LONG RANGE WATER RELIABILTY PLAN

moulton niguel water district

moulton niguel water district

2025 Long-Range Water Reliability Plan Update

Prepared by
Moulton Niguel Water District - Water Resources

26161 Gordon Road
Laguna Hills, CA 92653
www.mnwd.com

Table of Contents

Figures

Tables

Acronyms and Definitions

AF	acre-feet
cfs	cubic feet per second
GPCD	gallons per capita per day
in	inches
MAF	million acre feet
mg	million gallons
mgd	million gallons per day
sq. ft	square feet
Baker	Baker Water Treatment Plant
Basin	Colorado River Basin
CAMP4W	Climate Adaptation Master Plan for Water
CDFW	California Department of Fish and Wildlife
CDR	Center for Demographic Research at California State University Fullerton
CESA	California Endangered Species Act
CII	Commercial, Industrial, and Institutional
CRA	Colorado River Aqueduct
CWC	California Water Code
DCP	Delta Conveyance Project
Delta	Sacramento-San Joaquin Delta
Diemer	MWD's Robert B. Diemer Water Treatment Plant
DOF	Department of Finance
DOI	Department of the Interior
DPR	Direct Potable Reuse
DROA	Drought Response Operations Agreement
DWR	Department of Water Resources
EIS	Environmental Impact Statement
ET	Evapotranspiration
IPR	Indirect Potable Reuse
IRP	Integrated Resources Plan
IRWD	Irvine Ranch Water District
ITP	incidental take permit
LRWRP	Long Range Water Reliability Plan
MNWD	Moulton Niguel Water District
MOU	memorandum of understanding
MWD	Metropolitan Water District of Southern California
MWDOC	Municipal Water District of Orange County
OASIS	Optimized, Adaptive, Sustainable, and Integrated Supply
OCWD	Orange County Water District
PH&S	public health and safety
R6	El Toro Reservoir

Reclamation	Bureau of Reclamation
SB	Senate Bill
SDCWA	San Diego County Water Authority
SMWD	Santa Margarita Water District
SOC	South Orange County
SWP	State Water Project
SWRCB	State Water Resources Control Board
USGS	United States Geologic Survey
UWMP	Urban Water Management Plan
UWUO	Urban Water Use Objective
WSAP	Water Shortage Allocation Plan
WSCP	Water Shortage Contingency Plan
WSS	Water Supply Strategy
WTP	water treatment plant

Executive Summary

Moulton Niguel Water District (MNWD or the District) was established in 1960 as a water district serving a significant portion of Southern Orange County (SOC). MNWD provides potable water, recycled water, and wastewater services to approximately 170,000 residents within the District's service area. The service area encompasses approximately 37 square miles including the City of Laguna Niguel, City of Aliso Viejo, and portions of the cities of Laguna Hills, Dana Point, Mission Viejo, and San Juan Capistrano.

MNWD developed the following 2025 Long Range Water Reliability Plan (LRWRP) to forecast water demand projections, evaluate regional supply portfolios, identify potential water supply gaps, and inform future planning efforts such as the 2025 Urban Water Management Plan (UWMP). These efforts are dedicated to delivering high-quality, reliable drinking water for MNWD customers.

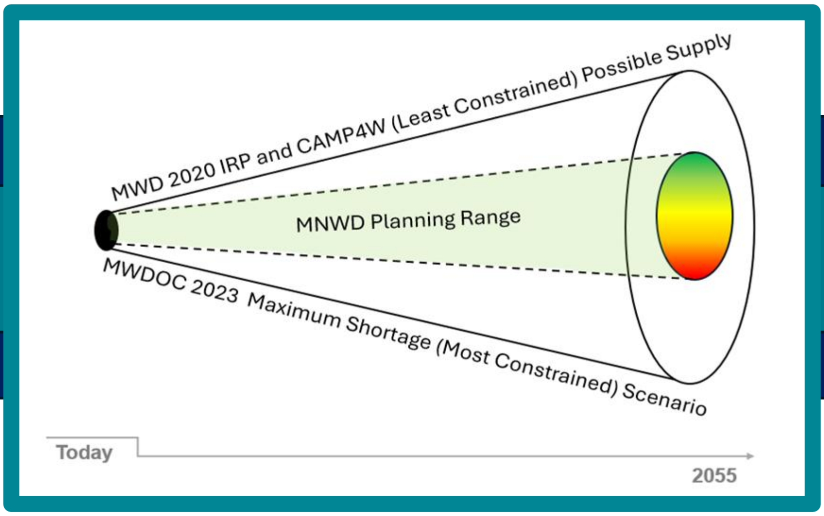
Long Range Planning Purpose

MNWD currently serves approximately 80% imported water and 20% recycled water. Customer demands are shown to be decreasing overall (across imported and recycled water supplies). Currently, the District relies exclusively on imported water supplies. Imported water is delivered by the regional State Water Project (SWP) contractor, Metropolitan Water District of Southern California (MWD), and the local wholesaler the Municipal Water District of Orange County (MWDOC). In 2021, MNWD adopted the Water Reliability Policy (21-04) which recognized the following key water reliability goals:

- Develop 31 to 60 days of annual average potable supply (Days of Reliability).
- Engage in cost-effective demand management and recycled water programs.
- Evaluate additional cost-effective emergency supply sources.
- Identify opportunities for additional dry-year storage.
- Continue to monitor direct potable reuse regulations for local projects.
- Support cost-effective regional solutions led by MWD to enhance water reliability.

Supply Reliability

To determine available supplies, MNWD incorporated eight supply scenarios developed using the latest MWD and MWDOC supply model results. Regional modeling was used to generate a planning range for future supply projections, incorporating potential maximum shortage supply scenarios. MNWD's planning range was established with the following key assumptions: 1) future supply conditions will occur between the regional supply projection ranges of full reliability to maximum shortage conditions, 2) regional shortages may occur in the future, 3) in case of a regional shortage, a baseline supply of 24,000 acre-feet (AF) is assumed to be available for MNWD prior to shortage allocations based on historical trends and 4) customers may be asked to reduce demands by at least 20% in response to shortage conditions (**ES-1**). For additional information on how the supply scenarios were evaluated please refer to **Appendix A: Water Supply Technical Report**.



ES - 1. MNWD Supply Projections, Future "Lens"

Supply modeling by MWD and MWDOC indicate that under most scenarios, supplies will be sufficient to meet demands. The selected scenarios were analyzed with the latest MNWD demand projections to determine potential supply gaps from 2026 to 2055. Under maximum shortage conditions, identified by MWDOC, supply modeling of the MNWD most constrained supply (**ES-2**) indicates that MNWD should consider potential shortages up to nearly 3,800 AF in 2055. Results indicate that maximum shortage scenarios may occur around 2035, at nearly 100 AF. Shortages may be increasingly likely and greater in the future; however, shortages have a low probability of occurrence (1.9% observed in MWDOC modeling for 2030) and are anticipated to be mitigated by future supply projects currently in planning stages.

ES - 2. Results of the MNWD Planning Range

Year	Demand with 20% Reduction (AF)	Average Maximum Shortage Supply (AF)	Difference (AF)
2030	15,921	16,530	609
2035	15,229	15,139	-90
2040	14,778	13,748	-1,030
2045	14,258	12,357	-1,901
2050	13,737	10,966	-2,771
2055	13,335	9,575	-3,760

System Reliability

A days of reliability analysis was conducted to determine the current annual average days of emergency potable supply. This analysis is conducted using average MNWD customer demands by month and calculating the available supply in the case of a regional water facility shutdown at the Diemer Water Treatment Plant.

MNWD has a combined internal emergency storage capacity of approximately 480 AF: comprised of 218 AF in internal storage tanks, 40 AF at the El Toro Water District "R6" Reservoir, and 276 AF in the Upper Chiquita Reservoir operated by Santa Margarita Water District (SMWD). MNWD also has capacity at the Baker Water Treatment Plant for an estimated 26 AF per day. In addition, MNWD has contractual access to an emergency interconnection capacity for up to approximately 22 AF per day for a maximum of 30 days through 2030. This existing emergency capacity is seasonal with 0 AF available in the summer months. For additional information please see **Appendix B: Water System Technical Report**.

Using MNWD's emergency water and system capacity parameters, days of reliability results indicate that MNWD has an annual average of 43 days with a 20% demand reduction in place. These days of reliability are higher in the winter due to lower water usage and lower in the summer due to higher water usage and reduced emergency interconnection capacity. Demand projections are shown to be decreasing over time with additional conservation efforts and slight decline in local population. Due to past customer behavior in times of drought, a 20% reduction is assumed for demand response. For additional information on the demand forecasts please refer to **Appendix C: Water Demand Technical Report**.

Conclusions and Recommendations

MNWD will continue to plan for long-term investments to ensure reliable water supplies for customers and continue to monitor conditions that impact regional reliability. It is recommended that MNWD continue to increase days of reliability by pursuing regional partnerships for emergency interconnections. In addition, options for dry-year storage should continue to be evaluated for potential investment, to expand locally available water resources and ensure continued water reliability that fills potential future supply gaps evaluated during extreme drought conditions.

Section 1 – Purpose

The 2025 Long-Range Water Reliability Plan Update (2025 LRWRP Update, Plan) is a comprehensive planning document used by MNWD to evaluate future water supply and demand scenarios and identify long-term strategies to enhance system reliability and resilience. Building on the 2020 LRWRP, the 2025 LRWRP Update incorporates the latest regional supply modeling from the Municipal Water District of Orange County (MWDOC) and the Metropolitan Water District of Southern California (MWD), as well as updated MNWD historical data and analytical methods. The Plan also reflects evolving regulatory requirements and state water policy considerations. Established in 1960, MNWD provides potable water, recycled water, and wastewater services to nearly 170,000 customers within South Orange County (SOC) (**Figure 1**).

