water Authority Formed as a public agency to develop, import and distribute water that originated outside of the county.



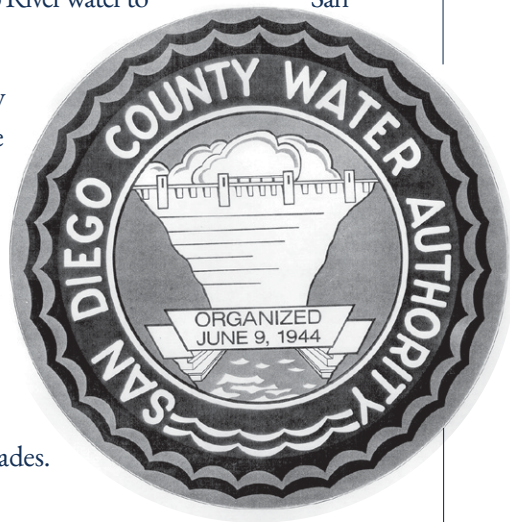
the old flume line.²⁰ In a sense, all parties were winners.

The true losers in the Spreckels/Fletcher dispute were the Capitan Grande Indians, who had little power to affect the outcome. They had moved to the El Capitan area from earlier territories and were granted land under a trust patent enacted in 1891. Now they had to move again as their land once more became valuable to others. The land was flooded under the reservoir and they were relocated to areas without water rights.

Unifying the County

Fletcher may have lost the battle for the Mission Gorge Dam, but he learned something important. A county with such limited local water resources needed to rise above warring water companies. He became a state senator and in 1943 he introduced a bill that had been proposed by Phil D. Swing to create the San Diego County Water Authority. Swing also co-authored the Boulder Canyon Project Act, which would eventually bring Colorado River water to San Diego County.

The County Water Authority Act enabled the county to acquire water outside its boundaries and distribute it throughout the county. The San Diego County Water Authority was formed in 1944 with nine member agencies a number that swelled to 24 in following decades.



San Diego County's Growth

1870

County population reached 4,234, with 2,300 in City of San Diego.

1873

San Diego Water Company formed.

1877

Southern Pacific Railroad extension connected to San Diego.

1880

County population reached 8,618, with 2,637 in City of San Diego.



1885

Santa Fe Railroad extension completed.

1886

Van Dyke organized the San Diego Flume Company.

1886

City of San Diego population hit 40,000 during a real estate boom.

1890

City of San Diego population dropped to 16,159 after a real estate bust.

1894

Spreckels formed the Southern California Mountain Water Company.

1900

County population rose to 35,090, with 17,770 in the City of San Diego.



1901

City of San Diego formed the Consolidated Water Company.

1910

Fletcher bought the Flume Company to form the Cuyamaca Water Company.



1915

City of San Diego population: 56,000.

1916

"Hatfield Flood" caused death and destruction throughout the county.

1920

All water in the county still developed locally. City of San Diego population at 74,683.

1923

Every major drainage area in the county (except Santa Margarita) had at least one reservoir.



1924

El Capitan Dam approved. (Not built until 1935.)

Major Dams in San Diego County (in Chronological Order of Construction)

Dam	Completed	Capacity in Acre-Feet	Built by / Owned by
Sweetwater	1886	30,079	Kimball Brothers Water Company/Sweetwater Authority
Cuyamaca	1886	8,195	San Diego Flume Company/Helix Water District
Lower Otay	1897, 1918+	49,849	Southern California Mountain Water Company/City of San Diego
Morena	1912	50,694	Southern California Mountain Water Company/City of San Diego
Escondido (Lake Wohlford)	1895, 1924+	6,506	Escondido Mutual Water Company/City of Escondido
San Dieguito	1918	883	Santa Fe Irrigation District/San Dieguito Water District & Santa Fe Irrigation District
Murray	1918	4,684	La Mesa, Lemon Grove and Spring Valley Irrigation District/City of San Diego
Hodges	1918	30,251	San Dieguito Mutual Water Company/City of San Diego
Barrett	1922	34,806	Southern California Mountain Water Company/City of San Diego
Henshaw	1922	51,774	San Diego County Water Company/Vista Irrigation District
El Capitan	1934	112,807	City of San Diego
San Vicente	1943, 2014+	89,312; 247,000*	City of San Diego; Expanded capacity (157,000 AF) owned by San Diego County Water Authority
Loveland	1945	25,400	California Water and Telephone Company/Sweetwater Authority
Sutherland	1954	29,508	City of San Diego
Miramar	1960	6,682	City of San Diego
Chet Harritt (Lake Jennings)	1962	9,790	Helix Water District
Dixon	1970	2,606	City of Escondido
Poway	1971	3,330	City of Poway
Turner	1971	1,612	Valley Center Municipal Water District
Red Mountain	1985	1,335	Fallbrook Public Utility District
Ramona	1988	12,000	Ramona Municipal Water District
Olivenhain	2003	24,000	San Diego County Water Authority

+Rebuilt

*When completed in 2014

Chapter 6

PUEBLO WATER RIGHTS

The struggle over El Capitan Dam involved more than a conflict between the leaders of two rival water companies. It also involved a fundamental question:

Did the city of San Diego have to pay the Cuyamaca Water Company for the water the company had developed on the San Diego River, or did the city have “prior and paramount” rights to the water?

This question emerged from a tradition of pueblo water rights that stretched back to the Spanish settlement — and would have consequences for state Supreme Court decisions in the second half of the 20th century. Until this question was settled, the construction of El Capitan was stalled and the city’s dreams of growth and economic expansion were on hold.

At issue was the 1783 Plan of Pitic, which was a guideline to founding Spanish pueblos in California. It was based on the Spanish principle that the governing authority had to “apportion water justly and fairly to each user and to prevent conflict.”¹ All residents should share a pueblo’s water and no one had a superior right to this common good.

The plan also distinguished between private rights (such as those of the ranchos that transformed into irrigation districts) and community rights (such as the pueblos that transformed into the cities). Privately owned rancho rights were usually “inferior” to those of a pueblo community which protected the “common good.” Even for water that originated on its property, the pueblo’s rights were not

absolute. It could not maliciously deny water to others or withhold water from a town without an adequate supply. Likewise, some private rights were protected against community abuse.

The test of fairness was “equity and justice,” and new towns were admonished that “there shall not result in injury to any private individuals.” These exceptions to the absolute rights of pueblos acknowledged the complexity of life-and-death water issues in an arid land.²

“To apportion water justly and fairly to each user and to prevent conflict.”

Principle of traditional Spanish water law

FLETCHER FILES
CAPITAN PAPERS
Union Files-32
Col. Ed Fletcher yesterday sent to city hall signed copies of an agreement transferring his holdings at El Capitan to the city for \$40,000. Approximately 252 acres are involved. Of this total 34 acres were included in an old option given La Mesa, Lemon Grove & Spring Valley Irrigation district some time ago. The water agreement between the city and the district turned over all Capitan lands and options to the city. Col. Fletcher said that the agreement deeds everything his family owns at El Capitan.

Excerpt from The San Diego Union
(February 5, 1932)

Pueblo water rights became little more than an interesting footnote for most of California water development. However, they were pivotal in the development of California's two largest cities: Los Angeles and San Diego.

In 1870, Los Angeles claimed that a landowner on the former Rancho Los Feliz was encroaching on the city's ancient pueblo water rights that had been granted by the King of Spain in the Plan of Pitic.³ The city argued that it inherited the status of pueblo in the Treaty of Guadalupe-Hidalgo and therefore could prevent a private landowner from using water from the Los Angeles River. The rancho had begun diverting water after the pueblo was founded, but no one had objected at the time. By 1870, however, Los Angeles wanted to safeguard its rights to the river for the future, so it sued the Vernon Irrigation District that was supplying the landowner. The city lost two cases because the courts upheld that the landowner's location by the river (riparian rights) and long-standing use of the water (appropriative rights) could not be denied. Los Angeles appealed to the state Supreme Court in 1895 and submitted statements about the Plan of Pitic. The irrigation district did not submit any materials supporting the exceptions to a pueblo's absolute rights, because it was confident the court would base its opinion on

its undeniable riparian and appropriative rights. The irrigation district's assumption was wrong. The Supreme Court took the city's assertion of exclusive pueblo rights at face value and ruled in the city's favor.⁴

In the 1920s, the city of San Diego based a case against the Cuyamaca Water Company on the Los Angeles precedent. The city argued that because it also had pueblo status, it could prevent the La Mesa, Lemon Grove and Spring Valley Irrigation District's upstream diversions.

The Supreme Court ruled for the city in 1930, thus allowing the El Capitan Dam to go forward. The city's ability to increase its water supply came at a time when urban areas were starting to contribute more to the economic strength of the state — and urban populations continued to grow. Soon, the city would outgrow even the supply created by the El Capitan Dam. By that time, the city and county were jointly searching for new supplies outside the county's boundaries, and the new, imported water would benefit both urban and agricultural users.



People walking on top of dam at El Capitan dedication (February 1935)

The 1930 Supreme Court Decision

The Practical Aftermath

In theory, the Cuyamaca Water Company's successor, the La Mesa, Lemon Grove and Spring Valley Irrigation District, lost its water following the 1930 state Supreme Court Decision. In practice, however, it only lost its right to the water; it still owned all the dams and facilities.

The City of San Diego gained the right to the water, but it could not afford to buy the facilities to receive it. The irrigation district needed water; the city needed a distribution system. Neither group liked the idea of annexing the water district to the city, and the irrigation district was not willing to sell because it needed water more than money. Thus, they worked out a compromise: the city let the irrigation district have some water and the irrigation district let the city use its distribution system.⁵

The Legal Aftermath

The question of pueblo water rights had another day in court. In 1955, Los Angeles sued communities in the San

Fernando Valley to assert its prior and paramount water rights. After 13 years of examining historical documents and questioning experts, the court ruled against Los Angeles and refuted a pueblo's successor's absolute right to water at the expense of other users. It reduced Los Angeles' share of water in the San Fernando Valley by one-third. The decision read, "The so-called 'pueblo water right' had no support in Spanish or Mexican law and ... its statement in some of the [earlier] cases was based solely upon erroneous translation, incomplete and inaccurate citations and unsupported conclusions drawn therefrom."⁶

That seemed a definitive blow to the City of Los Angeles' assertion of paramount pueblo rights, but it was not. Los Angeles appealed to the state Supreme Court, which overturned the lower court ruling in 1975. Although it acknowledged that pueblo rights remained inconclusive, it upheld the notion of letting prior decisions stand, especially older ones that would have far-reaching effects if overturned.⁷

Major Water Rights Decisions

1783

Plan of Pitic defined the basis for water rights in Spanish pueblos.

1784

Ranchos established with some rights to communal water.



1870 City of Los Angeles sued landowner of former rancho to prevent diversions from the Los Angeles River.

1870s

City of San Diego complained about diversions upstream on San Diego River.

1895

Los Angeles won state Supreme Court decision against Vernon Irrigation District over rights to the Los Angeles River.



1930 City of San Diego won State Supreme Court decision against the La Mesa, Lemon Grove and Spring Valley Irrigation District over rights to the San Diego River.

1935 El Capitan Dam and Reservoir completed.

PART 2



**DEVELOPING THE NEXT
GENERATION OF WATER
SUPPLIES**

Introduction

Over the Next Hill

Even during the struggle over who could develop the San Diego River in the 1920s, people were beginning to look beyond the county's footprint for water resources. The optimists believed that just one more water development project would solve their needs – but that goal proved elusive. An increasingly large group of residents came to realize that San Diego County would have to go the way of Los Angeles County and start importing water to meet the needs of a growing population and economy.

Gradually, the San Diego region would look “over the next hill” to the Colorado River and then to Northern California rivers fed by the abundant snows of the Sierra Nevada. During the last half of the 20th century, the county became increasingly dependent on imported supplies and almost every drop of drinking water came from distant sources. Droughts, regulatory restrictions on water sources, and the fear of a major earthquake severing imported water supply lines helped remind county leaders about the need to find new imported supplies they could better control – and to develop new local sources that could avoid some of these risks altogether. Starting in the early 1990s, farsighted and creative thinking by the Water Authority turned those opportunities into a diversified and much more reliable water supply portfolio with few equals.

Part Two looks at how San Diego county has succeeded in acquiring and maintaining a reliable water supply.

Chapter 7

COLORADO RIVER WATER

From Local Issues to Regional Project

The seeds of the idea to import water from the Colorado River were planted long ago. In 1856, Thomas H. Blythe, a developer from San Francisco, diverted water from the river to the Palo Verde Valley and then filed a claim to irrigate 40,000 acres. In 1900, the California Development Company built the Alamo Canal to divert Colorado River water through Mexico to the Imperial Valley. (At that time, San Diego County stretched east to the Colorado River, but it became separated from that water source when Imperial County was established in 1907.) The parched Imperial Valley had previously been called the Valley of the Dead, but water would change that image. Within four years, 700 miles of canals were irrigating 75,000 acres of the Imperial Valley for 8,000 settlers. While the Imperial Valley now had water, it had no flood control. Flood waters devastated the area when a temporary diversion levy broke its channel in 1905. Over the next two years, water from the Colorado River filled the ancient Salton Sink, creating the Salton Sea.¹

Residents organized the Imperial Irrigation District and began a campaign for the All-American Canal, which was soon attached to a larger initiative: the Boulder Canyon Project. The U.S. Congress saw the concerns of the lower Colorado River as part of a problem that covered the entire seven-state region of the Colorado River Basin (Colorado, Wyoming, New Mexico, Arizona, Utah, Nevada, and California), and that required permanent federal oversight. This expansion from local to national concern began with the Swing-Johnson Bill of 1922, which addressed issues of river regulation, flood control, water storage for irrigation and power generation.²

“Nobody owns water, nobody wants to steal anybody’s water — just stop it from wasting and going to the ocean. God has given us resources, and it’s up to us to develop them.”

Hans Doe, President of Vista Irrigation District³



Colorado River Aqueduct

Colorado River Compact

In 1922, representatives of the seven basin states signed the central piece of the Boulder Canyon Project, the Colorado River Compact, and sent it to the states for ratification. California ratified the compact in 1925 because it wanted the Boulder Canyon Dam and the All-American Canal for flood control, storage and reliability, which were benefits it could not achieve on its own.