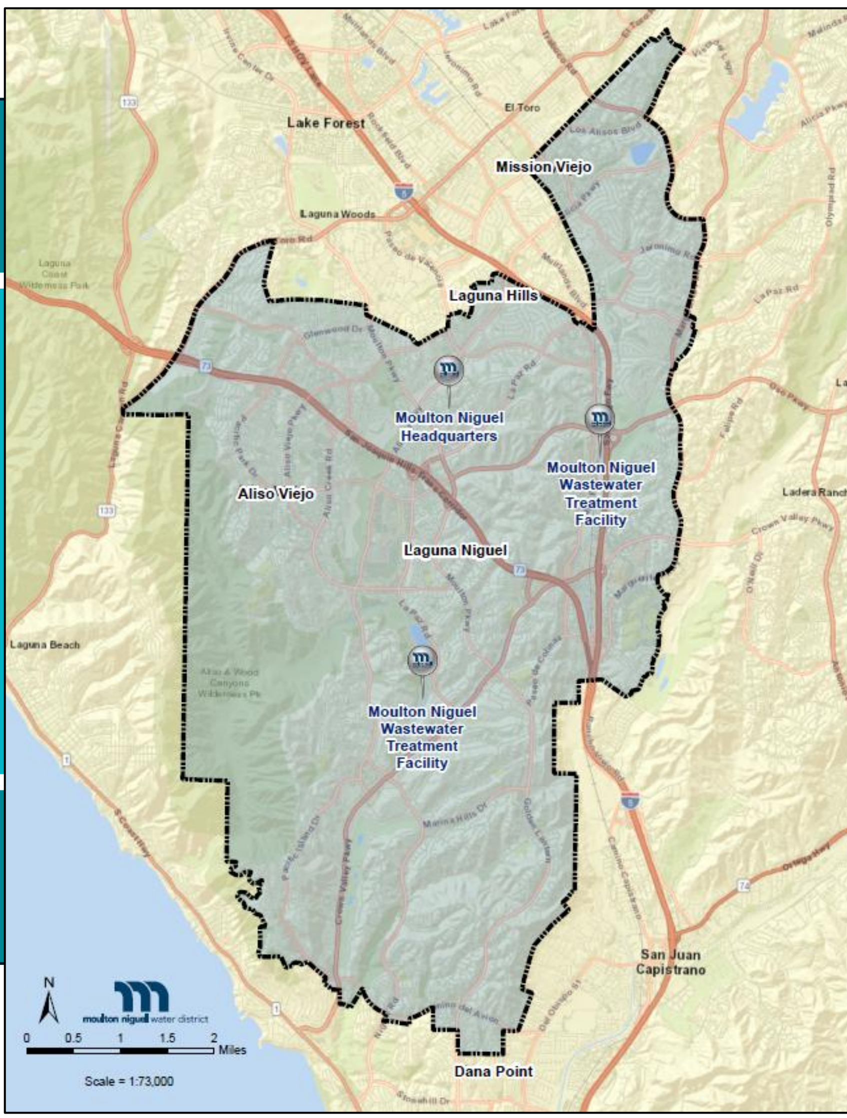


Figure 1. MNWD Service Area

The service area covers approximately 36.5-square miles across the Cities of Laguna Niguel and Aliso Viejo and includes portions of the Cities of Laguna Hills, Dana Point, Mission Viejo, and San Juan Capistrano.

MNWD's water supplies include imported water from MWD, purchased through MWDOC (a regional water wholesaler), as well as recycled water produced at MNWD's 3A and Regional Treatment Plants. Imported water is treated at the Diemer Water Treatment Plant as well as the Baker Water Treatment Plant (untreated water from Lake Mathews). MNWD's potable water supply is imported from MWD from the State Water Project (SWP) and the Colorado River Aqueduct (CRA).

Since 2000, the Colorado River Basin has been experiencing an extended drought that impacts regional water supply (DOI, 2023). Water supply from the SWP has also been significantly reduced over time, due to state restrictions and fishery protections in the Sacramento-San Joaquin Delta (Delta). Updated climate models indicate that less frequent, more intense storms are expected in the future, along with extended dry periods. Given the increased hydrologic variability, there is a heightened need to evaluate imported water reliability and identify ways to increase water resiliency across California.

1.1 LRWRP Objectives

The LRWRP Update is a high-level planning document designed to inform decision-makers on the benefits of future water resource investments, with analyses evaluated for the next 30-years, through 2055. The results of the 2025 LRWRP Update comprise a flexible and adaptive management approach that accounts for future risk and uncertainty.

The 2025 LRWRP Update has the following primary objectives:

1) Identify potential system and supply reliability risks.
2) Analyze impacts to MNWD's ability to meet future demands.
3) Recommend strategies that increase resiliency and meet MNWD priorities.
4) Support preparation of the 2025 Urban Water Management Plan (UWMP).
5) Support grant application development to fund future water resource projects.

1.2 2025 Updates

This 2025 LRWRP incorporates new historical data from 2021 through 2025 and extends the planning period from 2050 to 2055. The following report provides an assessment of current and future water supply conditions as well as documenting MNWD's latest strategies to ensure long-term water resilience for customers over the next 30 years. The 2025 LRWRP Update also analyzes the latest population projections, new development, water demand forecasts, and supply source modeling. The 2025 LRWRP Update Planning Goals include:

- **Water Reliability** – Ensuring enough water supplies to meet water demands under different hydrologic conditions, measured by frequency (probability of occurrence), duration (length of occurrence), and magnitude (volume) of water shortages.
- **Water Resiliency** – Ensuring the capacity to recover from water shortages caused by either drought, climate variability, system capacity limitations, or catastrophic system outages.
- **Water Efficiency** – Continue to incentivize customers to install water efficient devices and replace water-intensive turf with native landscaping.
- **Cost-Effectiveness** – Continue providing water services in a cost-effective manner.
- **Environmental Sustainability** – Support reduced reliance on imported water, improve energy efficiency, and enhance ecosystem health and water quality.

Section 2 – Background

2.1 Service Area Details

MNWD began serving SOC in 1960 with eight ranch customers, to establish a reliable water supply for their cattle. Over the past 60 years, SOC has transformed from cattle ranches into a robust residential community. As water demands were converted from ranching to residential needs, MNWD focused on developing the infrastructure necessary to serve its evolving customer base.

A. Historical Water Use

MNWD provides potable imported water (drinking water) as well as recycled water to customers. On average, MNWD provides approximately 24,000 acre-feet (AF) of potable water to customers annually and approximately 6,000 AF of recycled water (**Figure 2**). The volume of deliveries has consistently decreased over the past decade, after 2015 drought conditions. These conservation efforts are further supported by the “Making Conservation a California Way of Life” regulation, effective January 1, 2025.

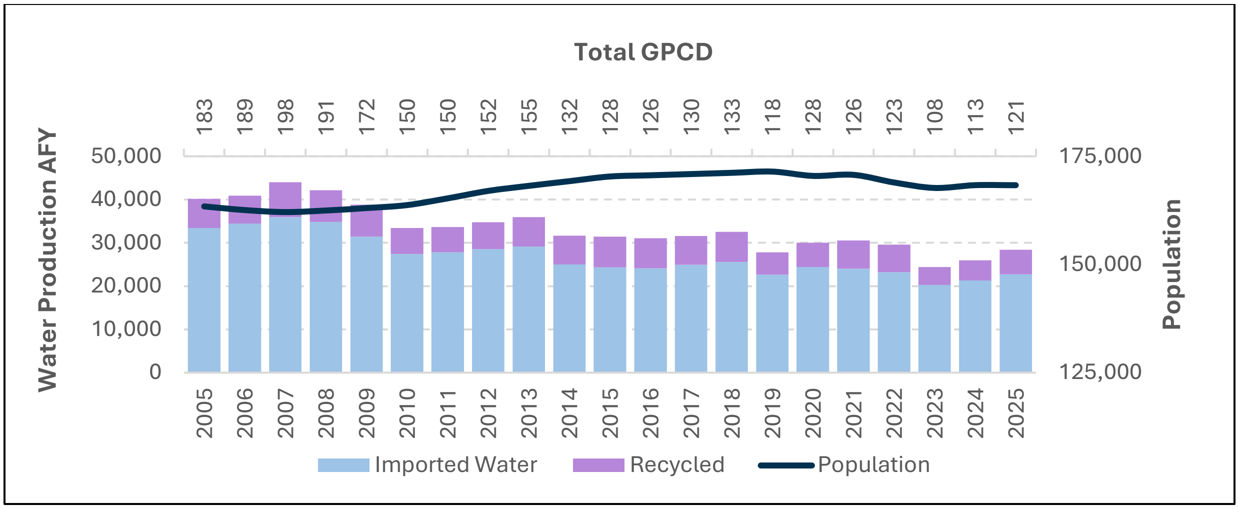


Figure 2. MNWD Historical Population and Water Demands (2005 to 2025)

B. Population Projections

Historical and forecasted population for MNWD, from 2010 to 2025, was provided by the Center for Demographic Research at California State University Fullerton (CDR). CDR methods are used to prepare the projected population for the MNWD service area from 2025 through 2050 (**Table 1**).

Table 1. CDR Projected Population for MNWD Service Area and Projected Dwelling Units

CDR	2025	2030	2035	2040	2045	2050
Population Served	168,315	167,762	167,396	166,548	164,639	162,767
Projected Dwelling Units	69,178	70,128	72,478	72,634	72,828	73,465

NOTE: Population projections were prepared by CDR and reflect MWDOC Retail Service Provider Boundaries as of January 2025. Initial projected dwelling units were also developed by CDR. MNWD supplements these projections by working directly with cities to incorporate forecasted development in the service area, which results in higher projected development than reflected in the CDR data alone. The projections presented here include additional development reported to MNWD for FYs 2026-2036.

Projections are prepared by CDR using the United States Decennial Census, State Department of Finance data, as well as Orange County projections. In June 2025, the population estimates for 2020-2025 by water provider service area were updated. In the latest methodology updates, CDR stated that areas experiencing negative population growth (decreasing population) are due to the age structure of residents, declining births, increased mortality, and lower migration rates.

Conversely, CDR projections indicate that dwelling units increase over the planning horizon, suggesting continued development growth alongside declining household occupancy over time. Over the next 25-years, dwelling units are projected to increase by approximately 4,300 units, with the majority of growth occurring within the next 10-years. MNWD will continue to monitor population and dwelling unit trends to ensure adequate planning for reliable water supplies.

C. Land Use

Table 2 summarizes MNWD's land uses within the service area. Residential land uses are one of the single greatest land uses occupying approximately 40 percent of the service area. Open space and park lands comprise the other largest land use occupying approximately 41 percent of the service area, with most acreage concentrated in the cities of Laguna Niguel and Aliso Viejo.

Commercial, industrial, and institutional (CII) land uses occupy approximately 18 percent of the service area. CII land uses are present in all cities throughout the service area; however, the greatest concentration occurs in Mission Viejo. Other miscellaneous land uses, including those using no water, vacant areas, and unknown uses occupy approximately 1 percent of the service area. The MNWD service area is generally built out and expectations of future growth are minimal, primarily limited to infill and redevelopment.

Table 2. Land Use Summary for MNWD Service Area

<table>
<tr><th>Land Use Category</th><th>Total Acres</th><th>Percent</th></tr>
<tr><td>Open Space and Recreation</td><td>9,172</td><td>41%</td></tr>
<tr><td>Total Residential</td><td>8,990</td><td rowspan="4">40%</td></tr>
<tr><td>Single Family</td><td>6,582</td></tr>
<tr><td>Multi-Family</td><td>1,987</td></tr>
<tr><td>Mixed Residential</td><td>421</td></tr>
<tr><td>Commercial, Industrial, and Institutional</td><td>4,017</td><td>18%</td></tr>
<tr><td>Other (1)</td><td>315</td><td>1%</td></tr>
<tr><td>Total (2)</td><td>22,494</td><td>100%</td></tr>
</table>

(1) Other category includes miscellaneous land use and planned development recorded in specific plans.

(2) Data is obtained from SCAG: 2019 Regional Land Use Information for Orange County, overlaid for MNWD service area.

D. Climate

Table 3 summarizes service area weather characteristics. Fall, winter, and spring are typically mild with warmer temperatures in the summer months. The average daily maximum temperature year-round is 75 °F. Average rainfall is approximately 13.7 inches. With approximately 74 percent of the total annual average precipitation occurring between the months of December and March.

Table 3. MNWD Service Area Average Weather Data (2020-2025)

Service Area	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Maximum Temperature (°F)[1]	67.4	68.2	67.2	71.6	72.5	78.2	83.5	85.9	84.1	79.8	73.7	67.6	**75.0**
Average Precipitation (inches)[1]	2.3	2.6	3.3	1.2	0.4	0.1	0.1	0.2	0.2	0.3	0.7	2.4	**13.8**

(1) Data obtained from CIMIS, Irvine Station #75, averaged from 2020 to 2025.

E. Evapotranspiration

Evapotranspiration (ET) is water that is lost from soil through evaporation and transpiration as a part of plants' metabolic process. The MNWD service area ranges in elevation from approximately 140 feet to 930 feet above sea level. To reflect the variation in elevation, 111 micro-zones are defined within MNWD, each with distinct water needs derived from ET. This variability in ET translates to fluctuating watering needs for landscape irrigation for homes, commercial properties, parks, and golf courses across the various micro-climates.

2.2 Water Policy Resolution

Imported water supplies are susceptible to system and supply reliability disruptions. System reliability is the ability to meet customer demands during unplanned emergency outages (e.g., seismic events, facility failures, and other catastrophic events) of key facilities. Whereas supply reliability is the ability to meet demand based on hydrologic variability (e.g., drought and elevated temperatures) and long-term changes in available imported water supply. Both system and supply reliability disruptions impact MNWD's ability to serve water customers. MNWD's Water Policy Resolution, initially adopted in 2008 (08-38) and last updated in 2021(21-04), outlines water reliability goals as the following:

- Support cost-effective regional solutions led by MWD to enhance water reliability.
- Continue to implement effective demand management & recycled water programs.
- Develop 31 days up to 60 days of annual average potable supply.
- Evaluate cost-effective emergency supplies (up to 15 CFS) .
- Identify opportunities for up to 10,000 AF dry year storage.
- In the event of an emergency outage, customers may be asked to reduce outdoor water usage.

2.3 Other Regional Planning Efforts

The 2025 LRWRP Update incorporates applicable information contained in the latest regional planning documents from federal, state, and local agencies as described below.

A. Bureau of Reclamation Colorado River Basin Plans and Guidelines

On March 19, 2019, the Department of the Interior, Bureau of Reclamation (Reclamation), and representatives from all seven Colorado River Basin states (Arizona, California, Nevada, Colorado, New Mexico, Utah, and Wyoming) signed two Drought Contingency Plans for the Upper and Lower Colorado River basins. The latest Drought Contingency Plan enables all seven states to conserve water through voluntary, proactive conservation measures to bolster water levels in Lake Powell and Lake Mead.

Colorado River Management Post 2026

Several agreements that govern the operation of Colorado River are scheduled to expire at the end of 2026. These include the 2007 Colorado River Interim Guidelines for Lower Basin Shortages and Coordinated Operations for Lake Powell and Lake Mead (2007 Interim Guidelines), the 2019 Drought Contingency Plans, as well as international agreements between the United States and Mexico pursuant to the United States-Mexico Treaty on Utilization of Waters of the Colorado and Tijuana Rivers and of the Rio Grande (1944 Water Treaty).

On January 17, 2025, Reclamation published an Alternatives Report documenting proposed alternatives and the process to develop them. On January 9, 2026, the Bureau of Reclamation released the Post-2026 Operational Guidelines and Strategies for Lake Powell and Lake Mead Draft Environmental Impact Statement (EIS). The EIS evaluates five alternatives for managing Colorado River reservoirs after current operating agreements expire in late 2026. Reclamation has not identified a preferred alternative, leaving flexibility for a potential consensus agreement among the seven basin states. A final decision will be required by October 1, 2026, with new guidelines taking effect in water year 2027. MNWD receives approximately 78% of imported supplies from the CRA. The 2025 LRWRP Updates acknowledges that post-2026 Colorado River management, on-going negotiations and proposed alternatives to Colorado River operations, may impact future imported water supplies.

B. California Water Plan

The California Water Plan is the State's strategic plan for sustainably managing and developing water resources for current and future generations. Required by Water Code

Section 10005(a), it presents the status and trends of California's water-dependent natural resources; water supplies; and agricultural, urban, and environmental water demands for a range of plausible future scenarios. On October 4, 2025 Governor Newsom signed Senate Bill 72 into law, directing the Department of Water Resources (DWR) to modernize the California Water Plan by building a data-driven playbook for the state's future. It sets a target of identifying 9 million acre-feet (MAF) of additional water supply by 2040 to offset the anticipated loss from warmer ambient temperatures in the future. DWR will develop new long-term water supply targets for 2050 and beyond. Specifically, SB72 directs DWR to quantify statewide watershed-level supply gaps, identify effective management actions with economic analyses, and set measurable state water and watershed-level targets. The California Water Plan is updated every 5-years with the next update expected in 2028.

2022 Water Supply Strategy

In 2022, the California Governor's office released California's Water Supply Strategy (WSS), which outlines priority actions to adapt to the effects of rising temperatures and drier conditions due to climate change. Priority actions include increasing stormwater capture, improving conservation, developing new local water, and expanding water storage programs. Specific strategy goals include:

- Increase storage space for 4 million AF of water;
- Recycle and reuse at least 800,000 AF by 2030;
- Conserve 500,000 AF of water (to make up for losses due to dry conditions); and
- Diversify supplies through local stormwater capture, recycling, and desalination.

The WSS outlines that by 2030 there will be approximately a 5 MAF gap in water that will need to be augmented by these strategy goals and actions. The WSS also listed a series of implementation steps which include:

- DWR would identify brackish desal projects for potential operation by 2030 and no later than 2040; and
- The State Water Board will review groundwater basins impaired by salt water for potential groundwater desalination;
- An advanced multi-agency effort to install 430 new stream gages and upgrade or reactivate 200 more across the state;
- DWR will advance the design of and the draft environmental impact report for the proposed Delta conveyance project (DCP); and
- The State Water Board will consider adopting regulations to allow for water rights curtailments in years when there is not a declared drought emergency.

These implementation actions come with criticisms, although it is clear that water shortages and adaptation to changing climate conditions is of growing concern across the state. Recent regional modeling efforts also support the probability of responding to water shortage conditions more frequently and with increasing severity in the future.

C. MWD Water Shortage Allocation Plan

In February 2008, MWD's Board of Directors adopted the Water Shortage Allocation Plan (WSAP) to fairly distribute a limited amount of water supply through a detailed methodology to reflect a range of local conditions and needs of the region's retail water consumers. The latest WSAP was updated in 2014 and was utilized in the 2015 drought.

MWD water allocations were imposed three times since 2000 with allocation reductions of 10 percent to 15 percent of the baseline imported sales. It is expected that MWD allocations may be implemented again in the future. Allocation surcharges are assessed when an agency's total annual usage exceeds its total annual allocation.

D. MWD 2020 Integrated Water Resources Plan

Since the late 1990s, MWD has produced an Integrated Resources Plan (IRP) every 5 years documenting the water needs of Southern California. The IRP serves as a key tool in evaluating investments and regional supply projects. In 2020, MWD initiated a new IRP process to better incorporate changing hydrologic variability and customer demands. The 2020 IRP looked at 4 planning scenarios through 2045: Scenario A (Low Demand, Stable Imports), Scenario B (High Demand, Stable Imports), Scenario C (Low Demand, Reduced Imports), and Scenario D (High Demand, Reduced Imports).

Results from the 2020 IRP and 2020 MWD UWMP indicate that MWD supplies are reliable, even with increased demands and reduced imports. Shortages were, however, observed in the SWP-dependent areas for Scenarios B, C, and D. It should be noted that more conservative results are now available from the latest MWDOC 2023 Water Reliability Study, discussed below, that incorporates updated modeling and quantifies regional shortages that may occur for Orange County supplies as well as the severity. After the latest IRP, MWD has transitioned to a modified planning approach known as the Climate Adaptation Master Plan for Water (CAMP4W) which includes annual updates and is integrated with the MWD Business Model process.

E. MWD Climate Adaptation Master Plan for Water (CAMP4W)

Building off the latest IRP modeling, MWD began the Climate Adaptation Master Plan for Water (CAMP4W) in 2023 with continuous updates and annual reporting provided through 2025. CAMP4W establishes an open public forum for decision-making to guide strategic capital investments. CAMP4W includes metrics for reviewing regional projects and incorporates approvals with MWD's updated business model to ensure adequate return on investment –combining water and financial resiliency planning.

In April 2025, the MWD Board approved the CAMP4W framework. The released CAMP4W goals are to:

1. Identify up to 300,000 AF of potential additional water supplies by 2035;
2. Identify up to 650,000 AF of potential additional water supplies by 2045;
3. Identify 500,000 AF of water storage for potential implementation by 2035; and
4. Review ongoing potential projects to determine next steps for MWD.

Proposed projects for review in 2025 include Pure Water Southern California, Sites Reservoir (1.5 MAF of new storage north of Sacramento), and the DCP.

F. MWDOC 2023 Orange County Water Reliability Study

For the 2023 Orange County Water Reliability Plan, three planning scenarios were considered as well as a maximum shortage scenario. The MWDOC planning scenarios include Warm/Wet, Warm/Dry, and Hot/Dry climate conditions. MWDOC planning scenarios included implementation of MWD's proposed Pure Water Southern California program (assumed online in 2030) and a new water transfer program for the CRA (100,000 AF per year). For MWDOC planning scenarios that included the DCP, MWDOC also identified that MWD would invest in new surface water storage of 250,000 AF.

The 2023 modeling was based on historical hydrology from 1965 to 2021 for both the SWP and CRA. The maximum shortage scenarios for South Orange County was reported to range from approximately 15,000 AF to 37,000 AF in 2050 with a 15 percent demand reduction in place, with a 3.5% probability of occurrence. The probability of a shortage occurring in any year, with differing severity levels, varied from 3.5 to 21%. While a shortage of this magnitude is considered to have a low probability of occurrence, these shortage conditions are still considered in future water resources planning efforts. MWDOC anticipates that these shortages will be reduced to near zero with planned future reuse and desalination projects in South Orange County.

MWDOC recommends that agencies prepare for 60 days of emergency storage for a regional outage (e.g., MWD Diemer Plant). This is consistent with MNWD's water policy goals and initiatives to ensure a reliable water supply for customers.

Section 3 – Water Demands

3.1 Historical Water Demands

Historical water demands have been consistently lower than previous MNWD projections, likely due to increased conservation efforts, showing an overall downwards trend. The MNWD Water Use Efficiency team has achieved success in reducing customer demands through water budget-based rates and programs such as rebates, educational programming, and media campaigns.

3.2 Demand Management and Water Use Efficiency

Projected water demands were developed using historical water usage, demographics, socioeconomics, water use efficiency factors, ongoing water use efficiency efforts, and weather. The demand forecast, projected through the year 2055, provides a basis on which to evaluate the ability of MNWD's water supply and infrastructure capacity to meet existing and future water demands. Water use efficiency is a voluntary choice by customers, which is incentivized through programming and access to rebates.

MNWD has implemented several water efficiency programs, most notably the water budget-based rate structure. MNWD also created a rebate program to reduce the cost of customer compliance with their individually calculated water budgets. Several rebates are offered including rebates for transforming turf landscapes into native landscapes that require less water, installing irrigation efficient devices and indoor water efficient devices. MNWD plans to continue to implement these demand management strategies as documented in the latest Urban Water Management Plan (UWMP).

These ongoing efforts help manage customer demands and encouraging efficient water use is the main contributor to downward trends in overall water use. Continued integration of these strategies in MNWD's 2025 LRWRP Update are essential to maintaining water reliability.