The other states would ratify the compact only if California agreed to abandon its claim to an extra-large share of the water from the Colorado River. California reasoned that it had already been using the river's water in the

Imperial Valley, while the other states had barely tapped it. The other states argued that they had greater riparian rights than California, which contributed virtually nothing to the river's flow. In 1929, California compromised. It signed the California Limitation Act, accepting 4.4 million acre-feet of the water, with not more than half of any surplus water after the other states received their allotments. Arizona still refused to ratify, so the deal became known as the Six State Compact. (Arizona eventually signed the compact in 1944.)

After California accepted the California Limitation Act, water agencies from the state agreed on a plan in 1931 to divide water among

themselves in a negotiation called The Seven Party Agreement. The irrigation districts to the east received first priority to the water of the Colorado River because they had already been using it. According to one tenet of Western water law, it was "first come, first served" for established users, as long as they were using the water "beneficially." The newly formed Metropolitan Water District of Southern California (MWD), which represented the interests of Los Angeles and the surrounding region, was fourth and fifth on the priority list for Colorado River water. It was created in 1928 by an act of the State Legislature to wholesale imported water to its member agencies.

The Seven Party Agreement Priorities and Allotments within California

The Boulder Canyon Project Act limited California's use of the water from the Colorado River to 4.4 million acre-feet per year plus half of the annual surplus left after the other parties had received their full allotments. However, this surplus can only be declared by the U.S. Secretary of the Interior. Furthermore, it did not provide for the allocation of this water within California. That agreement came about three years later, in 1931, when California's cities and agricultural interests entered into the Seven Party Agreement. The agreement created a system of "priorities."

The first three priorities went to agricultural interests — the Palo Verde Irrigation District, the Yuma Project, and the Imperial Irrigation District/Coachella Valley Water District. Their combined total use was limited to 3.85 million acre-feet per year. The fourth priority went to the Metropolitan Water District of Southern California for the use of 550,000 acre-feet per year.

These first four priorities were by far the most important because the Boulder Canyon Project Act (as intended by Congress and interpreted by the Supreme Court) guaranteed California only 4.4 million acre-feet per year. The remaining priority rights would come from surplus water.

The City of San Diego held a fifth-priority right, along with Metropolitan and the City of Los Angeles. Metropolitan and Los Angeles received a total of 550,000 acre-feet, and San Diego was entitled to 112,000. In 1946, when the San Diego County Water Authority annexed into Metropolitan, the City of San Diego assigned its water rights to Metropolitan as a condition of annexation. Today, Metropolitan holds rights to 1.2 million acre-feet of Colorado River water, 550,000 as a fourth-priority allotment, and 662,000 acre-feet as a fifth-priority allotment (only if a surplus is declared).

San Diego's Piece of the Pie

In 1926, as the Colorado River Compact looked like it would become a reality — five years before the Seven Party Agreement — the City of San Diego decided to stake its official claim for some of the river's water. Shelly J. Higgins, the city attorney, recounted this process:

We were going to stake San Diego's claim, and file on the river just the way an individual — say, a miner — would do ... I remember asking the councilmen how much water we should claim, and Councilman Fred Heilbron said not less than 112,000 acre-feet. ... With what amounted to secrecy, ... my deputy and I went by auto over the then-unpaved mountain and desert highway and onto the plank road through the sand dunes to Yuma. This was in midsummer, mind you. Early one morning — the sun was working itself into a white-hot rage at us creatures daring to venture across the desert — we went for a distance up river and piled rocks into a cairn and in the middle we placed our legal notices of filing for water and power, stuffed into a tin can.⁴

The 112,000 acre-foot claim-in-a-can became official in a 1933 contract with the U.S. Department of Interior. But there were conditions. First, the 1933 contract provided that San Diego's water was allocated to the "City of San Diego and/or the county of San Diego" and that the water "shall be used within the

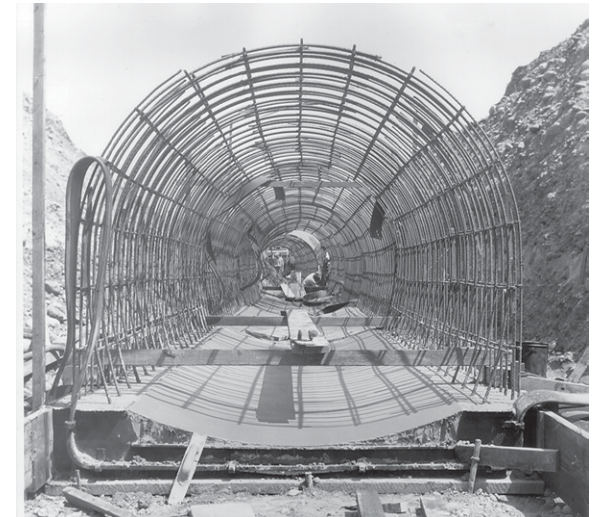
County as the City and the County may agree ..." In other words, the County now had a voice in allocation of San Diego's Colorado River water. Second, San Diego shared a fifth-priority for California's share of Colorado River water with MWD, and it would receive the water if there was surplus water after the six upstream states received their allotments. Furthermore, San Diego was the most remote of the parties, because it lies physically (as well as figuratively) at the end of the pipeline.

Indeed, San Diego had no means for receiving Colorado River water. Metropolitan was building the Colorado River Aqueduct to take delivery of its water. San Diego wanted to build an extension from the All-American Canal to take delivery of its share. The City of San Diego signed another contract with the Interior Department in 1933 to build a diversion from the All-American Canal, partly for economic reasons and partly to remain independent of MWD.

With both the City and the County of San Diego having rights under the federal water delivery contract and both wanting access to imported water, distribution of that water would eventually require a change in structure: the creation of a county water authority to import water to the region.

The War Years: The Navy Influences Water Supplies

The need for a county water authority to distribute imported water still seemed far off in 1940. With a population of 290,000 and the new El Capitan Reservoir, the City of San Diego thought it had enough water. In addition, there was still no aqueduct for receiving the imported water. That sense of contentment changed when the Japanese bombed Pearl Harbor and the United States entered World War II.



Reinforcing steel for the first San Diego Aqueduct (April 1947)

San Diego became a hub of Naval activity, with military and construction workers flocking to the area. The city's population nearly doubled in two years, to 500,000. Water use also doubled, but luckily the rainy years before the war left the reservoirs brimming. Still, it was clear that the city — and the Navy — would soon need the water from the Colorado River.

An aqueduct for bringing water to San Diego became a top priority. The Navy was willing to help build an aqueduct and let the city pay it back later. The Navy thought the fastest way to get Colorado River water to San Diego was to build a pipeline from MWD's Colorado River Aqueduct, which had already started delivering water to Los Angeles. San Diego saw its hope for a diversion from the All-American Canal in jeopardy, and the city worried that the Navy's plan called for an aqueduct that was only half the capacity the city would eventually need. The city reasoned that adding just another foot to the planned six-foot-diameter pipe would increase capacity by 50 percent but add only 4 percent to the cost.⁵ The Navy, however, needed a fast solution to an immediate problem and was not in the business of promoting the city's long-term interests. President Roosevelt settled the issue in an executive order, directing the Navy to build a six-foot-diameter pipeline from MWD's aqueduct — rather than one from the All-American Canal. San Diego would get neither the additional capacity nor independence from MWD.

As these negotiations progressed, then State Senator Ed Fletcher introduced a bill in 1943 for the formation of the San Diego County Water Authority to distribute the pending Colorado River water. The San Diego County Water Authority was formed with nine original members on June 9, 1944, just three days after D-Day.

San Diego stood on the brink of a water crisis that threatened the war effort. The new Water Authority, with Fred Heilbron at its helm, was poised to help — but the pipeline was not yet complete, and it still had no water



to sell as the war came to an end in 1945. As William Jennings noted, the Water Authority was still a humble, homemade organization, with Jennings' wife taking minutes of the meetings.

The new San Diego County Water Authority joined the Metropolitan Water District in 1946 so it could receive water deliveries when the pipeline from the Colorado River Aqueduct was complete.⁶ Upon joining MWD San Diego's 112,000 acre-foot share of the Colorado River was added to MWD's allotted share.

On November 26, 1947, the first Colorado River water finally flowed south from the Colorado River aqueduct's western end in Riverside County for 71 miles into the City of San Diego's San Vicente Reservoir near Lakeside via the San Vicente Aqueduct (later renamed Pipeline 1 of the First San Diego Aqueduct). It ran over some of the most rugged country ever crossed by a water line and could deliver about 65,000 acre-feet per year. "At a time when the whole area of San Diego County had less than three week's water supply remaining, it was just in time," recalled Jennings.⁷ The reservoirs that stored local water were dry.

A County Water Authority

At the beginning of the 20th century, counties had not been in the position to develop water. Water development had been accomplished by private individuals, cities or local districts. County or regional water authorities, such as had been created in San Diego and Los Angeles, were an aggregate of separate, independent agencies united under an act that gave them a voice in managing, operating and sharing water resources based on their assessed value. Water authorities have the explicit job of providing water to their customers, but they do not have the power to control the growth that increases their customers' demand for water. Land-use decisions rest with local governments.

More Pipelines

Most experts expected the population of San Diego to decrease after the war, but that was not the case. The people stayed, and as some predicted, Pipeline 1 proved inadequate to meeting their needs. A drought in 1950 and 1951 increased concerns about water shortages in the county.

The Water Authority appealed to the Navy to help build a second pipeline for the aqueduct. The Navy was willing, but its hands were tied. It had not actually built the first pipeline; the Bureau of Reclamation had. The Bureau was more than willing to build a new pipeline, but it could not. It could only fund agricultural projects. An exception had been made for the first pipeline because of the wartime emergency. Since the country was no longer at war, the Bureau could not fund a project that would provide urban water use — unless Congress ordered the Navy to request them to do so. The Water Authority embarked upon the arduous task of creating a united front from a group of skeptical parties to appeal to Congress.

This effort to create consensus was spearheaded by Fred Heilbron, the first chairman of the Water Authority. He first had to convince the City of San Diego, which had enough water at the moment, to stand behind something that would benefit the county at large. Then, he went to work to garner MWD's support: he and Jennings, the counsel to the Water Authority, learned about a breakfast meeting between the Secretary of the Navy and the president of MWD's Board of Directors, Joseph Jensen.



Though not invited, Heilbron and Jennings appeared anyway and took seats directly across from the Secretary. Jennings jumped into conversation with the Secretary, fervently explaining why San Diego needed the pipeline and needed MWD to pay half the cost. The Secretary turned to Jensen and said, “I presume that Metropolitan recognizes this situation and is willing to go along with it,” and then left before Jensen could object. After that victory, Heilbron enlisted three people to lobby Congress: two United States senators from California — William Fife Knowland and Richard M. Nixon — as well as a young congressman from San Diego County, Clinton McKinnon.⁸ The Water Committee of the San Diego Chamber of Commerce put together an impassioned book — *For the Want of a Nail* — to further plead the cause.

The effort paid off. In 1954 the second pipeline of the San Vicente Aqueduct, which is parallel to and the same size as the first, began delivering water. Even this doubling of capacity was insufficient. The Water Authority now had 18 member agencies and four times the service area it had when it was formed.

In 1961, Pipeline 3, was built in a second aqueduct along a different course, much closer

to the coast. Almost three times larger than the first pipe, it delivered an additional 170,000 acre-feet per year. The Water Authority’s service area had increased 30 percent in population from the 1950s. Now it served 95 percent of the county’s residents.

By the early 1970s, the population of the Water Authority’s service area exceeded 1,250,000. As William Jennings recalled, “That growth took place so rapidly, and was really unexpected ... that in the efforts to keep up with the growth ... everyone was just about half a jump behind the demands for water.”⁹ In 1973, a fourth pipeline, this one capable of carrying as much water as the first three pipes combined, was added to the Second Aqueduct. It was extended to the City of San Diego’s Alvarado Treatment Plant near La Mesa in 1978. By 1980, the county population had grown to 1.8 million, and the Water Authority served 99 percent of the residents.

A fifth pipeline — even bigger than the fourth — was added to the Second Aqueduct north of San Marcos in 1982. It brought the Water Authority’s total pipeline capacity to about 1 million acre-feet per year, roughly 15 times more than the capacity of the first pipeline, which had been built only 35 years earlier.¹⁰



“Aqueducts” & “Pipelines”

In the parlance of San Diego County water, the words “aqueduct” and “pipeline” can be confusing. “Aqueduct” is used to mean the land through which the pipelines run, rather than the pipes themselves. Thus, the First San Diego Aqueduct actually carries two separate and distinct pipes, Pipeline 1 and Pipeline 2. At present, Colorado River and Northern California water flows to San Diego County through five pipelines in two aqueducts.

9 Original Water Authority Members (1944)

- City of Chula Vista
- City of Coronado
- City of Oceanside
- City of San Diego
- Fallbrook Public Utility District
- Lakeside Irrigation District
- La Mesa, Lemon Grove & Spring Valley Irrig. Dist.
- City of National City
- Ramona Irrigation District

24 Water Authority Members (2022)

- Carlsbad MWD
- City of Del Mar
- City of Escondido
- Fallbrook Public Utility District
- Helix Water District
- Lakeside Water District
- City of National City*
- City of Oceanside
- Olivenhain MWD
- Otay Water District
- Padre Dam MWD
- Camp Pendleton Marine Corps Base
- City of Poway
- Rainbow MWD
- Ramona MWD
- Rincon del Diablo MWD
- City of San Diego
- San Dieguito Water District
- Santa Fe Irrigation District
- South Bay Irrigation District*
- Vallecitos Water District
- Valley Center MWD
- Vista Irrigation District
- Yuima MWD

* The Sweetwater Authority is a service organization for the City of National City and the South Bay Irrigation District.