3.3 Water Use Sectors

Total water use in MNWD's service area is comprised of five main billing categories (**Figure 3**), and one non-revenue category:

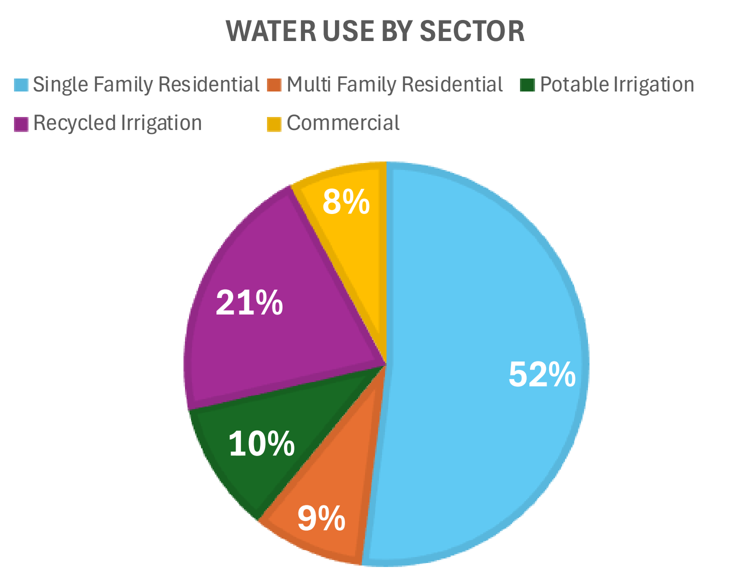


Figure 3. Average Water Use by Sector

Single-Family Residential: Single-family homes and townhomes with individual meters. (Comprises 52% of customers.)

Multi-Family Residential: Apartments, condominiums, and townhomes with master meters for the entire building or complex. (Comprises 9% of customers.)

Commercial: Businesses, schools, hospitals, and governmental customers. (Comprises 8% of customers.)

Potable Irrigation: Large landscape users with dedicated irrigation meters such as golf courses, common residential landscaping (e.g., homeowners associations), parks, medians, and greenbelts. (Comprises 10% of customers.)

Recycled Irrigation: All recycled water users including golf courses, parks, and large residential common landscaping areas. (Comprises 21% of customers.)

Other: Water sold through potable hydrants such as temporary construction users.

3.4 Forecasted Water Demands

Long-range water demand forecasting provides critical information for MNWD to plan, design, and construct capital-intensive infrastructure, such as new sources of water supply and treatment facilities. MNWD forecasts are based on the demographic projections available from CDR as well as the historical use of water by customers. Four water demand forecasts were prepared using population projections and historical water use data.

A. Water Demand Methodology

To estimate the impacts of factors that influence water demands, a multivariate statistical forecasting model was developed with forecasts out to 2055. The model uses historical monthly water production, annual population, conservation efforts, average evapotranspiration, and new development plans within the MNWD service area. Three forecasts were developed with a range of assumptions for an upper-bound, mid-point demand, and lower-bound demand projections from 2026 to 2055. Additional detail on the methods and scenarios selected is provided in **Appendix C: Water Demands Technical Report**.

B. State Regulations - Urban Water Use Objective

California adopted legislation in 2018 establishing a framework for urban water conservation standards and objectives, known as the Urban Water Use Objective (UWUO). Through UWUO, the state is directed to establish water efficiency standards for residential indoor and outdoor water use, metered landscape water use, and real water loss at utility distribution systems. These standards and the year they are projected to be implemented were considered in the fourth demand scenario. Additional information on the UWUO is included in **Appendix C**.

C. Potential Climate Variability Effects on Water Demands

Climate variability in Southern California is a challenge due to changes in local temperature and precipitation. Warmer temperatures typically affect water demands by increasing irrigation needs and accelerating evaporation rates in storage reservoirs. California has previously experienced extreme drought conditions (e.g., 2020-22, 2012-16, 2007-09, 1987-92, and 1976-77).

The Water Resilience Portfolio states that historical hydrological patterns can no longer serve water managers as a trustworthy guide –as winter snowpack is reduced, drought and wildfire grown more frequent, and intense storms worsen flooding. Climate science and updated projections are increasingly important as future conditions evolve and require ongoing adaptation for water management.

D. Water Demand Results

The results of the 2025 LRWRP water demand forecast include an upper bound, mid-point, lower-bound, and UWUO standard (**Figure 4**). For more details on how these scenarios were developed please refer to **Appendix C: Water Demands Technical Report**. MNWD utilizes the mid-point of projected demands in the UWMP. A comparison of UWMP projected demands was also prepared to show how demands have been reevaluated from 2010 to present, every 5 years.

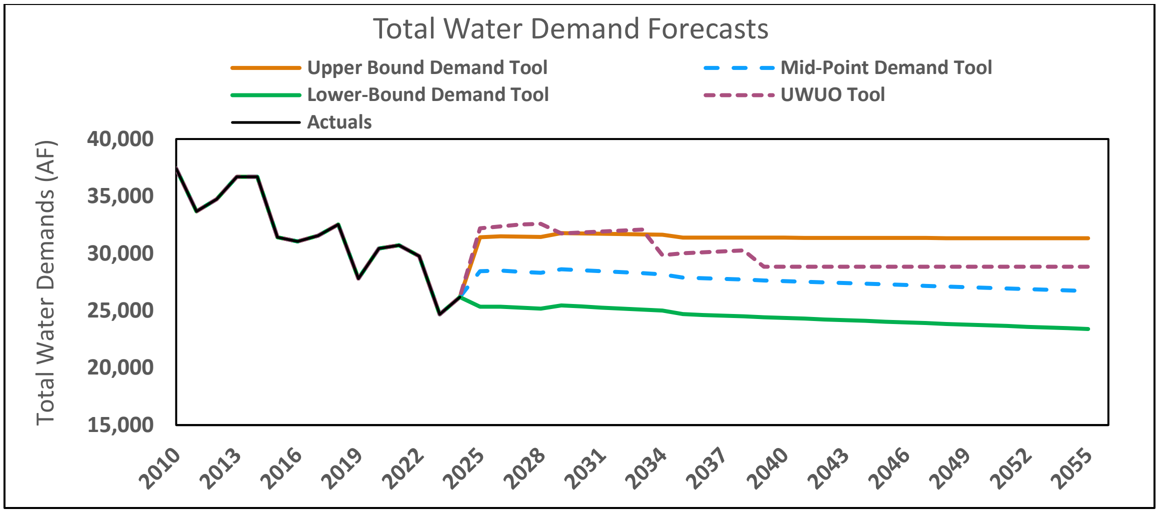


Figure 4. 2025 LRWRP Water Demand Forecast Results

Figure 5 shows the comparison of UWMP Mid-Point demand forecasts from 2010 to 2025. The future 2025 LRWRP projections (shown in blue) indicate the range of modeled customer demands between the upper and lower bound.

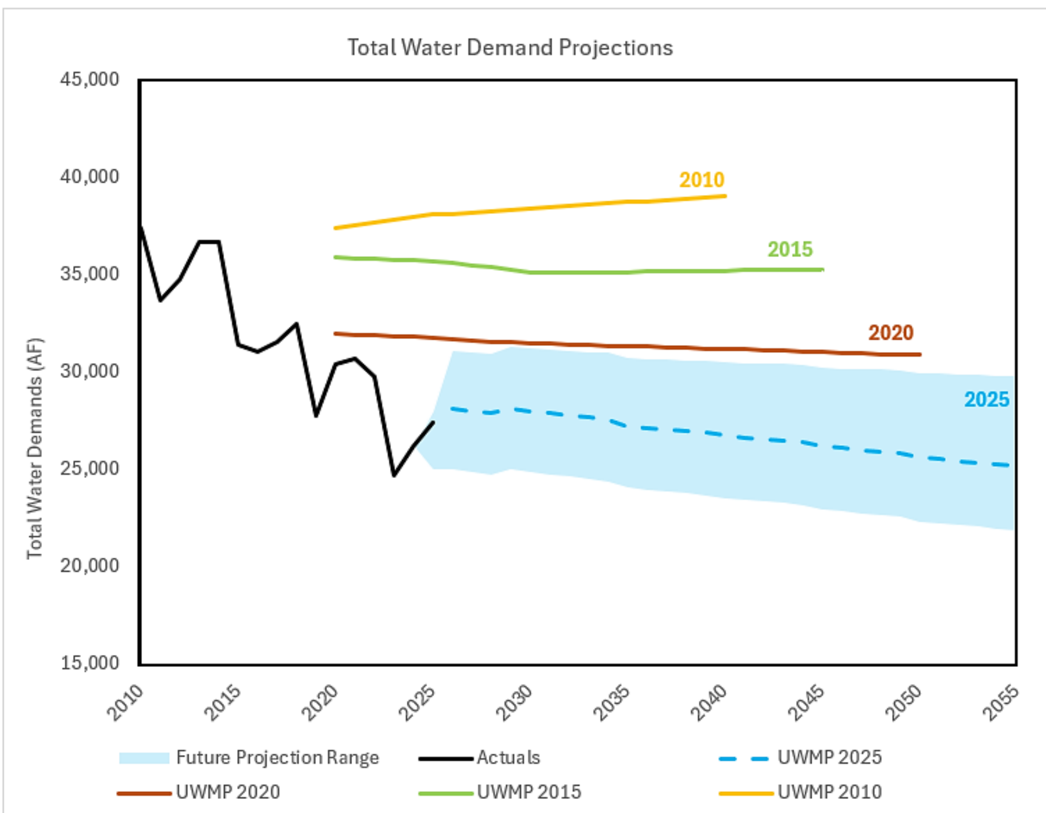


Figure 5. Comparison of UWMP Water Demand Projections

Section 4 – Water Supply Sources and System Vulnerabilities

MNWD's potable water supply is imported from MWD and purchased from MWDOC, the local water wholesaler. MWD sources imported water from the State Water Project (SWP) and Colorado River Aqueduct (CRA). The imported water ratio from the SWP (22% based on 10-year average) and CRA (78% based on 10-year average) varies from year to year depending on hydrologic conditions. For example, in 2022 when SWP was in 0-5% allocation, 100% of the MWD water supplied came from the CRA.

Imported water delivered to MNWD is treated at MWD's Robert B. Diemer Water Treatment Plant (Diemer) located north of Yorba Linda and at the Baker Water Treatment Plant (Baker Plant) located in Lake Forest. The Baker Plant was built to provide a redundant treatment facility in case of a Diemer outage. On average approximately 70 percent of MNWD water supplies are treated at Diemer, and the remaining 30 percent are treated at the Baker Plant.

For additional information, see **Appendix B: Water System Technical Report**.

4.1 Water Supply Sources and Regional Facilities

A. Imported Water Supplies

Imported water delivered by MWD comes from two main sources: the SWP and the Colorado River via the CRA. The SWP originates in Northern California from the Sacramento San Joaquin River Delta, an expansive inland estuary that serves as an integral part of California's water system. The Delta receives runoff flows from the Sacramento, San Joaquin, Mokelumne, Cosumnes, and Calaveras rivers. The Delta also provides habitat for many species of fish, birds, mammals, plants; as well as supports agricultural and recreational activities.

The CRA is a 242-mile system comprised of open canals, tunnels and siphons that carry millions of gallons of water a day to the people of Southern California. The system works by pumping water up to higher elevations at five different points along the aqueduct and then allowing it to flow downhill by gravity.

The Colorado River drains one-twelfth of the land area of the contiguous United States and is approximately 1,400 miles long. The river flows through seven states and into Mexico.

The area is divided into two basins: Upper Basin (Colorado, New Mexico, Utah, and Wyoming) and Lower Basin (California, Nevada, and Arizona). The 1922 Colorado River Compact regulates water distribution amongst the seven states (**Figure 6**). Later in 1944, the Mexican Water Treaty committed 1.5 MAF of annual flow to Mexico. The river is managed and operated under numerous contracts, agreements, and federal laws collectively known as the "Law of the River."

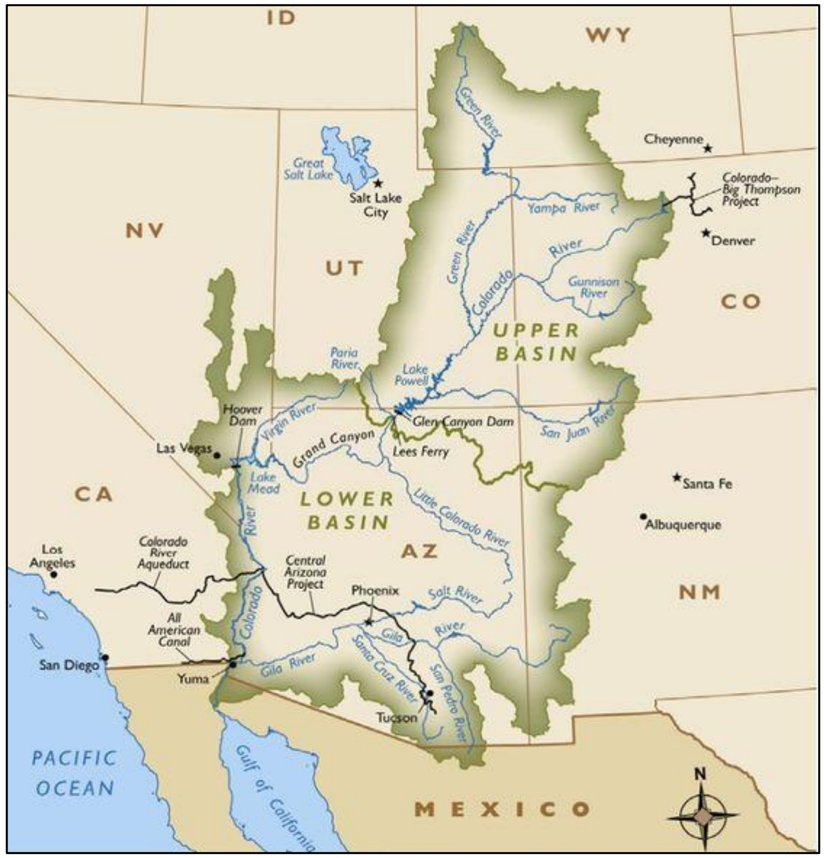


Figure 6. Colorado River Basin

In 2026, a series of operation and management agreements are set to expire including the 2007 Interim Guidelines, the 2019 Drought Contingency Plans, and the international 1944 Water Treaty. Access to Colorado River water supplies post-2026 is still under negotiation, with strict conservation needed to maintain operations.

MWD maintains a significant network of conveyance and distribution facilities to store and deliver SWP and CRA supplies. The Diemer Plant began operation in 1963. Diemer is situated on a hilltop in Yorba Linda, north Orange County, and treats water from both the SWP and the CRA before distributing it via gravity-flow to areas of Los Angeles and Orange counties. The facility has a treatment capacity of 520 million gallons a day (MGD). MNWD receives the majority of imported water from the Diemer Plant via Orange County feeders. In addition, MWD water stored in Lake Mathews is purchased and treated at the Baker Water Treatment Plant.

B. Local Supplies

Local supplies may be defined as water storage basins (e.g., tanks, surface reservoirs), groundwater (if available for pumping), and recycled water. MNWD does not have access to groundwater for pumping directly, although may be able to partner with local Orange County agencies in the future. In addition to its internal system tanks, MNWD owns capacity in the El Toro Reservoir (R6) operated by El Toro Water District (ETWD) and Upper Chiquita Reservoir operated by SMWD.

- **ETWD R-6 Reservoir:** MNWD has storage capacity of 13 million gallons (MG) of a total of 275 MG of R6 reservoir capacity.
- **SMWD Upper Chiquita Reservoir:** MNWD has a storage capacity of 90 MG. The total reservoir capacity is 244 MG.
- **South Coast Water District 5B Reservoir:** MNWD has storage capacity of 700,000 gallons.
- **MNWD System Storage:** MNWD has 28 potable water storage tanks (71 MG) and 11 recycled water (17 MG) storage tanks.

Furthermore, MNWD operates and maintains approximately 655 miles of potable water distribution pipelines and 140 miles of recycled mainline. MNWD utilizes the Joint Transmission Main, Eastern Transmission Main, and the South County Pipeline to convey water. MNWD also operates 25 potable pump stations to move water from lower pressure zones to the higher-pressure zones and 16 potable water pressure reducing stations and 5 flow control facilities to convey water from high to low zones. Whereas, in the recycled system there are 10 recycled water pump stations, along with 13 recycled water pressure reducing stations to pump water between the various pressure zones.

Recycled Water

MNWD's local supplies consist of recycled water supplies. Recycled water is wastewater that has undergone additional treatment based on regulatory standards. MNWD's tertiary-treated recycled water is also known as Title 22, as defined by California Title 22 Standards (Title 22, Division, 4, Chapter 3, 4 of the California Code of Regulations). Recycled water that has undergone tertiary treatment can be safely used for many non-potable applications, including landscape irrigation (e.g., golf course, parks, roadway medians).

MNWD has been a leader in recycled water use since 1968. Recycled water for non-potable use is delivered to customers in a separate distribution system of "purple pipes." MNWD produces approximately 20 percent of its supply by reusing treated water that would normally be sent out to the ocean.

C. Emergency Water Capacities

In addition to the imported water and produced recycled water, MNWD also has access to emergency water supplies via the Emergency Interconnection Service Agreement. The current agreement expires at the end of 2030 and consists of an emergency supply up to

10.6 MGD of water to be supplied by Irvine Ranch Water District (IRWD) with groundwater from the Orange County Basin, managed by the Orange County Water District (OCWD). For additional information see **Appendix B: Water System Technical Report**.

4.2 Water Supply and System Reliability Risks

Imported water is susceptible to both system and supply reliability disruptions. These reliability disruptions may impact MNWD's ability to serve water to customers in the future. For adequate long-term planning, potential risks, and vulnerabilities to both water sources and system capacity are evaluated. The following section reviews potential risks.

A. Supply Source Risks

Supply reliability disruptions may be caused by drought conditions, environmental regulations resulting in restrictions for Delta water exports, seismic risks to levees in the Delta that protect it from seawater intrusion, and long-term climate variability.

State Water Project

SWP reliability is impacted by changing environmental and regulatory conditions. The SWP source water comes from the Sierra Nevada Mountains. Melted snowpack makes its way through rivers and streams that converge in the Delta, where pumps move the water south to meet demands of water users. Prolonged droughts can significantly reduce exports from the Delta. Major seismic activities in the Delta area could result in long term pumping reductions by reducing SWP supplies for MWD. Channels in the Delta are constrained by an earthen levee system designed to protect below sea level islands from flooding. Over time, land subsidence has occurred; further increasing the risk of levee failure and island flooding. With a large earthquake, that impacts Delta levee operations, water exports could be disrupted for an extended period.

In addition, the Delta is an important ecosystem for threatened and endangered fish species. In 2007, a federal judge's ruling on the Delta smelt resulted in exports from the Delta being suspended. This, along with drought conditions in the western U.S., resulted in MWD having to implement its WSAP to meet reduced imported water.

Since 2007, a series of plans and biological opinions have been released along with additional regulations that includes: Long-Term Operations Criteria Plan (2010), Long Term Operations Opinions (2012), Biological Opinions (2013, 2019, and 2024), among others. In 2020, California Department of Fish and Wildlife (CDFW) issued DWR a California Endangered Species Act (CESA) incidental take permit (ITP) for the long-term operation of the SWP in the Delta for the protection of Delta smelt, longfin smelt, spring-run Chinook salmon, and winter-run Chinook salmon. The ITP is more limiting than previous regulations, with additional requirements tied to the number of fish “taken” or otherwise harassed, hunted, captured, or killed. In the Delta, fish are often impacted by export flows and physical infrastructure at dams, levees, and pump stations to move the water.

Colorado River Aqueduct

Since 2000, the Colorado River Basin (Basin) has experienced a historic, extended drought that impacts regional water supply and other resources, such as hydropower, recreation, and ecologic services. Reclamation closely tracks the status of two large reservoirs—Lake Powell in the Upper Basin and Lake Mead in the Lower Basin (**Figure 7**)—as indicators of basin storage conditions. The Drought Response Operations Agreement (DROA) defines elevation 3,525 feet as the "target elevation" at Lake Powell for minimizing the risk of the reservoir declining below 3,490 feet. The target elevation provides a 35-foot buffer above minimum power pool (elevation 3,490 feet) to allow for response actions before Lake Powell drops below 3,490 feet. Falling below target elevations would cause significant operation impacts and was previously referred to as “double dead pool” in the case that both Lake Mead and Powell would drop below their respective targets during drought.

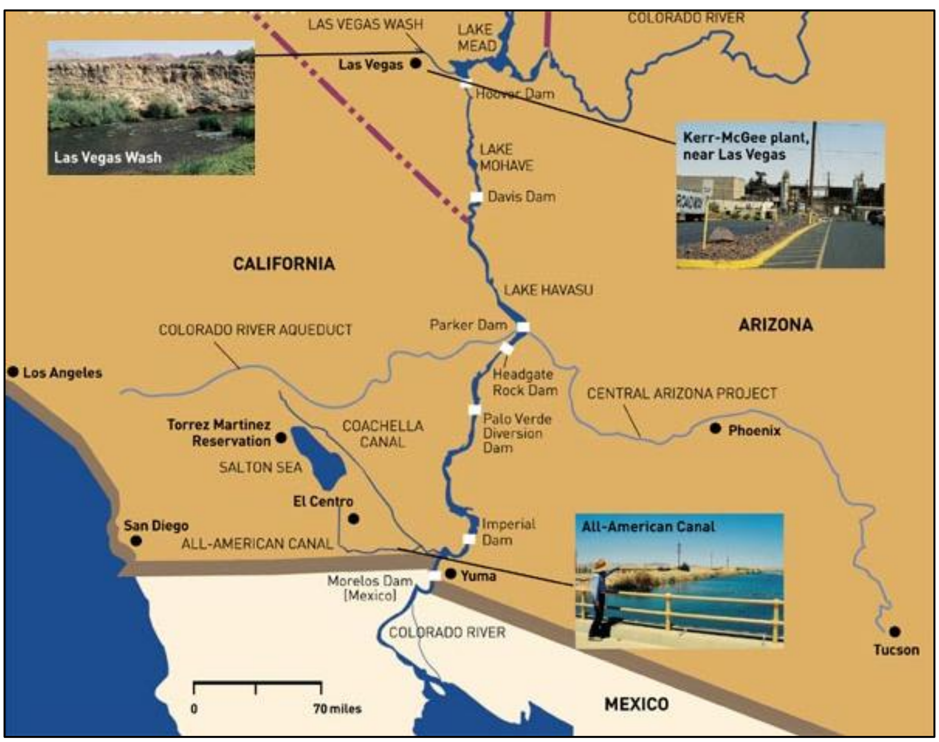


Figure 7. Colorado River in the Lower Basin States

In response to drought conditions, federal agencies and stakeholders work to find solutions to reduce the effects on those that rely on Colorado River water. In May 2023, the Department of the Interior and basin states announced a consensus-based proposal in which the three Lower Basin states (**Figure 7**) will conserve a total of 3 MAF prior to 2026, with 2.3 MAF of these reductions compensated by the federal government using previously appropriated funds.