Reducing Dependence on the Colorado River

Despite the long and meticulous negotiations for the Colorado River Compact, there were still disputes to be settled. The first involved differing interpretations by California and Arizona over what constitutes “surplus” water and the precise amount of Arizona’s allotment. The Colorado River Compact had allotted 7.5 million acre-feet (MAF) to the Lower Basin states, with Arizona receiving 2.8 MAF, California receiving 4.4 MAF and Nevada receiving 300,000 acre-feet. Any amount of water over that was considered “surplus.”

In 1964, the U.S. Supreme Court ruled that California and Arizona must share the surplus Colorado River water equally. However, California could continue using more than its share as long as Arizona did not need the surplus water.

When Arizona completed its Central Arizona Project in 1985, it began to claim its share of the surplus water. Thus, California had to reduce its dependence on Arizona’s share of the surplus water. That reduction would hit the Metropolitan Water District — and hence, the Water Authority — especially hard, because of its low priority to receive Colorado River water. Since the Water Authority was receiving about 20 percent of MWD’s deliveries, it anticipated reductions as well. Luckily, by the 1970s there was a new source for imported water — Northern California.



Concrete lining the All-American Canal prevented huge amounts of water from disappearing in to the desert sand.

The Development of The Colorado River

1856

First diversions created from the Colorado River to irrigate 40,000 acres in the Palo Verde Valley.

1900

Alamo Canal through Mexico to Imperial Valley completed.



1905-7

Floodwaters broke the river channel and flowed into the Salton Sink, creating the Salton Sea.

1911

The Imperial Irrigation District initiated the campaign for the Boulder Canyon Dam Project.

1922

Colorado River Compact signed; Boulder Canyon Project Act introduced to Congress (Swing-Johnson Bill).



1923

Six basin states ratified Colorado River Compact. (Arizona did not ratify, so the agreement became known as the Six State Compact.)

1926

City of San Diego filed for rights to the Colorado River Water.

1928 Metropolitan Water District (MWD) formed.

1929

California agreed to a limitation of 4.4 million acre-feet, plus half of the surplus water.



1931

Seven Party Agreement in California set priorities for dividing Colorado River water within the state.

1933

City of San Diego signed contract with U.S. Department of Interior for storage and delivery of Colorado River water.



1936

Boulder Canyon Dam (Hoover Dam) completed.

1941

MWD's member agencies first received water from the Colorado River Aqueduct.

1941

Naval activity boomed in San Diego as part of the buildup for World War II.

1942

All-American Canal delivered water to the Imperial Valley.



1943

State Senator Fletcher introduced a bill to create the San Diego County Water Authority.

1944

San Diego County Water Authority formed. Arizona signed the Colorado River Compact.

1946

Water Authority joined MWD.

1947

San Diego Aqueduct completed; Colorado River water flowed into San Vicente Reservoir.



1954

Pipeline 2 of the First Aqueduct completed, running parallel to Pipeline 1.

1961

Pipeline 3 completed in the Second Aqueduct to a new storage reservoir at Miramar, increasing the Water Authority's delivery capacity by 80 percent.

1973

Pipeline 4 in the Second Aqueduct completed.



1978

Water from Northern California arrived via the State Water Project.

1982

Pipeline 5 in the Second Aqueduct increased water delivery capacity to one million acre-feet per year.

2003

Quantification Settlement Agreement is signed. Water Authority and Imperial Irrigation District implement Water Transfer Agreement. Water Authority acquires additional water conserved from lining of the All-American and Coachella canals.

2007 Coachella Canal lining completed.

2010 All-American Canal lining completed.

Prediction and Reality

In its First Annual Report in 1946, the Water Authority predicted the water needs for the urban population by the year 2000. The reality was quite different:

	Est. for 2000	Actual 2000
Service Area Population	725,00	2,845,000
Needed Water	91,000 acre-feet	695,000 acre-feet

The Water Authority did qualify its predictions in 1946, saying: "It is quite possible that the population of San Diego County will exceed the 725,000 estimated for the year 2000. Such an increase would require the conversion of some land formerly used for agricultural purposes to urban use, since only such lands will have water available."¹¹

Chapter 8

WATER FROM THE NORTH

The ink had not been placed on the Colorado River Compact when another large water project was percolating in California. This new project, which evolved into the State Water Project, foretold a profound change in the way water would be distributed in the state — and in San Diego County.

A Shift in Thinking

During the 1920s, the state of California became increasingly concerned about the imbalance between the sources of water in the state and the areas of greatest demand for water. It first focused on the shortage of water in the agricultural Central Valley by planning the Central Valley Project to distribute water from the Sacramento River to the San Joaquin Valley.

The Great Depression of the 1930s left the state without the means to fund the project, so the federal government, through the Bureau of Reclamation, built it.

This project reflected a transition in the way the state thought about its role in managing water resources. When California became part of the United States, water was owned and controlled according to individual rights. Those individuals began to organize and pool their rights into mutual water companies, which were private corporations made up of landowners.

This private ownership of water led to abuses of people who had no access to water, prompting William H. Jennings, the water lawyer, to write, “The public and the Legislature began to see

water as essential to life, the same as air, and that one could, by mere happenstance, be in the position to prevent his neighbors from having a correlative right with him in this absolute necessity of life.” As that thought relates, the state had started to adopt a position that would not allow one individual or company to deprive others of the water needed to survive.

Gradually, this concept was extended to cover public water agencies and irrigation districts. One agency should not take away water from another. Jennings explained, “You can’t take the last drop of water and dry up an area without replacing it in some way or other.” From there, the concept of making surpluses available “to areas of deficiency” was applied to regional and even national water rights.¹

“We got along fairly well except we all became occasionally impassioned and a little bit emotionally aroused when we were thinking of the terrible things that the others were trying to do to us.”

William Jennings, on the negotiations for the Feather River Project (State Water Project)²

What Goes Around...

In 1848, the U.S. gained control of San Diego County and replaced the Spanish concept of communal rights to water with the principle of individual, private ownership. About a century later, water agencies revisited the discarded Spanish concept as they began to deliver water to places that did not have it and had not been using it.

In San Diego County, the Water Authority had initially been formed as a way to distribute supplemental water to agencies with existing water supplies. Much of the county lacked local water resources, though, so the Water Authority now took on the role of creating a supply for new areas. One voice adamantly opposed such a commitment: Arthur Marston, a board member of the Water Authority and an important merchant of the day. He believed that future demands upon the supply would greatly exceed what the Water Authority could deliver, creating a dangerous situation for the county.³

Meanwhile, the members of the Metropolitan Water District were in the same frame of mind as the Water Authority. They passed the Laguna Declaration at a meeting in Laguna Beach in the early 1950s, establishing MWD as a regional water importer responsible for providing water to the district it served. Originally, MWD supplemented local supplies with Colorado

River water, but it opened the door to the future by defining its mission: “When and as additional water resources are required to meet increasing needs ... , the Metropolitan Water District of Southern California will be prepared to deliver such supplies.”⁴ That short statement enabled the development of lands throughout the district regardless of the availability of adequate local water supplies.

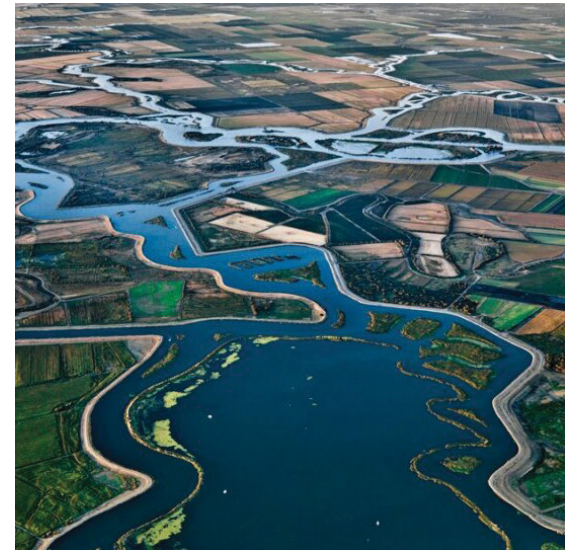
William Jennings commented, “Now, this was a very pious declaration, but of course, it was another matter to implement it.”⁵ In saying that, he referred to some of the problems that would follow. Where would they find more water for more people? From the north, it was hoped.

The State Redistributes Water

On a statewide level, the new commitment to redistribute water to places of need came to life in the State Water Project. It would capture water from several Northern California rivers, funnel it south through the Sacramento-San Joaquin Bay-Delta, feed it into the California Aqueduct, pump it over the Tehachapi Mountains and deliver it to reservoirs near the Antelope Valley north of Los Angeles.

The State Water Project proposal launched a bitter north-south controversy. Northern Californians asked, “Why should Southern Californians be allowed to steal our water?”

Southern Californians countered, “It’s not their water; it’s California’s water, and we’re all Californians. Why should the precious water that we desperately need run wasted into the sea?” In 1957, Gov. Goodwin Knight assembled a Water Lawyers Committee that was equally divided among Northern Californians and Southern Californians, Democrats and Republicans, and legislators and outsiders. William H. Jennings, who was part of that group, stated, “In fact, it was so evenly divided that its sessions finally wound up in a rather well-edited and well-prepared statement that half of the group agreed to sign and the other half refused to sign. This was presented to the Legislature as the final report of the committee.”⁶



The environmentally sensitive Sacramento-San Joaquin Bay-Delta is the hub of the State Water Project.

Under the leadership of Gov. Edmund G. “Pat” Brown, the State Water Project eventually was built, and it started delivering water to Southern California. With that new resource, both the Water Authority and the Metropolitan Water District could make good on their commitments to provide water to new areas – for a while. One controversial component of the plan, a “Peripheral Canal” around the environmentally sensitive Bay-Delta, was never built as it was defeated in a statewide referendum in 1982. As a result, the State Water Project never delivered as much water as originally intended. The effort to find an alternative method to reliably deliver the water – and it continues to this day, presenting an opportunity to consider new approaches to providing water reliability.



Environmental degradation in and around the Bay-Delta caused additional complications. During the 1990s, Gov. Pete Wilson and President Bill Clinton initiated an unprecedented collaboration of state and federal agencies – as well as urban, agricultural and environmental groups – to develop a long-term solution that would restore the Bay-Delta as both a reliable water source and a healthy habitat for fish and wildlife. This collaborative body became known as the CalFed Bay-Delta Program. In 2000, CalFed completed a comprehensive management plan, which was embodied in a Record of Decision endorsed by state and federal agencies.

In the decade after CalFed released its plan, there was intense conflict on how to move water from, through or around the Bay-Delta to users elsewhere. The state Legislature created the California Bay-Delta Authority to implement CalFed’s plan. After the release of an independent report by the Little Hoover Commission that found CalFed’s plan to be “costly, underperforming, unfocused and unaccountable,” the state Legislature dissolved the California Bay-Delta Authority and moved all Bay-Delta-related funding to the Office of the Secretary of Resources (later the California Natural Resources Agency). Meanwhile, populations of fragile species in the Bay-Delta continued to decline.

In 2008, a federal court ruling exacerbated the challenges of water deliveries from the Bay-Delta by invalidating biological opinions that had guided operations of the State Water Project and the Central Valley Project for years. The judge’s decisions and new biological opinions called for more protections of imperiled fish species. Subsequent new biological opinions severely limited the availability of water that may be exported from the two projects.

Later, the same judge decreed that the new biological opinions did not adequately explain the link between project operations and the decline of fish species and, further, failed to consider the impacts of water export restrictions on human activity and the economy. As a result, restrictions on project water exports remain in place, but they are not as stringent as the 2008 restrictions.

In 2009, the Legislature created the Delta Reform Act of 2009 that established the coequal goals of providing a more reliable water supply for California and protecting, restoring and enhancing the Bay-Delta ecosystem. The act also made reducing dependence on the Bay-Delta while improving regional self-sufficiency an imperative – a path that the Water Authority was already on by implementing its water supply diversification strategy.

Additionally, the Delta Reform Act dictated that the Bay-Delta Conservation Plan (BDCP), a joint state and federal effort focused on balancing water supply reliability and ecosystem health, be integrated into the Delta Plan crafted by the Delta Stewardship Council if it met the standards in state and federal environmental restoration laws. In 2012, Gov. Jerry Brown and U.S. Interior Secretary Ken Salazar outlined a framework for the proposed BDCP, intended to achieve the “co-equal goals.” Rather than proposing a Peripheral Canal, they proposed the construction of two large tunnels to carry water under the Bay-Delta.

The Water Authority’s Board of Directors supported securing a long-term fix for the Bay-Delta, with the assurance that the project can be equitably paid for by stakeholders. Consistent with state policy, the Water Authority continued to drastically reduce the San Diego region’s reliance on water from the Bay-Delta, and local leaders wanted to avoid being stuck with an oversized bill for a resource with limited local benefit.

Seeking to ensure a “business case” could be made for the project, the Water Authority in 2013 joined a group of urban water agencies, environmental organizations and business

groups seeking an alternative “portfolio” approach be thoroughly evaluated in the BDCP. The portfolio approach called for building a smaller, single tunnel and investing in an array of local water supply projects to reduce reliance on imported water.

A decade after the Water Authority’s call for a portfolio approach, Bay-Delta fixes remained in limbo due to high costs and large uncertainties. The state broke the BDCP into two processes: one focused on ecosystem restoration and the other centered on a new water conveyance facility. For the Water Authority, key questions remain about how costs would be allocated for the tunnel project, which swelled to more than \$17 billion. In addition, given the statewide embrace of water-use efficiency and water reuse, any future Bay-Delta fix would need to consider changed conditions and climate risks.

Reliance on a Far Away Source

After the State Water Project supplemented water supplies from the Colorado River, San Diego County relied on imported water for up to 95% of its total supply. That ratio represented a big shift from the 1920s when people thought that local water from the county’s own watersheds could meet the needs of any city that might ever grow there. Starting about 2015, however, the amount of local water supplies in San Diego County started to increase with the Carlsbad Desalination Plant and subsequent moves by retail agencies to generate more water through local programs like water recycling and purification — the era of supply diversification.



The Bay-Delta

The Bay-Delta is a 1,000-square-mile network of islands and waterways at the confluence of the Sacramento and San Joaquin rivers east of San Francisco Bay. It is a key water source for the state and an important ecosystem for fish and wildlife. Bay-Delta water supplies have become increasingly unreliable as deteriorating ecological conditions have led to regulatory restrictions on pumping water south.