The Colorado River also experiences high salinity. The significant salt load creates environmental and economic damage. Through the Salinity Control Program's efforts, the salt load of the Colorado River has been reduced by upwards of 1.3 million tons annually. Salinity conditions, worsened in drought remain a water quality concern for Lower Basin states as well as Mexico.

B. System Reliability Risks

System reliability disruptions for MNWD may also be caused by outages at Diemer or damage to pipelines that transport treated imported water during a seismic event. MWDOC recommends that member agencies plan for a 100 percent interruption of MWD supplies for up to 60 days and for a concurrent power grid outage for a minimum of 7 days.

MWDOC suggests that retail agencies may be on their own for up to 2 months following a major earthquake if MWD facilities are damaged and otherwise inoperable. Following an outage event, repair work will be prioritized in the MWD system to enable the largest number of people to be served. **Table 4** provides a summary of the potential outage durations currently considered by MWD and MWDOC with estimated duration of outage.

Table 4. MWD Seismic Performance and Estimated Duration of Outage

MWD Facility	Estimated Outage Durations
MWD – Colorado River Aqueduct	2-6 months
DWR – State Water Project East and West Branches	6-24+ months
MWD – Conveyance and Distribution Pipelines	1 week - 3 months
MWD Treatment Plants	1-2 months (partial flow) Up to 6 months (full capacity)

Source: MWDOC 2018 Water Reliability Study

California Earthquakes and Seismic Events

The United States Geologic Survey (USGS) manages the Uniform California Earthquake Rupture Forecast, which calculates the likelihood of rupture for earthquake faults within California. Southern San Andreas Fault was identified as having the highest likelihood (19 percent) of a magnitude 6.7 earthquake or greater in the next 25 years (MWD, 2018). In addition, there is a reported 93 percent chance of a magnitude 6.7 or greater earthquake occurring on one of the faults within Southern California within the next 25 years, and a 36 percent chance of a magnitude 7.5 or greater earthquake occurring.

For MNWD, the primary system reliability risks are seismic events. Within California, these active faults can generate significant earthquakes and cause widespread damage to infrastructure. The risk of earthquake damage to infrastructure from these active faults may include seismically induced ground shaking, seismically induced ground failure, and surface fault displacement, among others.

Imported water deliveries are dependent on an extensive network of facilities to pump, store, and convey imported supplies to MNWD. Water systems are vulnerable to seismic events that can varying for days, weeks, or months. Given the presence of major earthquake fault lines in proximity to MWD facilities, earthquakes have a high potential for infrastructure outage that may disrupt service to MNWD.

Potential for Diemer Outage

Earthquake fault lines intersect with the Diemer and treated imported pipelines that convey water to MNWD. Diemer may be impacted by a seismic event from the Whittier Fault, while the EOCF2 and AMP are both vulnerable to impacts from a seismic event at the Puente Hills Fault and the Peralta Hills Fault. The San Joaquin Hills fault may also impact the EOCF2, however, treated water can still be delivered through the AMP to supply water to MNWD. In general, pipelines are more resilient and flexible than water treatment plants and may tolerate higher ground accelerations.

Potential for Baker Outage

The Baker Plant is located further away from the active fault lines and is less susceptible to earthquake damage compared to Diemer. The Baker Plant was constructed to provide a backup capacity in the event of a Diemer outage. Water managers are faced with the challenge of understanding the potential size of a seismic-caused outage event that would result in significant interruption to the facility. Other unplanned outages may still occur such as those caused by wind, wildfire, and distribution of electrical power services.

C. System Resiliency Efforts by Agency

Water delivered to MNWD's service area passes through MWD's and then MNWD's conveyance and distribution systems. In the case of a catastrophic earthquake, any of these systems could see damage or disruption. Due to this relationship between SWP contractor (MWD), wholesaler (MWDOC), and retailer (MNWD), the following section accounts for existing initiatives to prepare for seismic hazards and ensure reliable water systems across facilities.

MWD Resilience Planning Efforts

MWD owns and operates a complex conveyance, treatment, and distribution system serving a 5,200-square-mile area within an active seismic region. Seismic resilience is an essential aspect of MWD's overall reliability strategy. MWD has been proactive in mitigating seismic risks to its infrastructure, as well as improving its ability to maintain, or quickly restore, water deliveries following a major earthquake.

In 2018, MWD published the first Seismic Resilience Report which identified several near-term goals to improve MWD's seismic resilience. Subsequently, the 2020 Seismic Resilience Report Update and 2023 Seismic Fact Sheet were prepared. The Seismic Resilience Report and updates identifies performance goals to further increase MWD's system seismic resilience. These goals include:

1) Coordination within MWD and its member agencies to diversify resources;
2) Enhancing operational flexibility;
3) Providing adequate emergency water supplies; and
4) Identifying and addressing infrastructure and system vulnerabilities.

MWD has successfully improved water supply reliability by diversifying the region's water resources portfolio and applying adaptive resource management approaches. System reliability is further achieved through MWD's development of local water supplies, emphasis on water conservation, and establishment of emergency storage on the coastal side of major earthquake faults that are crossed by the SWP, CRA, and Los Angeles Aqueduct. These actions will help Southern California to receive deliveries during outage periods.

MWDOC Resilience Planning Efforts

MWDOC works to inform member agencies of potential impacts to imported water supply to adequately prepare for potential disruption. The MWDOC 2018 Water

Reliability Study concluded that MWDOC member agencies should plan to secure an additional emergency capacity of up to 15.1 cfs (10,939 AFY) to withstand an MWD outage of treated water deliveries for up to 60 days.

This informed the recommended emergency days of reliability (60-days) to return MWD's Diemer Plant to partial flow capacity after a significant seismic event. Since this recommendation was initially released in 2019, MNWD has worked to secure additional supplies, reduce customer demands, as well as establish additional emergency supply options where possible.

MNWD System Resilience

For the 2025 LRWRP Update, it is assumed that facility shutdowns at the Diemer Plant may significantly reduce treated water supplies for up to 60 days. A failure event of any treated imported water pipeline is assumed to last 7 to 15 days. For disruption to treated imported MNWD supplies, due to dual pipeline failure (7 days) or Diemer Plant failure (up to 60 days), MNWD requires emergency supplies to deliver water to customers.

MNWD's Water Reliability Policy established a goal of 31 days up to 60-days of annual average supplies available in the system. During emergency situations, demand curtailment may be necessary. During major system outages, it is expected that nonessential water uses (e.g., outdoor landscape irrigation) will be minimized or eliminated for the duration of the outage to ensure enough water is available for public health and safety (PH&S).

Section 5 – Water Reliability Analysis

Water reliability is the ability of a water system to deliver sufficient volumes of water to meet customer demands under a range of conditions, including droughts, infrastructure disruptions, and other system stresses. In other words, water is considered reliable when available supplies are adequate to meet customer demands.

MNWD performed a series of water reliability analyses further documented in **Appendix A: Water Supply Technical Report**, **Appendix B: Water System Technical Report**, and **Appendix C: Water Demands Technical Report**. The following sections describe the key methods of the MNWD water reliability analysis and its results.

5.1 Water Supply Projection Methods

Water supply projections require complex models and refined assumptions to adequately address seasonal variations in hydrology as well as annual management actions taken regionally across the state. Modeling supply using multiple scenarios accounts for differing risk factors, including hydrologic and operational constraints, as well as establishing a range of outcomes to support long-term water planning.

As previously described in Section 4, MNWD receives imported water supplies from both the SWP and CRA from MWD (Southern California's SWP contractor) via the local wholesaler MWDOC. MNWD's supply modeling utilizes the most recent information available from MWD and MWDOC, including:

- Climate Adaptation Master Plan for Water (CAMP4W)
- 2025 Integrated Water Resources Plan (IRP) Needs Assessment (Preliminary)
- 2023 Orange County Water Supply Reliability Study
- 2020 Integrated Water Resources Plan (IRP) Needs Assessment
- 10-year average supply deliveries (MWD and MWDOC member agencies)

Using the best available information, MNWD evaluated eight regional supply scenarios to determine a range of possible future conditions with an upper and lower bound of supply (see **Appendix A**). Next, MNWD prepared specific planning scenarios utilizing additional assumptions to develop the most probable range of available supplies for the MNWD service area. These assumptions included:

- 24,000 AF of base supply is available to MNWD based on historical demands;
- Mid-point and lower bound customer demands from 2025 to 2055;
- Shortages may occur between 2025 to 2055;
- MNWD customers will reduce demand by 20% in response to shortages, in compliance with the Water Shortage Contingency Plan; and
- Probable supply conditions exist between the possible "best" and "worst" case; and
- Shortages were applied proportionally based on the last 10 years of supply deliveries to MWDOC and MNWD from MWD.

5.2 Supply Reliability Analysis

MNWD's supply reliability modeling was developed using regional imported water supply availability results provided by MWD and MWDOC, combined with MNWD's forecasted customer demand projections. As summarized in **Appendix A**, available supplies are sufficient to meet projected demands under most modeled scenarios. Supply shortages occur only under maximum regional shortage conditions, which are associated with a relatively low probability of occurrence.

MWDOC modeling indicates that maximum shortage event occur approximately 1.5% to 1.9% of the time in 2030, and 3.5% of the time by 2050. By comparison, MWD regional shortages of any size occur approximately 3.5% of the time in 2030 and increase to as much 21% of the time by 2050. While maximum shortage conditions are considered low-probability events, regional response actions would be expected to minimize impacts and ensure that water remains available to protect public health and safety. These scenarios are included for conservative planning purposes.

To evaluate potential supply gaps, MNWD compared projected demands against the most constrained supply scenario in MNWD's supply planning range. The lower end of MNWD's planning range reflects the constrained supply conditions from the average maximum shortages in regional supply models. When projected supplies meet or exceed demand, supply is considered reliable. When supplies fall short of demand, the unmet need represents a supply gap.

Results indicate that under the least constrained supply conditions for the MNWD planning range, projected demand is met throughout the planning horizon. As shown in **Figure 8**, when constrained supply scenarios are compared against lower, midpoint, and upper bound water demand projections, shortages may occur beginning in 2030.

	2030	2035	2040	2045	2050	2055
Lower Bound Demand	0	-90	-1,030	-1,901	-2,771	-3,760
Mid-Point Demand	-1,922	-2,649	-3,615	-4,515	-5,415	-6,432
Upper Bound Demand	-4,508	-5,459	-6,651	-7,778	-8,906	-10,148

Figure 8. Potential Supply Gaps for MNWD Constrained Supply Planning Range

The 2025 LRWRP incorporates updated regional water supply projections, population forecasts, demand assumptions, and considerations for a statewide or regional water shortages. Results using the more constrained supply projections and lower bound water demands, with an assumed 20% demand reduction, are summarized in **Table 5**.