Chapter 9

RELIABILITY THROUGH DIVERSIFICATION

San Diego County blossomed in the decades following World War II, watered by cheap and seemingly endless supplies delivered first through the Colorado River Aqueduct and eventually through the State Water Project. Universities sprouted. The defense industry boomed. Major League Baseball arrived. Horton Plaza gave the fast-growing legions of suburbanites a downtown destination. The county's population more than tripled

between 1940 and 1960, then nearly doubled again by 1980.¹ Thanks to the big investments in pipes and canals a generation earlier, the region didn't lack access to water for its fast-growing economy.

But dark clouds loomed on the horizon and steadily became more menacing. By the late 1980s, officials at the San Diego County Water Authority and its member agencies were increasingly worried that near-total dependence on Metropolitan Water District for imported

water was unsustainable for the region's growing population and could cripple its burgeoning economy if cutbacks were imposed.

If there were holdouts among the officials, a five-year drought that stretched ominously into 1991 convinced them that changes in the region's historic approach to water policy were warranted — changes that would be big, bold, and probably controversial and expensive, but necessary.

For the next two-plus decades, the Water Authority labored against sometimes long financial and political odds to make those changes a reality. Agreements were forged with member agencies, private companies, and irrigators. Negotiations were undertaken with state and federal lawmakers and regulators. And the region entered the modern era of the Water Authority with numerous audacious projects rolling out one after the other.

Access to water allowed modern institutions to bloom in San Diego County.



One result was that when a “megadrought” parched much of the western United States from 2020-22, San Diego County was spared while water districts elsewhere in Southern California and the Southwest suffered through months of shriveled supplies.² As a headline in The New York Times put it: “Despite a Punishing Drought, San Diego Has Water. It Wasn’t Easy.”³

Said retired Water Authority General Manager Sandra L. Kerl: “The Water Authority and its member agencies met the daunting challenges of drought by ensuring our region has a water supply from diverse and reliable sources. We’ve been successful, but our work is not done. We remain laser-focused on diversity, reliability and affordability.”

“San Diego’s experience demonstrates that for communities reliant on imported water from ecosystems, diversifying their supply portfolios with an emphasis on local sustainability is the smart path forward.”

Carpe Diem West, a nonprofit organization of water managers, scientists and conservationists (2013)⁴

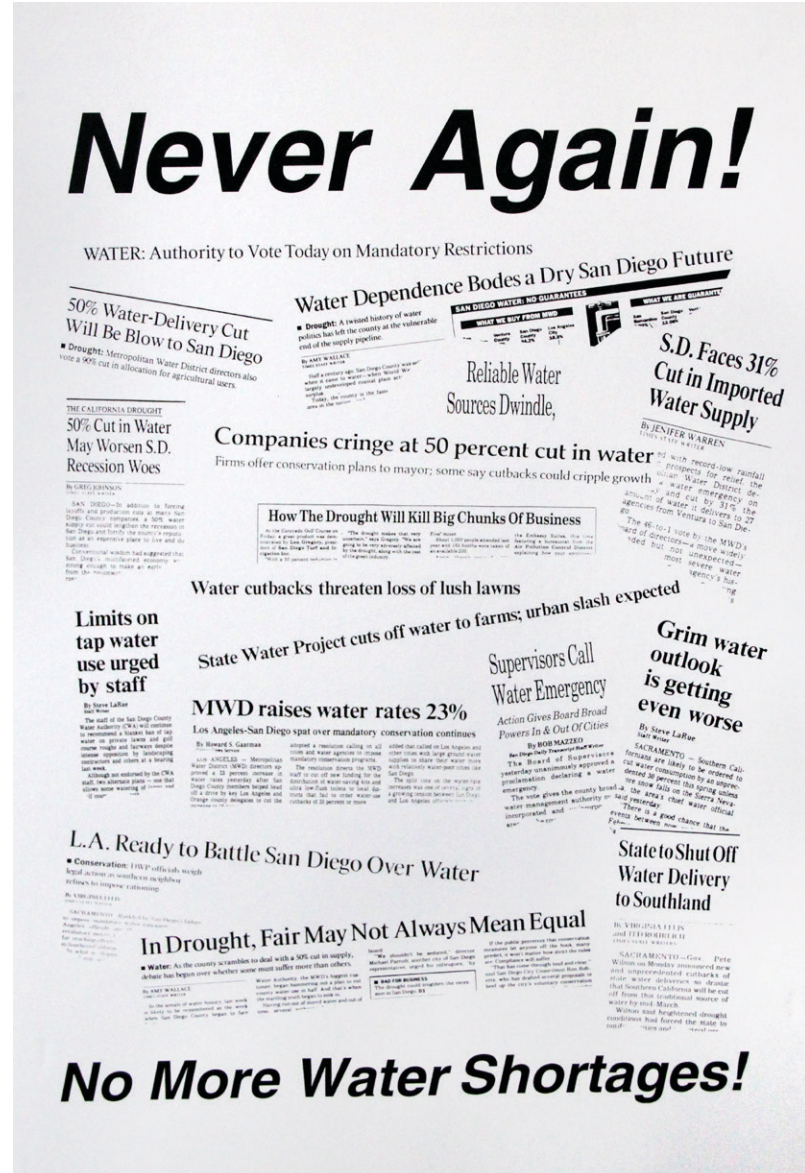


Crisis Hammers San Diego County

Reliability wasn't the reality at the start of the Water Authority's modern story in 1990. At the time, San Diego County's water was virtually all imported by the Los Angeles-based Metropolitan Water District of Southern California, the nation's largest water agency. To compound the challenge for San Diego County, more than half of the water it purchased each year actually "belonged" to other MWD member agencies that weren't using the amount reserved for them. That over-reliance on MWD put the region's economy and quality of life at risk – and eventually resulted in an ambitious new strategy to secure San Diego County's future.

After four dry years, San Diego County reached a crisis point by late 1990. In November of that year, MWD enacted the first stage of its shortage allocation plan – small-scale reductions that would have amounted to little more than an annoyance.

But conditions continued to deteriorate, and in February 1991 MWD imposed a 20% cut to the San Diego region's urban water users and a 50% cut to its agricultural water users for an overall supply reduction of 31%. While such severe cuts presented a huge challenge for the region, things quickly got worse when MWD announced plans to slash urban water deliveries to San Diego County by 50%. That reduction would have hit the region disproportionately hard, fundamentally altering life for nearly 2.5 million residents. The situation was even worse for the county's \$1 billion agricultural sector. Farmers faced reductions of 90% in water supplies – cuts that would have devastated one of the region's economic engines.



In the Early 1990's Regional leaders demanded that the Water Authority ensure reliable water supplies.

Headlines of the era tell the story: “Companies cringe at 50 percent cut in water,” said one. “50% Water-Delivery Cut Will Be Blow to San Diego,” screamed another. “Water Dependence Bodes a Dry San Diego Future,” predicted a third.

Just as MWD’s deeper cuts were about to take effect, it started raining. And raining. And raining some more. It rained so much that month that “Miracle March” entered the local lexicon and MWD-enforced cutbacks were held to “only” 31 percent. Even though the worst threats didn’t materialize, the supply allocations continued for 13 months, dealing a strong blow to San Diego County and its economy.

Such painful restrictions in the water supply chain galvanized the region’s business and community leaders. Why, they demanded, did the Water Authority depend on a single supplier for virtually all its water? What kind of investment strategy relies 95 percent on a single source of supply? The rallying cry boiled down to a few words that still resonate: “Never again! No more water shortages!”

The civic lesson was clear: “We had all our eggs in one basket and the bottom fell out,” said then-Water Authority Board member Mike Madigan. For the Water Authority Board, there would be no turning back to the days of near-total reliance on a single supplier. The risks of another drought and a mandatory cutbacks were too great.

Business and political leaders demanded a strategy that protected the region from facing such draconian cutbacks ever again. The group’s proclamation’s thundering preamble began: “We hold these truths to be self-evident....”

The Era of Investments

While the concept of water supply diversification crystallized quickly, the strategy was complicated and time-consuming to put in place. Imported supply options other than the Colorado River and the State Water Project – say, the Columbia River or Alaskan icebergs – were just too far away to be practical. Worse still, access to existing water sources was increasingly restricted. Environmental laws made managing water supplies more complex, while water pollution, swelling demand for water across the Southwest, droughts, and interstate legal battles added stress.

Over the next two decades, the Water Authority invested \$2.4 billion in regional water reliability projects that produced an economic impact of \$4.8 billion with 1,475 jobs supported annually and \$1.8 billion in local salaries.⁵

Chris Frahm, a leader in the water independence strategy first as a Water Authority board chair and later as an attorney working for the agency, said San Diego’s winning strategy had four prongs: “advocate, negotiate, legislate and – if necessary – litigate.”

The Water Authority’s three signature projects after the “Miracle March” awakening secured water reliability for the region.

The Projects

- Cementing the largest water conservation-and-transfer deal in U.S. history to secure water from the Imperial Valley
- Partnering with a private company to build the nation’s largest seawater desalination plant
- Super-sizing San Vicente Reservoir by raising the height of the World War II-era dam

Those efforts – individually and collectively – earned accolades from across the nation. Some even won international acclaim. In just two decades, the San Diego County Water Authority emerged as a recognized leader in producing solutions to overarching problems that seemed intractable.

Long-Term Water Transfers

Long-term water transfers were the first supply diversification option developed by the Water Authority after the 1987-92 drought, and more than three decades later they continue to form the foundation of the region's reliability strategy. Those transfers – along with the environmental and economic benefits they delivered – created a template for other regions to improve stewardship of the overtaxed waters of the West.

The water transfer concept was simple: Move water from regions where it is abundant – oftentimes far from cities – to places where users are willing to pay more for increased supplies. In practice, however, water transfers are complicated by decades of court rulings and legal agreements that stipulate where water can be used and who can use it.

In 1995, the Water Authority began negotiations with the Imperial Irrigation District for the transfer of up to 500,000 acre-feet of water per year from the fertile farming area in the southeastern corner of California. Three years later, the Water Authority and IID signed an agreement that provided for the transfer of between 130,000 and 300,000 acre-feet per year, depending on the exercise of certain options. Despite legislation signed in 1998 by then-Gov. Pete Wilson to encourage the transfer, implementation took five more years.

MWD responded to the prospect of reduced sales to its largest customer – the Water Authority – by seeking to protect its monopoly on water service. In late 2003, pressure from the Legislature and the governor forced MWD to back down. It joined the Water Authority, IID, the Coachella Valley Water District, the state of California and the U.S. Department of the Interior in signing the historic Colorado River Quantification Settlement Agreement of 2003, the largest water conservation-and-transfer agreement in U.S. history.

That complex set of more than two dozen agreements made remarkable upgrades to water management in the Colorado River Basin that continue to resonate today. For starters, it limited California's use of Colorado River water to its basic annual apportionment of 4.4 million acre-feet, instead of allowing California to continue relying on surplus supplies that belonged to other fast-growing states in the Southwest.



The Quantification Settlement Agreement signing (October 16, 2003)

The linchpin of the deal was a long-term schedule for transferring conserved water from the Imperial Valley to San Diego County. It called for conveying up to 200,000 acre-feet of conserved Colorado River water annually to San Diego County for up to 75 years, if both parties agree to extend the arrangement after the first 45 years. That water is delivered to the San Diego region through MWD's Colorado River Aqueduct.

In addition to the IID transfer, the QSA provided for lining portions of the All-American and Coachella canals that traverse Imperial and Riverside counties, then transferring the water conserved by the projects to San Diego County.

QSA water supplies began flowing into the San Diego region in 2003. They quickly provided a major reliability benefit, and transfers grew incrementally, meeting more than half of the region's water demand by 2023. Over 110 years, the QSA could provide the Water Authority with 21 million acre-feet of water – a huge victory for regional water-supply reliability.

Enhancing Infrastructure

As San Diego water leaders pursued the water transfer, they also were working on a very different piece of supply reliability strategy: enhancing the region's infrastructure so that it could store more water locally and move the water where it was needed during droughts or other emergencies.

Earthquake faults present the most potentially catastrophic vulnerability for Southern California's water supplies. The aqueduct from Northern California to MWD traverses seismic faults, including the infamous San Andreas Fault. All the major pipelines from Riverside County to San Diego County cross the Elsinore Fault zone.



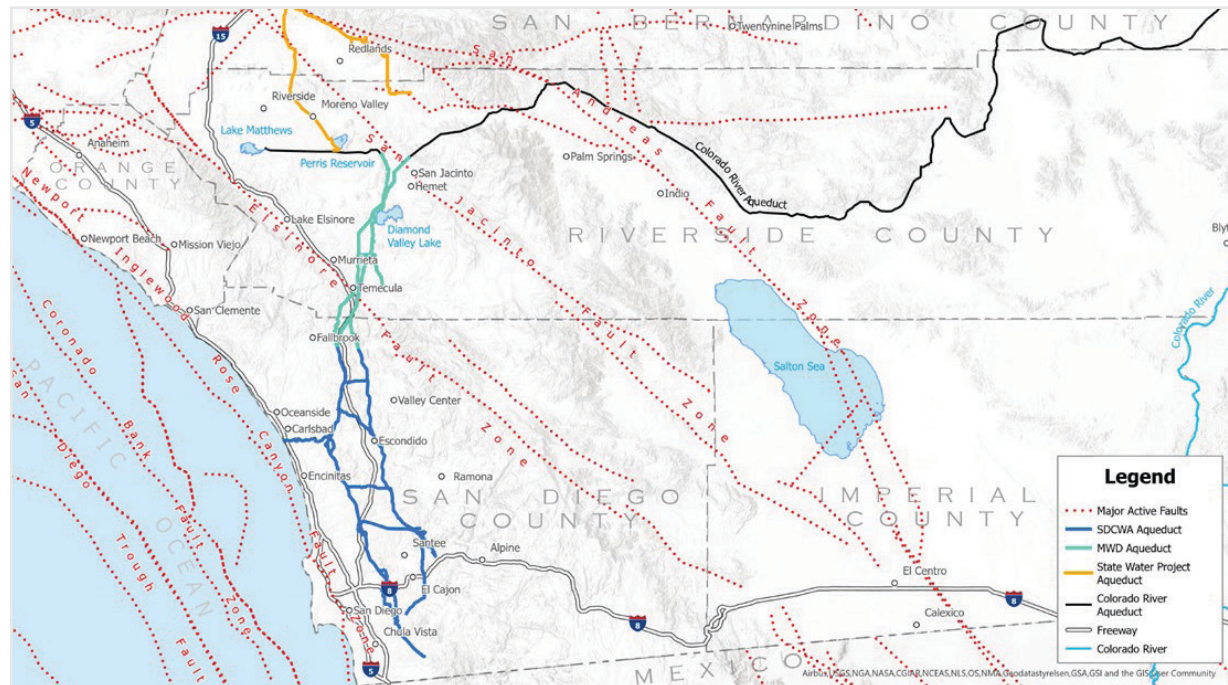
Before Lining The All-American and Coachella canals lost thousands of acre-feet of water that seeped out of unpaved dirt canals.