Table 5. Potential MNWD Percentage Reliable Results (2030-2055)

Year	Lower Bound Demand with 20% Reduction (AF)	Average Maximum Shortage, MNWD Supply (AF)	Difference (AF)
2030	15,921	16,530	609
2035	15,229	15,139	-90
2040	14,778	13,748	-1,030
2045	14,258	12,357	-1,901
2050	13,737	10,966	-2,771
2055	13,335	9,575	-3,760

MNWD potable water supplies are shown to be reliable through 2035, with minor supply gaps emerging thereafter and increasing gradually over time. By 2055, modeled shortages reach approximately 3,800 AF. Regional hydrologic trends including earlier snowmelt, increased runoff intensity, and reduced summer baseflows are expected to continue impacting imported supply reliability. As these trends continue, the frequency and magnitude of potential shortages may increase, underscoring importance of long-term planning and mitigation strategies.

5.3 System Reliability

MNWD has access to existing emergency supplies via the SOC Emergency Interconnection Agreement. This agreement is set to expire at the end of 2030. Based on the contract terms and agreements, from the years 2025 to 2030, no supply is available during the summer months (0 cfs) and limited supplies are available throughout the year (**Table 6, Figure 9**).

Table 6 shows the contracted Emergency Interconnection Agreement available capacity in cfs for all SOC agencies party to the agreement. MNWD may access up to 58.93% of the available cfs for SOC. For a detailed chart of the MNWD available supply please refer to **Appendix B: Water Systems Technical Report**.

Table 6. SOC Emergency Interconnection Agreement (Available CFS Capacity)

Emergency Contract	2010-2014	2015-2019	2020-2024	2025-2029	2030
Jan	25	21.5	18.5	16	0
Feb	26.5	23	20.5	18.5	0
Mar	25.5	22	19.5	17	0
Apr	20.5	16	12.5	9	0
May	18	12	7.5	3	0
Jun	15.5	7	1.5	0	0
Jul	13	1.5	0	0	0
Aug	13	1.5	0	0	0
Sep	12	0	0	0	0
Oct	15.5	6.5	1	0	0
Nov	18	13	8.5	4.5	0
Dec	21	18	15	11.5	0

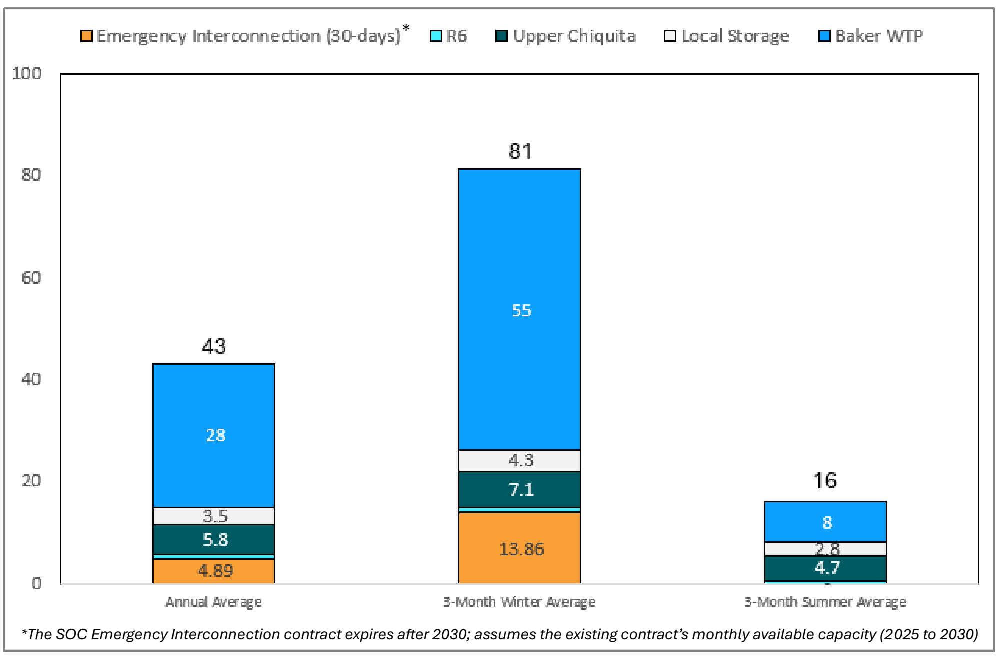


Figure 9. Days of Reliability with 20% Demand Reduction

MNWD performed a detailed assessment for days of reliability and how these results vary throughout the year based on the changes in seasonal demands (**Appendix B**). These results indicate that MNWD should consider additional emergency supplies to provide up to 60 days of demands in the event of a facility outage. On average, annually, MNWD has approximately 43 days of reliability with 20% demand reduction and 67 days with 30% demand reduction in place, see **Table 7**.

Table 7. Days of Reliability with Customer Demand Reduction

Demand Reduction	Days of Reliability with Emergency Connection[1]	Days of Reliability with No Emergency Connection[1]
20% Reduction	43	25
30% Reduction	67	39

(1) *Average annual days of reliability are calculated using the last 3-year-average customer demands (by month) and the available cfs to MNWD from the 2025-2029 contract.*

Section 6 – Planning Recommendations

6.1 2025 MNWD Water Policy Goals

MNWD Water Reliability Policy includes key goals and quantifiable benchmarks to ensure MNWD continues to maintain high-quality, reliable water for customers. These goals are included below with 2025 updates and ongoing recommendations:

Days of Reliability

Goal: 31 to 60 days

Recommendation: Continue to reduce demands through efficiency programs. Pursue additional emergency sources through regional partnerships.

Emergency Supplies

Goal: Up to 15 cfs

Recommendation: Continue evaluation of potential Santa Ana emergency connection project for 10-14 cfs.

Dry -year Storage

Goal: Up to 10,000 AF

Recommendation: Continue to seek out regional partnerships and opportunities for dry-year storage.

Demand Management and Recycled Water Programs

Goal: Cost-effective programs to reduce water usage.

Recommendation: Continue water use efficiency and recycled water programs for ongoing success in reducing customer demands.

NEW: Develop Local Supply

Goal: Develop up to 15% Local Supply

Recommendation: Evaluate Direct Potable Reuse (DRP) opportunities to develop up to 15% local water supply. Support long-term reliability planning by expanding local resources.

In addition, MNWD is dedicated to supporting cost-effective regional solutions led by MWD to enhance water reliability. Regional solutions may vary over time and are currently being evaluated in the CAMP4W process at MWD.

6.2 Project Opportunities

MNWD also may pursue opportunities to develop, participate in, and partner with local water projects. These projects offer potential for new local water capacity, improved reliability, as well as promote regional resilience across multiple agency jurisdictions.

Direct Potable Reuse – OASIS Water Resource Center

Direct Potable Reuse (DPR), purifying wastewater to drinking water standards and integrating it directly into the public drinking water supply without an environmental buffer, is now regulated in California. Effective as of October 1, 2024, public water systems may choose to engage in DPR projects. Over the next 5 years Southern California is likely to see additional local supplies as a result of DPR or Indirect Potable Reuse (IPR). MNWD is currently in the planning phase for the Optimized, Adaptive, Sustainable, and Integrated Supply (OASIS) Water Resource Program as a potential DPR source. As proposed, the OASIS Program would be a new local supply source, potentially providing up to 5 MGD of advanced water purification.

Santa Ana Emergency Interconnection

The existing emergency interconnection agreement with OCWD and IRWD is set to expire at the end of 2030. MNWD seeks to establish a new source of emergency supply in the case of a Diemer outage or other facility-related emergency response. A partnership and potential Groundwater Basin Emergency Interconnection Project is being explored with the City of Santa Ana. As currently proposed, the City of Santa Ana would make available capacity (up to 10-14 cfs) for emergency use.

The project would include construction of new facilities to pump, treat, and transfer groundwater to South Orange County. Water for South Orange County would only be available during non-drought related emergencies as defined by the MWD Administration Code, where MWD is physically unable to deliver water due to natural or catastrophic failure. The City of Santa Ana would then be able to use the well and treatment facilities continuously, in the absence of emergency response. MNWD continues to coordinate with the City of Santa Ana, OCWD, MWD, MWDOC, and other interested parties to implement this project.

San Diego County Water Authority Exchange

In March 2024, San Diego County Water Authority (SDCWA) and MNWD signed a memorandum of understanding (MOU) to explore potential water transfers and exchange opportunities. SDCWA is currently exploring water transfer opportunities within the Southern California region.

6.3 Conclusions

The 2025 LRWRP Update indicates that MNWD's water supplies remain reliable across the majority of scenarios considered. In moderate shortage conditions, potential supply gaps can be effectively managed through implementation of MNWD's WSCP to reduce demands by 20 percent or more. Under maximum regional supply shortage conditions (most constrained supply scenario), supply gaps are projected to appear beginning around 2034 ranging from approximately 100 AF up to 3,800 AF by 2055. To proactively address potential future supply gaps, it is recommended that MNWD continue to pursue regional partnership opportunities to secure additional emergency water supplies, expand dry-year storage, and further reduce water demands. In addition, it is recommended that MNWD continue ongoing planning efforts for the Santa Ana Emergency Interconnection Project and OASIS Water Resource Center.

MNWD has already made substantial investments to enhance system redundancy and resiliency against infrastructure failures and regional supply outages, including potential disruptions at the MWD Diemer Water Treatment Plant. These efforts include participation in the Baker Water Treatment Plant, implementation of water use efficiency programs and educational outreach, and advancement of long-term supply reliability projects such as direct potable reuse. It is recommended that MNWD continue these efforts through an adaptive management framework, with supply conditions reevaluated at least every five years in accordance with Urban Water Management Plan requirements.

References

Cal EPA, 2020. State Agencies Release Draft Water Resilience Portfolio. January 3, 2020. Available: https://calepa.ca.gov/2020/01/03/press-release-state-agencies-release-draft-water-resilience-portfolio/?mc_cid=5ee0f58e7a&mc_eid=c18f6d9bc1. Date Accessed: January 13, 2020.

CA Waterboards et al., 2022. California's Water Supply Strategy Aug 2022 Date Accessed: January 6, 2026.

CIMIS, 2025. CIMIS. https://cimis.water.ca.gov/WSNReportCriteria.aspx. Date Accessed: April 23, 2025.

CNRA et. al, 2020. National Hydrology Data. https://data.cnra.ca.gov/dataset/national-hydrography-dataset-nhd. Date Accessed: April 23, 2025.

Colorado River Basin Salinity Control Forum, 2019. Briefing Document. Available: http://coloradoriversalinity.org/docs/CRBSCP%20Briefing%20Document%202019-03-20.pdf. Date Accessed: March 6, 2020.

Delta Stewardship Council, 2018. The Delta Plan, Chapter 3, A More Reliable Water Supply for California and Chapter 7, Reduce Risk to People, Property, and State Interests I the Delta, both Amended April 2018. Available: http://deltacouncil.ca.gov/delta-plan/.

DWR, 2025. Drought Webpage. Available: https://water.ca.gov/Water-Basics/Drought. Date Accessed: May 30, 2025.

MNWD, 2015. Long-Range Water Reliability Plan, June 5, 2015.

MNWD, 2020. Long-Range Water Reliability Plan, March 8, 2021.

MWDOC, 2016. Orange County Water Reliability Study. Available: https://www.mwdoc.com/your-water/water-supply/local-water-supply/orange-county-water-supply-reliability-study/.

MWDOC, 2019. Orange County Water Reliability Study. Available: https://www.mwdoc.com/wp-content/uploads/2019/02/2018-FINAL-OC-Study-Report_Final-Report_02-01-2019-with-appendices.pdf. Date Accessed: January 13, 2020.