During Lining In total, 58 miles of concrete lined canal was constructed to replace the All-American and Coachella canals.



After Lining Constructing concrete-lined canals resulted in huge water savings to sustain San Diego County.



Fault Lines and major water delivery systems In Southern California

And San Diego County's location at the end of the pipes means that it will be affected by any major disruption upstream – a situation that prompted the Water Authority to build an emergency storage system south of the Elsinore Fault to provide a secure, local water supply.

But earthquakes aren't the only threat. The Water Authority also needed to prepare for potential impacts from a changing climate. As temperatures rise, snowfall and snowmelt patterns are shifting in the Sierra Nevada and the Colorado River Basin. Rising sea levels could damage water treatment and water recycling

plants, and cause saltwater intrusion in the Sacramento-San Joaquin Bay-Delta. A major levee failure in the Bay-Delta could interrupt critical water supplies from that region. In addition, droughts are becoming more frequent and more intense. As they do, demand for water rises at the same time that supplies wane.

Given the magnitude of the potential problems, the Water Authority's \$1.5 billion Emergency & Carryover Storage Project (E&CSP) became the signature element of the agency's Capital Improvement Program. It provided a network of new and enlarged

reservoirs, pipelines and facilities designed to store and move water if a natural disaster or drought cuts off imported supplies.

Work on the once-in-a-generation E&CSP first emerged into the public consciousness with the construction of the Olivenhain Dam in the rugged hills between Escondido and Encinitas. Construction began in 2000 and concluded in 2003, making Olivenhain Dam the region's first new major dam and reservoir in half a century. It was a monumental achievement, securing approximately 20,000 acre-feet of in-county water storage – a critical asset for the rapidly growing region.

But Olivenhain Dam had other distinctions as well: It was the first roller-compacted concrete dam built in California and the largest dam of its kind in North America. At a height of 318 feet, the dam was designed to withstand a 7.25-magnitude earthquake. The project also included a pumped-energy project designed to help meet peak power demands by generating hydropower as water moved downhill from Olivenhain to Lake Hodges.

After the Olivenhain success, an equally ambitious dam and reservoir project by the Water Authority soon followed: raising the height of the San Vicente Dam, owned and operated by the City of San Diego. The plan was to increase

the dam by an additional 117 feet, which would more than double the reservoir's capacity as the last major component of the E&CSP.

Construction on the foundation of the San Vicente Dam Raise began in 2009 and the project was completed in 2014, creating the largest water storage increase in county history. Aided by pump stations and a major new pipeline, the system is designed to permit the delivery of water even after a major quake. As part of the project, the original San Vicente Marina was inundated by the expanding reservoir. A new marina with a larger boat ramp, 300 parking places, and enhanced amenities such as picnic tables took its place. Several days each

week, county residents and tourists flock to the reservoir for boating and fishing.

Dam engineers such as Ian Hope also visit to learn about roller-compacted concrete and other aspects of San Vicente Dam. In early 2023, Hope joined a tour by two Water Authority engineers who were involved in the dam raising project. Hope, past chair of the British Dam Society, was impressed with the dam's safety features given the ever-present earthquake threat. "Water Authority customers can rest assured when the next quake happens there is resilience in their water supply network," Hope said. "This is an impressive demonstration of well-engineered infrastructure."



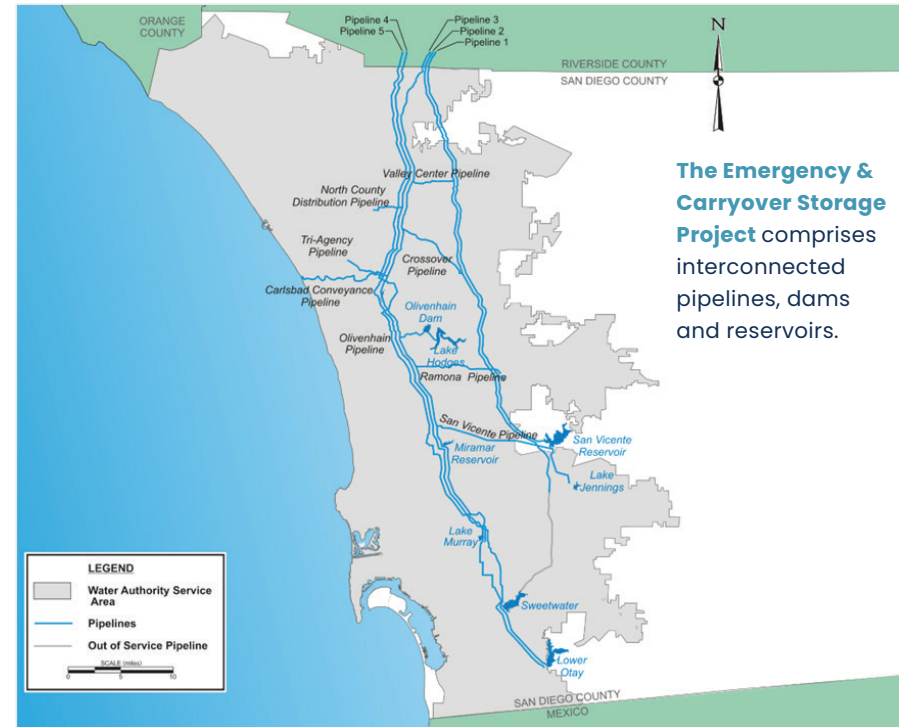
Construction of the San Vicente Dam Raise began in 2009.



Today, San Vicente holds more than double of the reservoir's original capacity.

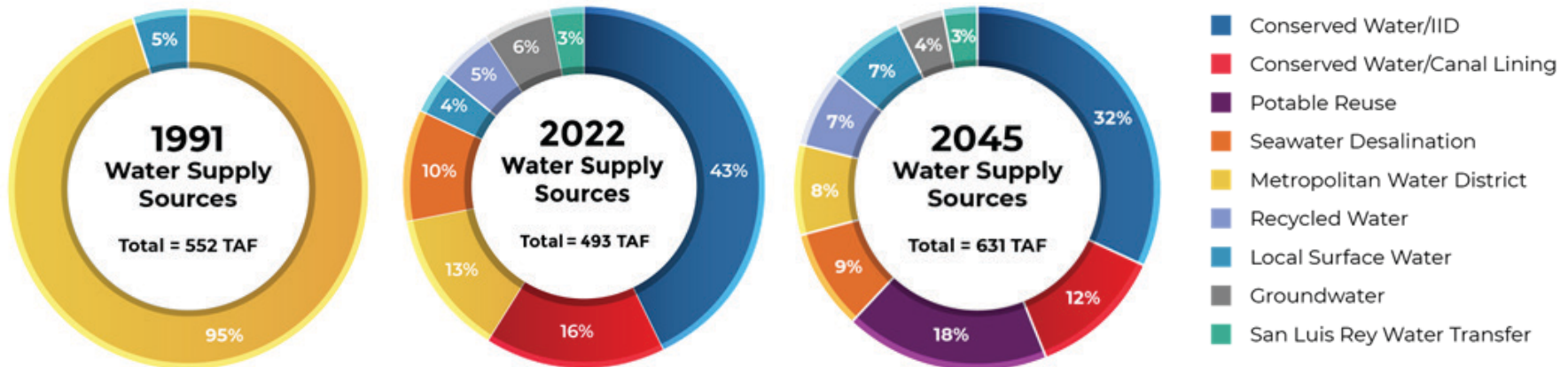
The E&CSP’s impact was so significant that it catapulted the Water Authority into the global spotlight. In 2017, president of the American Society of Civil Engineers (ASCE) joined dozens of local water leaders and stakeholders, to bestow the association’s top international engineering award on the Water Authority. ASCE President Norma Jean Mattei presented the plaque for Outstanding Civil Engineering Achievement Award to Water Authority officials, including Board Chair Mark Muir and General Manager Maureen Stapleton. Mattei saluted the Water Authority and its member agencies for having the foresight and dedication to build the E&CSP.

“The Water Authority planned for the future, making an investment that ensures the public’s health, safety, and welfare in case of disaster through this project,” Mattei said. “We stand here today because the San Diego County Water Authority, and all 24 member agencies that are part of it, were willing to make the investment because they saw the value and had the vision to put plans in motion.”⁶



The Emergency & Carryover Storage Project comprises interconnected pipelines, dams and reservoirs.

San Diego County Water Supply Mix by Year



Pacific on Tap

The third signature piece of the Water Authority’s strategy was equally innovative and impressive: the nation’s largest seawater desalination plant that would turn the Pacific Ocean into a reservoir. Under the 30-year agreement with Poseidon Resources, the Water Authority receives enough fresh water to meet the needs annually of approximately 400,000 people. At the end of the agreement, the Water Authority can purchase the plant for \$1.

The Water Authority Board authorized the development of a Seawater Desalination Plan in 2001, but it took more than a decade to launch construction. During the intervening years, Poseidon fended off more than a dozen lawsuits and the total cost to integrate the seawater desalination into the regional water delivery system reached \$1 billion.

“There were a lot of headwinds,” said Jeremy Crutchfield, the Water Authority’s project manager for the desal plant in the early 2020s. “It required a lot of political will to get it done.”

It also required world-class engineering expertise. To turn seawater into drinking water, a series of reverse osmosis membranes remove salt and other microscopic impurities. The process does such a good job that small amounts of additives must be injected into the water before it is pumped into the delivery system for public use. Otherwise, the purified ocean water would be so pure that it could damage the delivery pipes by leaching minerals from them.

The desal plant immediately produced benefits: As a drought-proof local supply, it ensured the county had enough water in the drought of 2016 and helped convince state regulators to reduce conservation mandates for the San Diego region.⁷



Groundbreaking at the Claude “Bud” Lewis Carlsbad Desalination Plant (June 2013)



The Carlsbad Desalination Plant produces up to 54 million gallons per day of locally controlled water for San Diego County.

While the cost was significant, the upside was impressive: The ability to meet water demands even in years like 2022 when millions of Southern Californians were on strict water rations. Call it the lesson of “Miracle March”: owning your water supply may cost more than renting it year-to-year from an outside agency – but with ownership comes security from drought and mandatory cutbacks. That’s the San Diego County Water Authority’s approach the wholesale water provider and regional planner for a metro area of 3.3 million people with a \$268 billion regional economy.

“A responsible water agency has to plan for decades into the future, not just months or even years, that’s what the San Diego County Water Authority has been doing, and what we will continue to do.”

Mel Katz

Water Authority Board Chair



The Carlsbad Desalination Plant began operations in 2015.

Building Reliability

1980

Population explodes in the San Diego County Region.

1991

After a historic drought, MWD imposes mandatory allocations.



1991

A public outcry prompts policy-makers to move away from MWD as San Diego’s single source of water.



2000s

The Water Authority’s Emergency Storage & Carryover Project is constructed, designed to store and move water if a natural disaster or drought cuts off imported supplies.

2003

The Quantification Settlement Agreement (QSA) is signed, becoming the largest water conservation-and-transfer agreement in U.S. history.

2014

The San Vicente Dam Raise is completed.



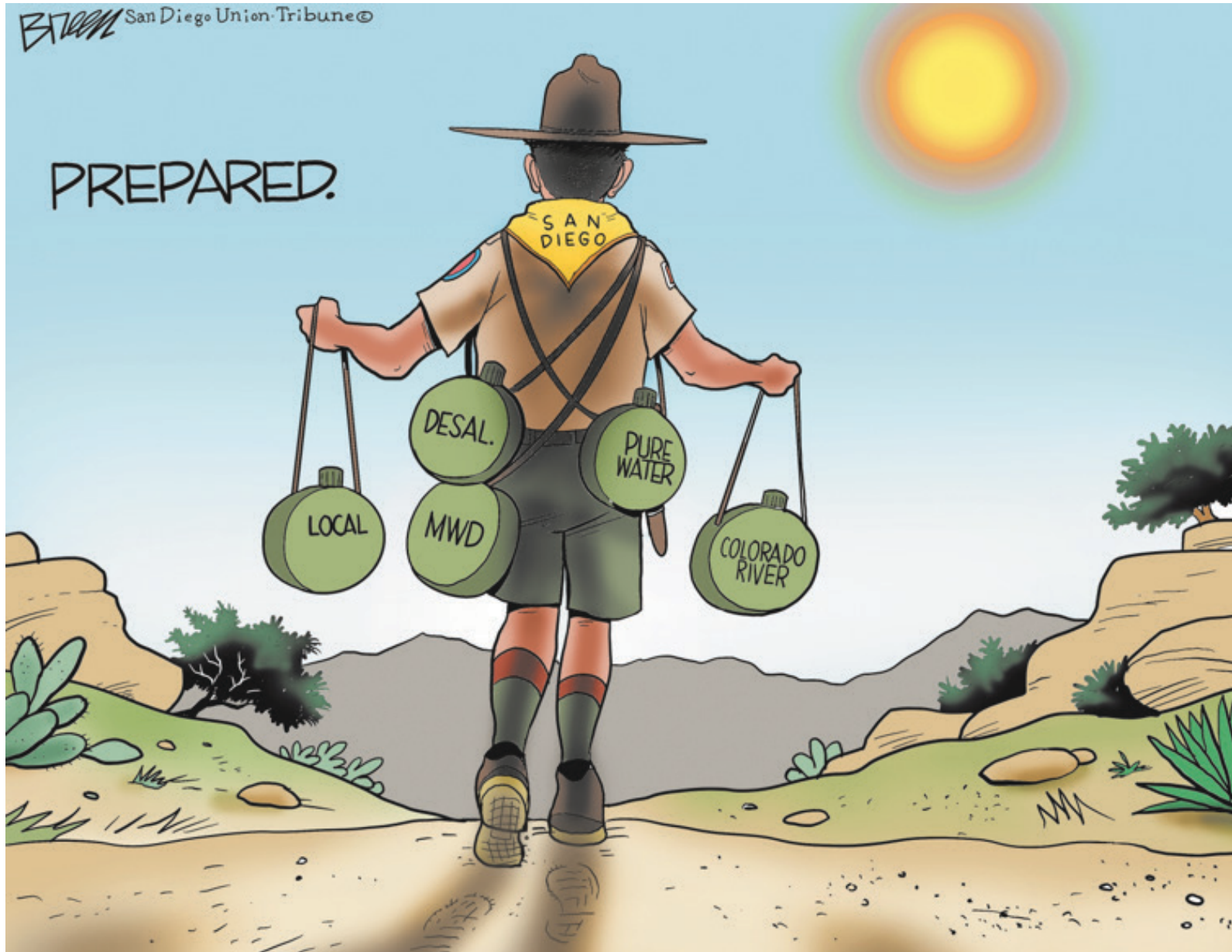
2015

The Claude “Bud” Lewis Carlsbad Desalination Plant begins operations.



2022

The San Diego region survives a major three-year drought without water cutbacks.



A cartoon, The San Diego Union Tribune, by Breen

A cartoon by artist Steve Breen for The San Diego Union-Tribune depicted the many ways that San Diego County has invested in water supply infrastructure and prepared for drought with innovative and forward-thinking supply diversification methods.

Chapter 10

EMBRACING A WATERSMART FUTURE

While the Water Authority was garnering attention for its pioneering water supply and storage projects, an equally important revolution was happening without as much fanfare.

The agency and its many partners reshaped the way water is used in San Diego County by helping to make water conservation and efficiency a way of life. The results were profound; between 1990 and 2022, per capita water use dropped more than 40% in the San Diego region, and state data in 2023 showed the county had the lowest per capita water use in Southern California.

The remarkable progress resulted from several complementary factors, including a series of increasingly frequent and severe droughts that forced conservation into the public consciousness; the Water Authority's commitment to public outreach and education programs that helped change the way residents and businesses think about water; and the development of innovative programs such as rebates, guidebooks and classes that eased the transition into WaterSmart lifestyles.

Even before the Water Authority's supply diversification quest came into focus, the agency was hard at work on reducing demand. One of the most impactful advances came right at the start – successfully sponsoring state legislation in 1991 that established the first low-flow toilet requirements in the nation. By 1994, all toilets installed or sold in California could use no more than 1.6 gallons per flush, less than half the water of many

old-school commodes. Toilet manufacturers wanted to avoid making different toilet models for California, so they started offering low-flow versions nationwide.

In addition, similar legislation made its way into federal law and ultimately into international standards. Continued efforts to achieve greater efficiency in toilets were matched across the spectrum of water-using devices, including irrigation sprinkler heads and washing machines. While those initiatives went well beyond the Water Authority's influence, the agency proved instrumental in sparking a fundamental change in thinking about the value of water in the era of limits.

“As long as citizens continue to conserve, I believe we will have adequate water supplies in our region. Being at the end of the pipeline, getting less rain than Tucson, we have built an insurance policy that no other area of the state can claim.”

Jim Madaffer,

Former Water Authority Board Chair

Water Authority efforts to improve water-use efficiency were rooted in the belief that wise stewardship of water resources is important no matter the weather, and that seemingly small changes to personal habits could combine with technological efficiencies to produce profound changes.

Throughout the 1990s and the first decades of the 2000s, that kind of thinking prompted the agency to roll out a series of resources and rebates for residents to promote the kind of conservation that supported the economy and quality of life for which San Diego County was famous. Those resources included numerous low-water landscaping guides, award-winning outreach campaigns – “Don’t Be a Water Hog,” “Brought to You by Water,” and “20-Gallon Challenge” – while coordinating with other agencies to offer major rebates for replacing unused lawns with low-water landscapes.



San Diego
**BROUGHT
TO YOU
BY WATER...**

Award-winning outreach campaigns and educational resources have contributed to significant conservation in the region.

The Water Authority also pioneered classes for residents to learn about low-water landscaping techniques and a separate series of classes for landscaping professionals to learn about installing and maintaining low-water plants and devices.

The multi-pronged approach produced significant results: In the early 2000s, one acre-foot of water was roughly enough to sustain two typical families in the region. By 2023, it was estimated that one acre-foot of water could serve three families – a 50% increase.

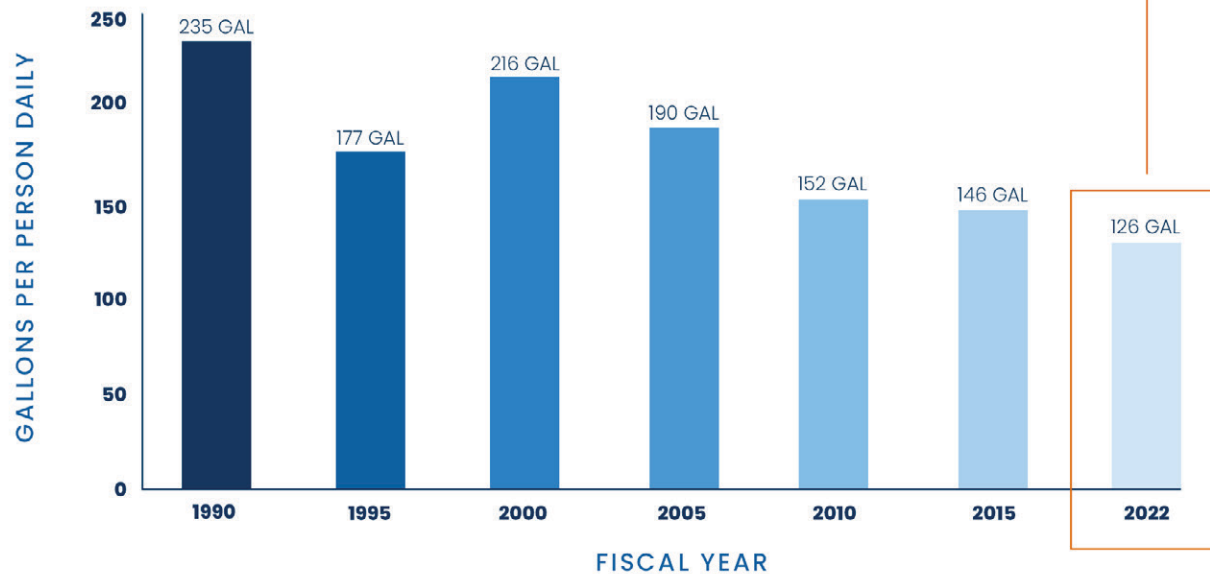


Water use surveys provide residents with recommendations to improve outdoor landscapes and indoor water-use efficiency.



A culture of conservation in San Diego County has inspired residents to adopt low-water landscapes.

Per capita water use in San Diego region has declined more than 40% since 1990



An Era of Limits

In retrospect, San Diego County's water crisis in the early 1990s was fortuitous because it forced the region to grapple with emerging realities of life in California and the rest of the Southwest well before many others were faced with the hard truth: Water is a limited, valuable, and finite resource.

Nowhere was that more evident than on the Colorado River. After more than 20 years of declines, by the 2020s it was widely recognized that the river was overallocated – more water was being taken out than was going in.

At the same time, groundwater basins across the West were being depleted and the Sierra Nevada was swinging between years of extreme snowfall and years with just a dusting of snow. The combined impacts of water uncertainty rippled across the West, with Arizona starting to curb development because of insufficient supplies and 7 million people in the Metropolitan Water District service area being put on water rations in 2022.¹

The Colorado River’s decline prompted a series of high-stakes negotiations with the seven Basin states, the U.S. government, tribes, and Mexico, about how to share cutbacks as the river shrinks due to a hotter and drier climate.

“The crisis over the Colorado River is the latest example of how climate change is overwhelming the foundations of American life, not only physical infrastructure, like dams and reservoirs, but also the legal underpinnings that have made those systems work. A century’s worth of laws, which assign different priorities to Colorado River users based on how long they’ve used the water, is facing off against a competing philosophy that says, as the climate changes, water cuts should be apportioned based on what’s practical.”

The New York Times ²

Those challenges highlighted the value of the Quantification Settlement Agreement of 2003 – not just for the Water Authority but for the entire Southwest.

The Water Authority’s supplies from the Colorado River were largely insulated from cutbacks in 2022 by virtue of the Imperial Irrigation District’s high-priority water rights. In addition, the conservation-and-transfer agreements at the heart of the QSA provided a model for other states seeking to conserve water in one place for use in another.

But large-scale uncertainties on the Colorado River weren’t the only issues at play. Some of the challenges were more routine: like ensuring investments in pro-active maintenance and repairs of 310 miles of large-diameter pipeline and more than 1,000 related structures. And then there was the issue of upgrading numerous dams across the region that were flagged by state regulators for repairs.



A “bathtub ring” is left on Lake Mead as the Colorado River declined.



An urgent repair on Pipeline 4 (2022)

The Next Frontier: Water Affordability

While the San Diego region received extraordinary benefits from two decades of big-ticket projects and programs, the region also was forced to grapple with the reality that such work comes at a cost that's spread out over decades. By the early 2020s, the region was in the thick of paying off its debt as some other agencies were just starting to make major, costly investments to keep the water flowing.

At the same time, Water Authority member agencies tapped Local Resource Project funds to shore up their own local supplies, particularly water purification projects that turn wastewater into drinking water using a reverse osmosis treatment process similar to seawater desalination. While the concept created a political firestorm in the late 1990s, two decades later San Diegans largely accepted the safety and need for water purification and three plants were under development across the region by retail water agencies.

Concurrently, the nation experienced shockwaves of inflation that drove up the costs of key components of the water supply system – steel, electricity and chemicals – at the fastest rate in a generation.



Pure Water Oceanside ribbon cutting ceremony (March 2022)

To compound the challenges, water use didn't rebound after successive droughts; water use edged up after prohibitions ended but generally continued its downward trend from the peak of 2007. From a financial standpoint, continued conservation proved challenging because it meant that fixed costs had to be spread over fewer gallons sold.

The Water Authority wasn't alone; agencies across the county and across the nation struggled with water affordability. In San Diego County, residents in some areas paid twice as much as water users in other areas due widely due to differing investments and water supplies made by local agencies. While water costs might have sneaked up on residents, the Water Authority had been working within complex laws for rate-setting to minimize the cost of water for several years. "More than ever, our mission today includes enhancing water affordability for everyone in the region," said Water Authority Board Chair Mel Katz.

Through ratepayer protection lawsuits, the Water Authority returned \$90 million to member agencies in 2021. The court rulings also help avoid hundreds of millions in future overcharges and thereby minimize future disputes over rates charged to transport the Water Authority's Colorado River water supplies through MWD facilities.³

"More than ever, our mission today includes enhancing water affordability for everyone in the region."

Mel Katz,
Water Authority Board Chair

In addition to convening local, state, and federal officials to address the complex issues around water affordability, the Water Authority pursued several avenues to reduce costs for ratepayers.

They included:

- Securing state funds for low-income ratepayers
- Ramping up advocacy for state and federal investments in water supply projects
- Working collaboratively with local community organizations along with state and federal leaders to craft a low-income assistance program that meets the region's diverse needs
- Working with retail member agencies to assess different rate structures for 2024 and beyond
- Developing alternative revenue sources
- Attracting and retaining highly skilled staff to ensure the viability of the regional water delivery system for generations

In addition, the Water Authority continued to operate an industry-leading Asset Management Program that proactively monitors for pipeline weaknesses and addresses them before they become large and costly problems. As far back as the early 1980s, the agency pioneered a pipeline rehabilitation method that lowered expenses to less than half of the costs for pipeline replacements. The Water Authority's steel relining process was then adopted by utilities around the world – and it continues to be the most cost-effective way to rehabilitate critical large-diameter pipelines.

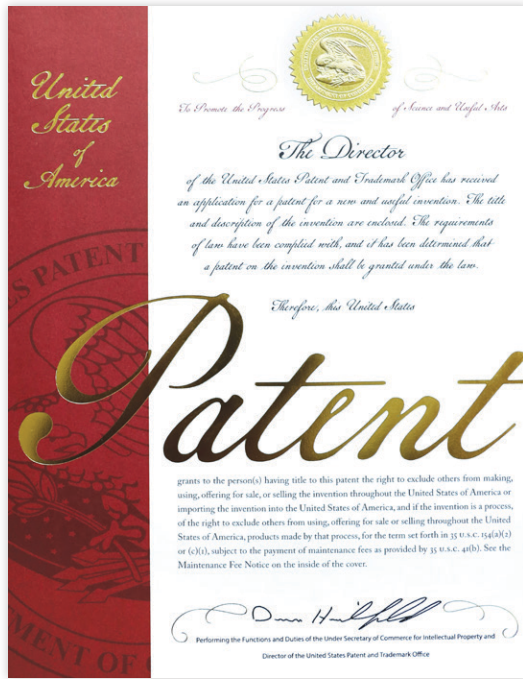
The Water Authority has also been at the forefront of deploying technologies to assess the condition of its assets. In 2006, for instance, the Water Authority became the first water agency in the country to adopt acoustic

fiber-optic technology for monitoring its pre-stressed concrete cylinder pipelines, and the first to adopt local 24-hour monitoring of water pipelines. Dependence on fiber optics declined over time as the Water Authority rehabilitated critical stretches of the pipeline. However, high-tech tools such as magnetic flux leakage, electromagnetic scanning, acoustic leak detection, and satellite-based radar detection are all used by the Water Authority to minimize the costs of ongoing reliability upgrades.

In 2022, the Water Authority was granted its first utility patent when Water Authority Operations and Maintenance Manager Martin Coghill invented a new pipeline monitoring tool to save time, reduce costs and improve safety during ongoing aqueduct inspections.



The Water Authority has developed new tools for assessing critical water infrastructure for decades.



The U.S. Patent and Trademark Office awarded a Patent in April 2022 for the Water Authority’s pipeline inspection system.

The U.S. Patent and Trademark Office awarded Patent #US011,293,581 in April 2022 for the Water Authority’s pipeline inspection system, which comprises a body, cameras, support members and light sources to capture high-resolution images of pipeline walls.

“This new pipeline inspection tool is a prime example of the Water Authority’s commitment to innovation that benefits ratepayers by saving money and enhancing reliability. We have a long history of advancing industry-leading solutions, from state legislation to adopt low-flow toilets in the early 1990s to the nation’s largest water conservation-and-transfer program a decade later to the largest seawater desalination plant on the continent,” retired Water Authority General Manager Sandra L. Kerl, said at the time.

Conservation & Affordability

1991

The Water Authority sponsors state legislation that establishes low-flow toilet requirements.

1990s–2020s

Award-winning outreach campaigns and education resources enhance regional water conservation.



2000

The State of California amends the County Water Authority Act, expanding the Water Authority’s ability to build electric and natural gas facilities.

2003

The Water Authority and Imperial Irrigation District reach an agreement for the largest agricultural-to-urban water transfer in U.S. history.

2020

Regional water use decreases by more than 40% since the 90s.



2021

The Water Authority returns \$90 million to member agencies from ratepayer protection lawsuits, the result of an ongoing focus on water affordability.

2022

The Water Authority is awarded a patent for its pipeline inspection system.

2023

The Citizen’s Water Academy reaches nearly 800 graduates.



Looking Ahead

San Diego County residents have always been creative and determined in their quest to find enough water to keep the county vibrant and prosperous. For more than a century, solutions once thought extreme have turned into reality to meet the region's water needs. From building wooden flumes through rugged canyons to creating hundreds of miles of modern aqueducts that transport water from remote sources, water users have benefitted from stunning projects that have re-engineered water in San Diego County and throughout the West.

Looking to the future, strategic long-term planning will continue to help the Water Authority carry out its mission of ensuring a reliable water supply to sustain the county's 3.3 million residents and its \$268 billion economy. Local water industry professionals are pioneering local resource development by augmenting seawater desalination with continued advances in water-use efficiency, groundwater recovery, and water purification.

Throughout the San Diego region's history, every resident has depended on water to prosper. Providing that water has not always been easy, and new challenges will continue to emerge, requiring new thinking and new solutions. But one thing is certain: with a clear vision and strong community support, the region's water agencies are united and effective in their purpose – to quench a thirst.

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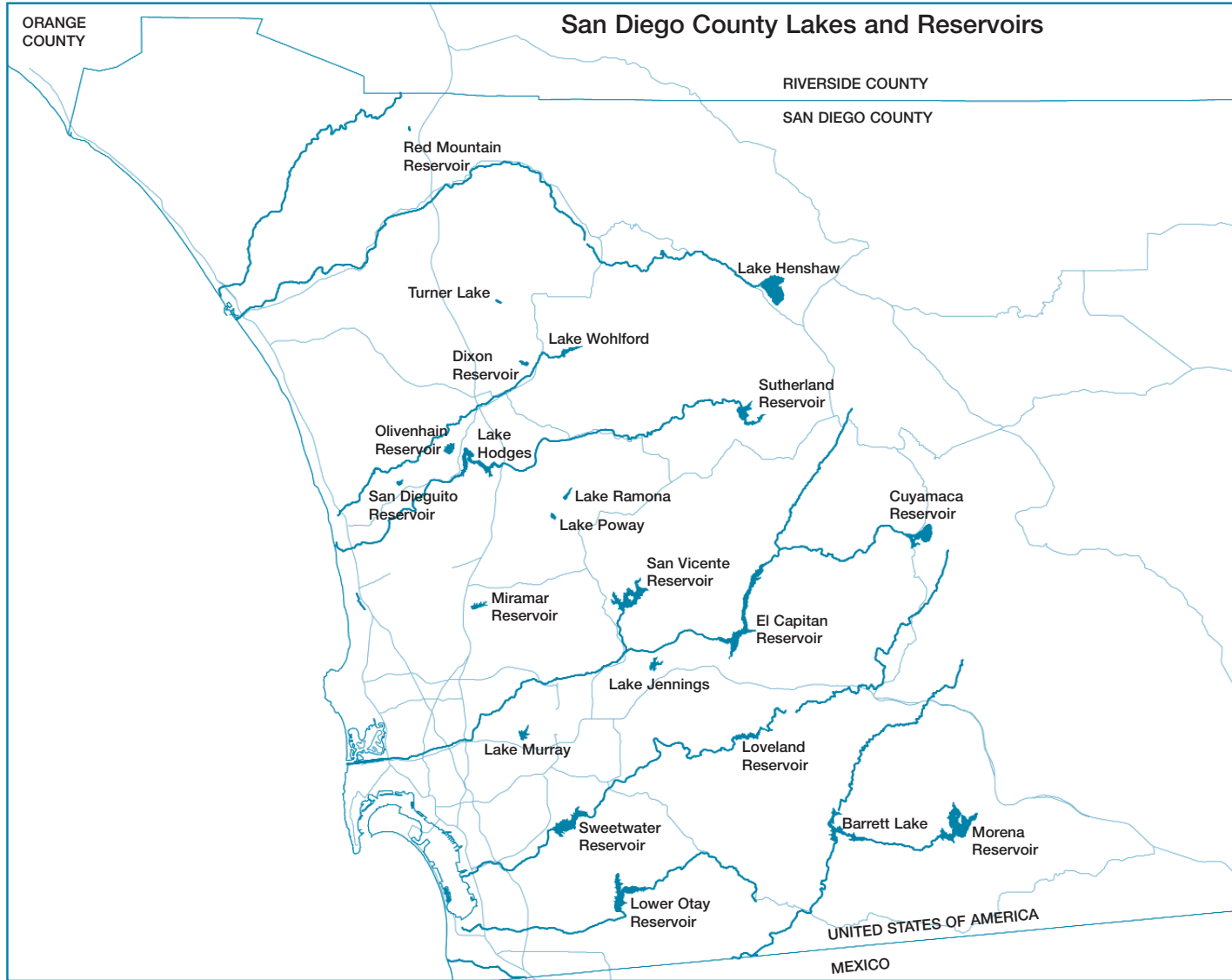
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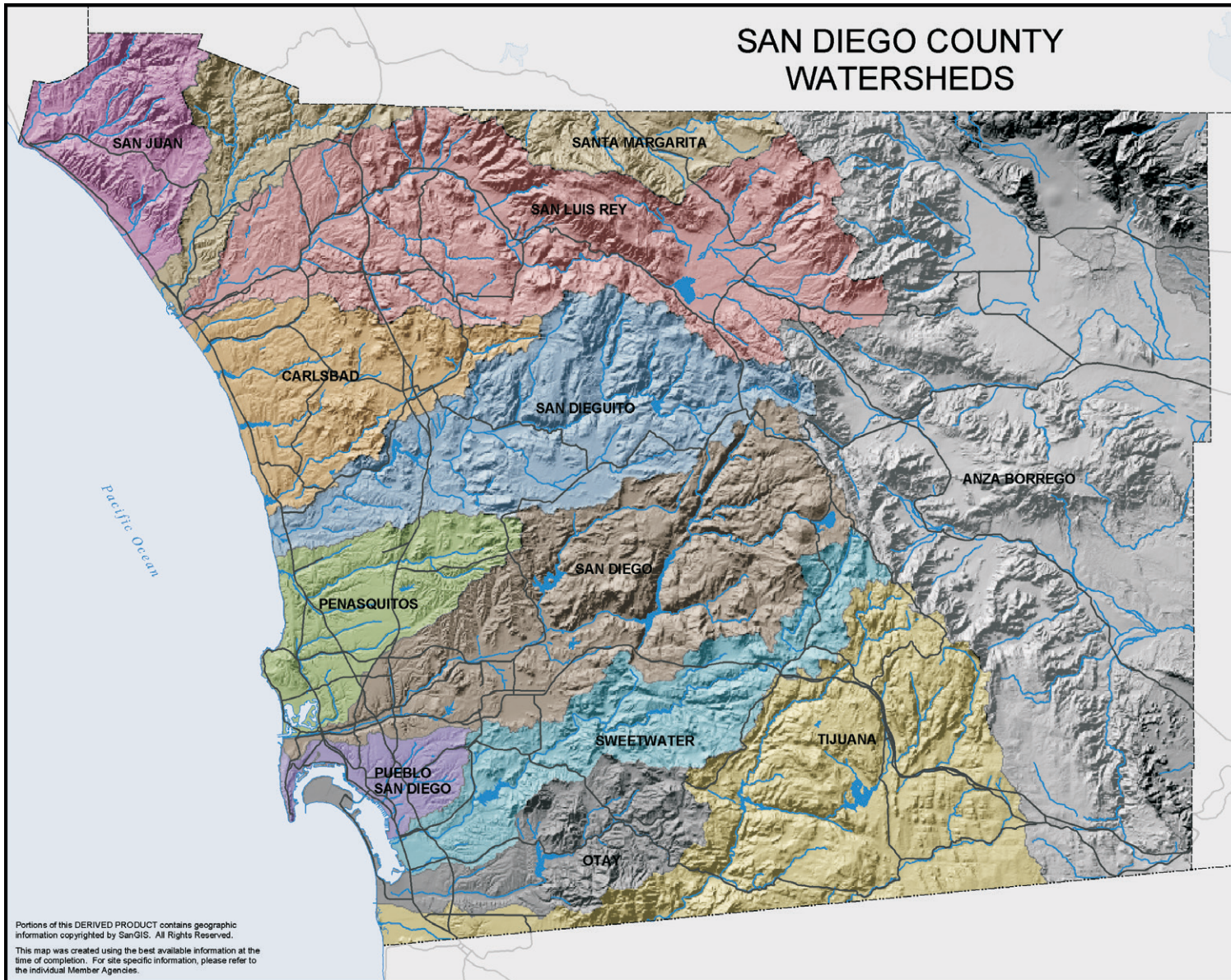
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Maps and Charts



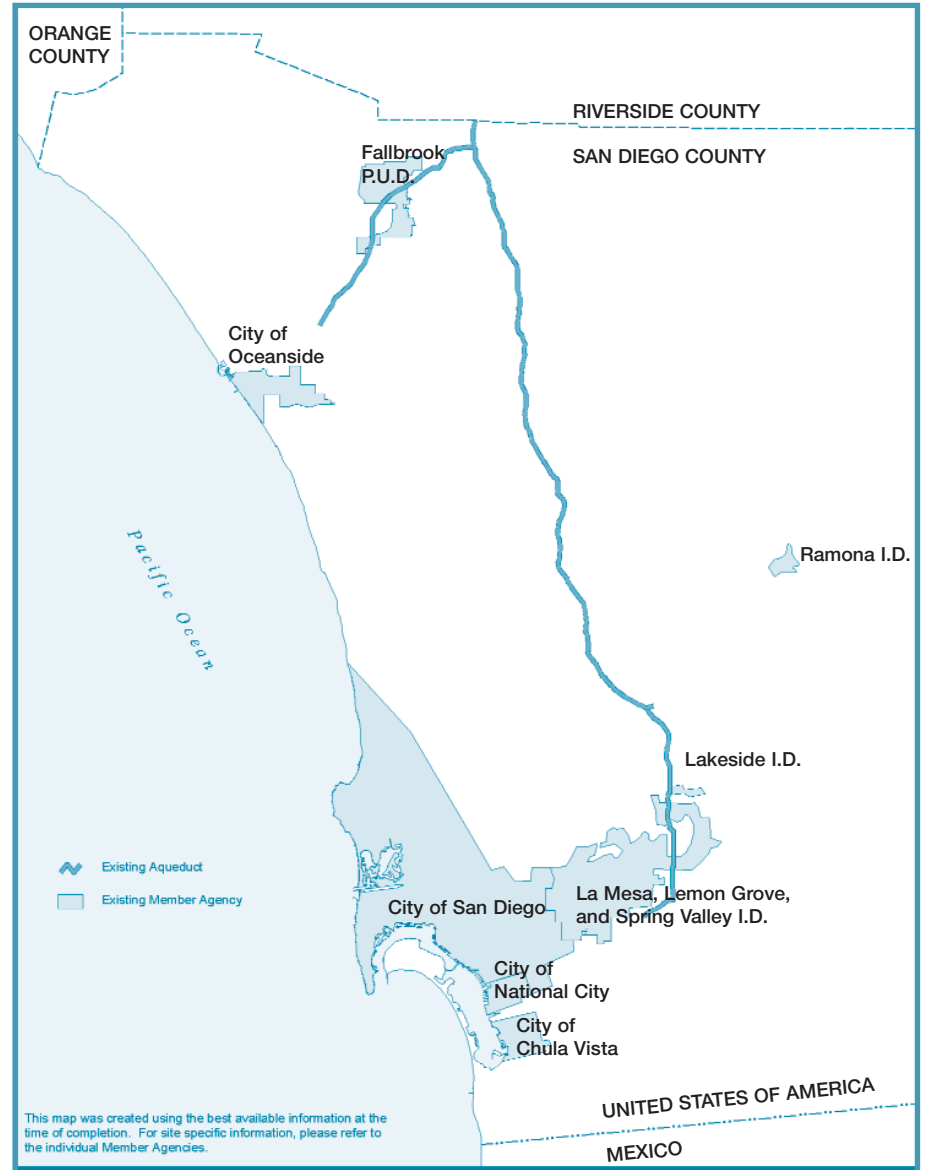
Historic Overview of SDCWA Area, Population, Water Use and Miles of Pipeline

Year	Area (Acres)	Population	Total Water Deliveries (Acre-Feet)	Pipeline (Miles)
1948	94,706	432,000	41,093	67.5
1950	119,213	434,777	58,612	67.5
1955	349,493	702,300	98,972	102
1960	543,606	956,400	156,858	161
1965	718,900	1,150,000	230,911	161
1970	753,200	1,255,000	245,678	166
1975	761,678	1,527,520	376,286	204
1980	898,733	1,806,035	309,756	210
1985	902,702	2,047,000	436,201	222
1990	908,945	2,435,903	674,993	222
1995	908,964	2,622,948	386,560	250
2000	918,128	2,814,481	589,062	274
2005	922,381	2,977,337	553,625	279
2010	947,289	3,167,171	491,924	300
2015	946,211	3,146,771	494,957	310
2020	934,777	3,254,441	353,958	310



SDCWA Service Area — Year 1946 - 1948

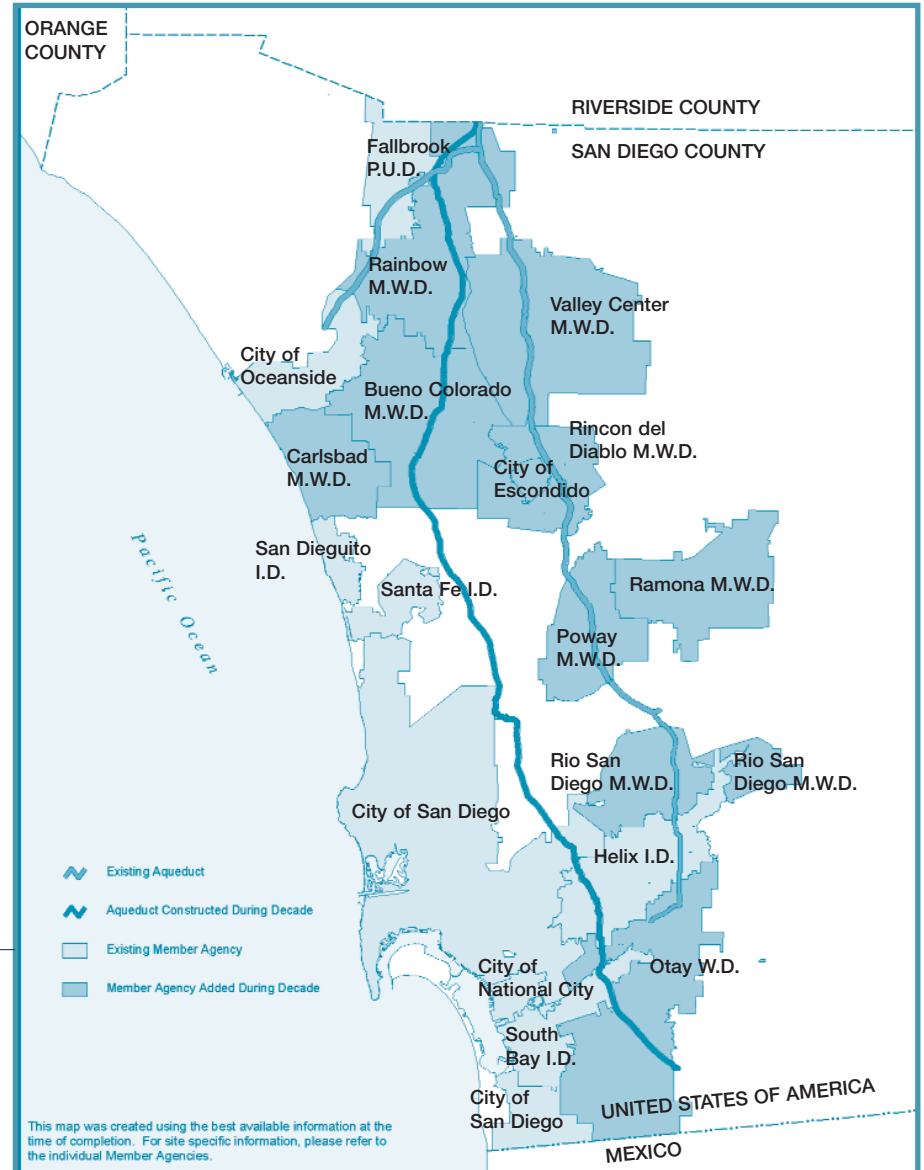
SDCWA Member Agency	Population	Area (Acres)	SDCWA Water Deliveries (Acre-Feet)
City of Chula Vista	11,100	3,238	1,800
Fallbrook Public Utility District	3,00	1,856	691
Lakeside Irrigation District	1,300	320	0
La Mesa, Lemon Grove and Spring Valley Irrigation District	24,500	19,008	4,256
City of National City	17,700	2,950	1,837
City of Oceanside	10,700	5,536	0
Ramona Irrigation District	1,000	659	0
City of San Diego	362,700	61,139	32,461
TOTAL	432,000	94,706	41,093



MILES OF PIPELINE = 67.5

SDCWA Service Area — Year 1960

SDCWA Member Agency	Population	Area (Acres)	SDCWA Water Deliveries (Acre-Feet)
Bueno Colorado MWD	31,500	50,540	3,735
Carlsbad MWD	10,000	20,668	3,588
City of Escondido	18,500	4,061	2,142
Fallbrook Public Utility District	10,000	15,469	8,106
Helix Water District	122,100	30,958	14,176
City of National City	32,300	4,781	5,306
City of Oceanside	24,700	17,060	3,528
Otay Water District	5,400	49,841	639
City of Poway	4,800	22,980	1,567
Rainbow MWD	2,800	40,040	5,662
Ramona MWD	5,600	29,900	322
Rincon del Diablo MWD	14,000	20,271	2,244
Rio San Diego MWD	25,500	27,655	2,138
City of San Diego	557,200	125,827	93,892
San Dieguito Irrigation District	15,000	4,948	1,488
Santa Fe Irrigation District	7,700	10,132	1,346
South Bay Irrigation District	64,300	15,315	5,350
Valley Center MWD	5,000	53,160	1,358
Others			271
TOTAL	956,400	543,606	156,858



MILES OF PIPELINE = 161

SDCWA Service Area — Year 1980

SDCWA Member Agency	Population	Area (Acres)	SDCWA Water Deliveries (Acre-Feet)
Bueno Colorado MWD	51,000	20,067	7,402
Costa Real MWD	31,500	20,369	12,223
City of Del Mar	5,040	1,082	1,283
De Luz Heights MWD	225	11,830	1,097
City of Escondido	64,100	13,333	8,749
Fallbrook Public Utility District	18,700	16,104	12,174
Helix Water District	203,500	31,663	19,800
City of National City	47,200	5,431	1,593
City of Oceanside	77,800	25,383	19,326
Olivehain MWD	23,000	27,367	5,313
Otay Water District	51,600	64,788	11,782
Padre Dam MWD	89,000	54,082	13,721
Camp Pendleton Marine Corps Base	33,150	134,625	0
City of Poway	36,600	22,809	7,052
Rainbow MWD	7,800	46,754	27,040
Ramona MWD	16,000	46,939	6,239
Rincon del Diablo MWD	13,800	16,370	4,789
City of San Diego	849,600	204,945	92,986
San Dieguito Water District	30,900	5,637	5,732
San Marcos CWD	24,200	28,548	6,855
Santa Fe Irrigation District	24,200	10,200	6,258
South Bay Irrigation District	99,200	15,533	1,500
Valley Center MWD	15,600	62,061	32,681
Yuima MWD	1,870	12,813	1,601
Others			2,560

TOTAL 1,806,035 898,733 309,756



MILES OF PIPELINE = 210

SDCWA Service Area — Year 2012

SDCWA Member Agency	Population	Area (Acres)	SDCWA Water Deliveries (Acre-Feet)
Carlsbad MWD	84,838	20,640	16,179
City of Del Mar	4,161	1,442	1,083
City of Escondido	141,788	21,569	17,330
Fallbrook Public Utility District	35,000	27,988	12,115
Helix Water District	267,922	31,350	24,072
Lakeside Water District	35,500	11,488	3,374
City of National City	58,586	4,812	1,235
City of Oceanside	167,943	26,982	23,773
Olivehain MWD	81,701	30,942	19,305
Otay Water District	208,000	80,320	30,542
Padre Dam MWD	96,589	54,402	11,457
Camp Pendleton Marine Corps Base	79,600	134,625	800
City of Poway	48,382	25,047	11,138
Rainbow MWD	19,611	47,260	20,465
Ramona MWD	33,360	45,868	6,020
Rincon del Diablo MWD	29,955	10,596	5,950
City of San Diego	1,376,173	213,121	164,837
San Dieguito Water District	39,593	5,652	2,663
Santa Fe Irrigation District	19,400	10,359	5,577
South Bay Irrigation District	125,174	13,836	4,269
Vallecitos Water District	94,871	29,630	16,082
Valley Center MWD	25,453	64,253	27,722
Vista Irrigation District	126,244	21,167	12,353
Yuima MWD	1,870	13,460	1,198

TOTAL 3,201,714 946,812.4 439,551.9

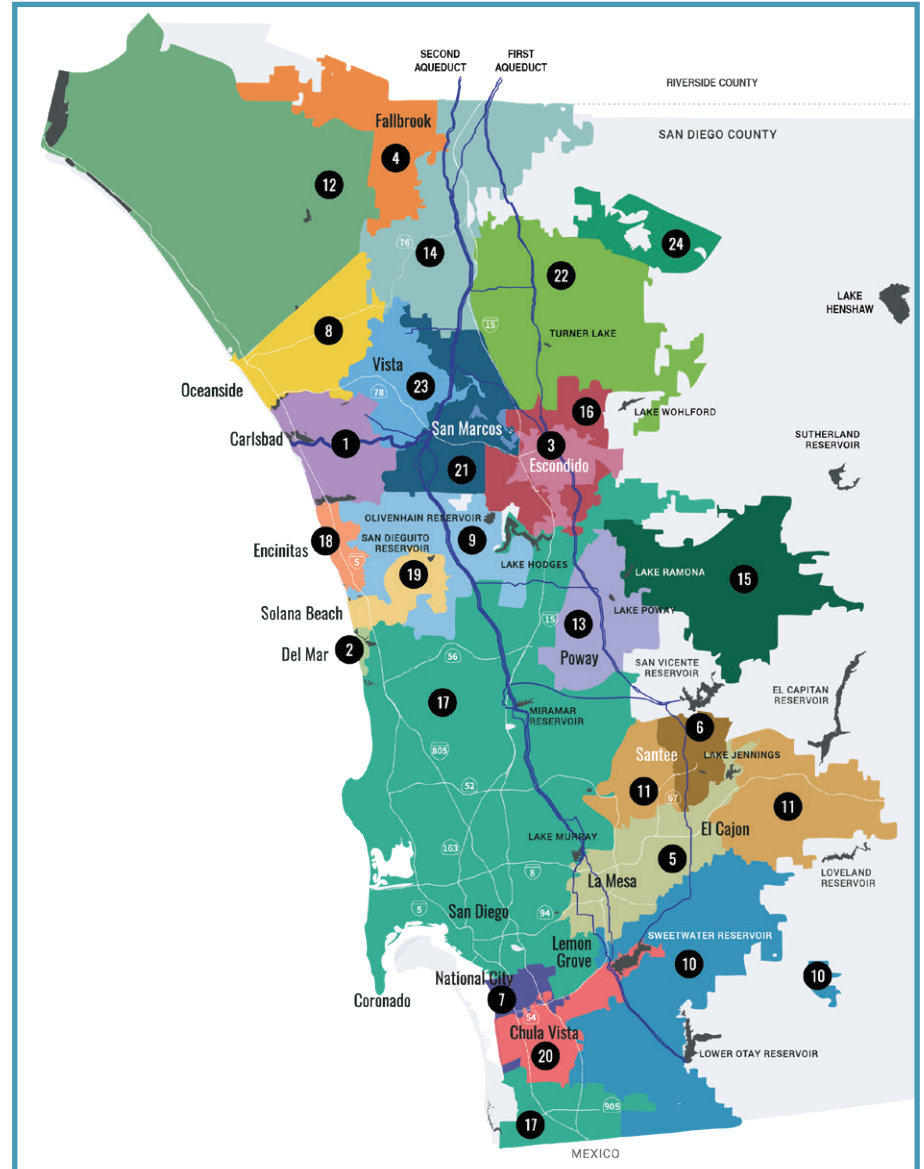


MILES OF PIPELINE = 299

SDCWA Service Area — Year 2022

SDCWA Member Agency	Population	Area (Acres)	SDCWA Water Deliveries (Acre-Feet)
Carlsbad MWD	92,865	20,682	12,286.7
City of Del Mar	4,297	1,442	1,007.7
City of Escondido	136,245	18,560	13,122.8
Fallbrook Public Utility District	35,237	27,988	7,516.3
Helix Water District	277,168	30,291	27,969.5
Lakeside Water District	35,500	11,488	3,183.7
City of National City	61,471	4,812.4	601.5
City of Oceanside	178,021	26,982.5	21,340.5
Olivenhain MWD	86,614	30,942.1	18,446.8
Otay Water District	227,957	80,208.0	29,631.9
Padre Dam MWD	88,963	45,892.8	9,951
Camp Pendleton Marine Corps Base	61,030	134,625	181.7
City of Poway	49,338	25,047	9,738.5
Rainbow MWD	23,536	47,670	16,299.3
Ramona MWD	36,097	45,868	4,815.8
Rincon del Diablo MWD	32,019	10,596.1	5,007.8
City of San Diego	1,430,483	213,121	158,879.8
San Dieguito Water District	39,823	5,659	4,191.3
Santa Fe Irrigation District	18,890	10,359	7,789.1
South Bay Irrigation District	127,900	13,836.9	4,100.1
Vallecitos Water District	110,521	28,465.5	11,452.2
Valley Center MWD	29,708	64,293	17,131.3
Vista Irrigation District	132,838	21,088	8,418.9
Yuima MWD	2,660	13,460	5,153.5

TOTAL 3,319,181 933,378.1 398,217.7



MILES OF PIPELINE = 310



**With a clear vision and strong community support,
the region's water agencies are united and effective
in their purpose: to quench a thirst.**



***San Diego County
Water Authority***