MWDOC, 2023. Orange County Water Reliability Study. Available: https://www.mwdoc.com/wp-content/uploads/2023/08/MWDOC_2023-OC-Water-Reliability-Study-Final.pdf. Date Accessed: February 13, 2025.

Metropolitan Water District of Southern California (MWD), 1999. Water Surplus and Drought Management Plan. Available: http://www.mwdh2o.com/PDF_About_Your_Water/2.4_Water_Supply_Drought_Management_Plan.pdf. Date Accessed: May 8, 2020.

MWD, 2016. Integrated Water Resources Plan 2015 Update. Available: http://www.mwdh2o.com/PDF_About_Your_Water/2015%20IRP%20Update%20Report%20(web).pdf. Date Accessed: January 13, 2020.

MWD, 2022. Integrated Water Resources Needs Assessment. Available: https://d1q0afiq12ywwq.cloudfront.net/media/sgvlkith/2020_irp_needs_assessment.pdf. Date Accessed: February 13, 2025.

MWD, 2018. Seismic Resilience First Biennial Report. Available: http://www.mwdh2o.com/PDF_About_Your_Water/SRS%20Report%201551_Final_030518A_Submit_Reduced.pdf.

MWD, 2020. Seismic Resilience Report 2020 Update. Available: http://www.mwdh2o.com/PDF_About_Your_Water/Seismic%20Resilience%20Report%20-%202020%20Update.pdf.

MWD, 2021. Urban Water Management Plan. d1q0afiq12ywwq.cloudfront.net/media/21641/2020-urban-water-management-plan-june-2021.pdf. Date Accessed: February 12, 2025.

MWD, 2024. CAMP4W Annual Report. mwdsc-annual-report-2024_digital_combined.pdf. Date Accessed: January 23, 2026.

MWD, 2025. CAMP4W Implementation Strategy. MWD-ImplementationStrategy_April 2025_FINAL.pdf. Date Accessed: May 5, 2025.

NOAA, 2025. Climate Data Online. https://www.ncdc.noaa.gov/. Date Accessed: April 23, 2025.

OC Public Works, Historic Rainfall Data, Laguna Niguel (Sulphur Creek Dam), 2017. Available: MNWD, 2015. Long-Range Water Reliability Plan, June 5, 2015. Available: http://www.ocwatersheds.com/monitoring/hydrology/historic_data. Date Accessed: May 13, 2020.

Poseidon, 2020. Seawater Desalination Huntington Beach Facility Website. Available: https://www.hbfreshwater.com/project-facts.html. Accessed April 2, 2020.

SWRCB, 2019. A Proposed Framework for Regulating Direct Potable Reuse in California. August 2019. Available: https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/documents/direct_potable_reuse/dprframewkseced.pdf. Accessed April 2, 2020.

U.S. DOI, 2019. Paradox Valley Unit of the Colorado River Basin Salinity Control Program Draft Environmental Impact Statement Volume I. December 2019. Available: https://www.usbr.gov/uc/envdocs/eis/Paradox/20191200-PVU_DEIS_Vol1_508.pdf. Date Accessed: March 6, 2020.

U.S. DOI, 2023. The Hardest-Working River in the West. https://storymaps.arcgis.com/stories/2efeafc8613440dba5b56cb83cd790ba. Date Accessed: May 30, 2025.

Appendix A: Water Supply Technical Report

moulton niguel water district

Water Supply Technical Report

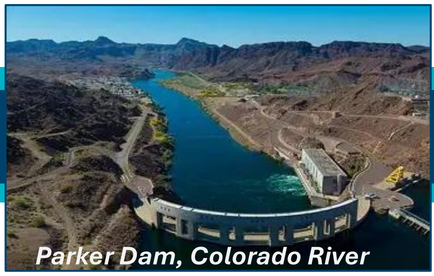
Purpose

Water supply refers to the quantity of water that can be reliably produced, conveyed, and delivered to customers. Supply is subject to hydrologic conditions, infrastructure capacity, and regulatory constraints. In the context of Southern California's water system, available water supplies are influenced by numerous factors including the State Water Project (SWP) annual allocation, state reservoir storage, Sierra Nevada snowpack, snowpack melt throughout the year, access to other regional sources such as groundwater basins, regional water storage, Colorado River Aqueduct (CRA) supplies, as well as local water supply facilities, among other considerations.

Water supply availability varies throughout the year and can change significantly between seasons. Modeling supply availability under multiple scenarios helps account for differing risk factors, such as the likelihood and duration of hydrologic or operational constraints, and establishes a range of outcomes to support long-term water planning. Historically, water supply modeling has been conducted at the regional level by SWP contractors, with results documented publicly to support transparency and stakeholder understanding.


Sacramento-San Joaquin Delta


Diemer Plant


Parker Dam, Colorado River

Moulton Niguel Water District (MNWD or the District) receives imported water supplies from both the SWP and CRA. Imported supplies are delivered from the Metropolitan Water District of Southern California (MWD), Southern California's SWP contractor, via the local wholesaler, the Municipal Water District of Orange County (MWDOC). MNWD's supply modeling builds upon the most recent information available from MWD and MWDOC:

Metropolitan Water District of Southern California:

- Climate Adaptation Master Plan for Water (CAMP4W)
- 2020 Integrated Water Resources Plan (IRP) Needs Assessment
- 2025 Integrated Water Resources Plan (IRP) Needs Assessment (Preliminary)

MWD modeling results and associated data are presented at the member agency level, i.e., MWDOC. Preliminary results and baseline updates for the 2025 Needs

Assessment were presented at the MWD service area level during public meetings held in September and November 2025. These 2025 preliminary results were used to inform the following analyses, although they are not used in the final MNWD planning results. The final MWD modeling results are anticipated in spring 2026.

Municipal Water District of Orange County

- 2023 Orange County Water Supply Reliability Study
- 10-year average supply deliveries (MWD and MWDOC member agencies)

The MWDOC results include modeled supply and shortage scenarios presented at both the MWD and South Orange County (SOC) level. In response to increasing supply volatility, regional modeling has shifted to scenario-based analyses that evaluate outcomes under a range of climate extremes. These methods help to better define a spectrum of possible planning futures.

MNWD's 2025 Long-Range Water Supply Reliability Plan (LRWRP) was developed using water supply projections extending 30-years into the future, from 2025 to 2055. These projections are designed to be sufficiently broad to capture a range of plausible hydrologic and operational uncertainties. This Water Supply Technical Report documents the data sources used, methodologies applied, key assumptions, and analytical approach supporting supply projections developed for the 2025 LRWRP.

Scenario Planning and Data Sources

MNWD utilized various regional supply scenarios to establish a MNWD planning range for future water supply availability considered in long-term planning. Given MNWD's reliance on imported water, a total of ten regional supply scenarios were considered in the development of the 2025 LRWRP to characterize anticipated available base-supplies (**Table A-1, Table A-2,** and **Table A-3**). The data sources underlying these scenarios are described in the following section.

Table A-1. MWD Needs Assessment Supply Scenarios (2020)

Scenario A	Low Demand, Stable Imports
Scenario B	High Demand, Stable Imports
Scenario C	Low Demand, Reduced Imports
Scenario D	High Demands, Reduced Imports

Table A-2. MWDOC Orange County Water Reliability Study (2023)

Warm/Wet	Supply Scenario
Warm/Dry	Supply Scenario
Hot/Dry	Supply Scenario
Maximum Shortage	Shortage Scenario

Table A-3. MWD Needs Assessment Supply Scenarios (2025)

Scenario C – Preliminary Baseline	Maximum Shortage 2035/2045
Scenario D – Preliminary Baseline	Maximum Shortage 2035/2045

It should be noted that the MWD 2025 Preliminary Baseline scenarios are built upon the same import and demand framework as in 2020 for Scenarios A, B, C, and D (**Table A-1**). Future projects and assumptions considered are expected to align with the goals of the Climate Adaptation Master Plan for Water (CAMP4W) improving these outcomes. While these MWD preliminary maximum shortage scenarios are low-probability conditions identified in regional modeling, they are referenced in this technical document to inform the "most constrained" supply evaluation for long-term planning efforts with recent and readily available information.

The 2025 preliminary numbers are a baseline without further adjustment from MWD, as such, only the existing 8 complete regional supply scenarios were used in MNWD's evaluation.

Climate Adaptation Master Plan for Water (CAMP4W)

In 2020, the MWD Urban Water Management Plan (UWMP) concluded that water supplies were generally reliable for Southern California, with the exception of SWP-dependent areas, which were identified as more vulnerable to drought and water shortages due to system limitations. In the years that followed, hydrologic conditions worsened, and SWP allocations in 2021 and 2022 were reduced to just 5 percent, up from zero only to address public health and safety needs after two critically dry years. In response to these conditions, and following the release of the MWD 2020 UWMP, the MWD Board directed staff to integrate water resources, climate, and financial planning more fully through the development of the CAMP4W, with the goal of ensuring continued long-term water supply reliability.

In October 2023, MWD established a Joint Task Force composed of Board Members and Member Agency Managers to guide the development of CAMP4W, which is structured around five core elements:

1) Climate and Growth Scenarios

2) Time-Bound Targets
3) A Framework for Climate Informed Decision-Making
4) Policies, Initiatives, Partnerships, and
5) Business Models and Funding Strategies

This decision-making framework builds upon previous water supply Needs Assessments, ongoing climate vulnerability assessments, and infrastructure studies. As part of the CAMP4W process, MWD staff were directed to implement an adaptive management framework designed to address uncertainty and remain responsive to evolving conditions. This approach includes annual reporting on water supply needs, detailed evaluation of proposed projects, and review of water resources investments to ensure alignment with CAMP4W objectives.

In April 2025, MWD released the CAMP4W Implementation Strategy which expands the analysis to account for a range of climate-related risks, including prolonged droughts, sea-level rise, increased flood risk and infrastructure damage, extreme heat, and wildfires. As the region's SWP contractor, MWD serves as a primary source of information on the availability of regional imported water supplies. Accordingly, the data used to support the 2025 LRWRP supply scenarios and assessments are informed by the regional modeling results published by MWD and MWDOC.

2020 Integrated Water Resources Plan - Needs Assessment

Regional water supply modeling is primarily informed by the MWD Integrated Water Resources Plan (IRP) Needs Assessment. The IRP is updated every 5 years to guide water supply investments, programs, and policy decisions. According to MWD, the IRP "allows (their) member agencies to make plans for water deliveries (to ensure) Southern California Water supplies are reliable and MWD is braced for change."

In 2020, MWD initiated a new IRP process that evaluated multiple planning scenarios reflecting a range of supply and demand conditions. These scenarios—labeled A, B, C, and D— represent combinations of low to high imported water availability and low to high demand levels (**Table A-1**). Scenarios C and D reflect the most severe conditions, with substantially reduced imported water supplies available to the MWD service area. Data supporting the 2020 Needs Assessment were provided by MWD staff, with supply projections extending through 2045 and based on historical hydrology from 1922 to 2017.

The IRP Needs Assessment framework has since been incorporated into the broader CAMP4W planning effort, where it continues to inform scenario-based evaluation of regional water supply reliability under various climate and system stressors.

2025 Integrated Water Resources Plan - Needs Assessment

The latest MWD IRP Needs Assessment continues to rely on scenario-based planning and is anticipated to be finalized in Spring 2026. Preliminary results for the more constrained supply conditions, scenarios C and D, have been presented at public meetings and are summarized below.

Under MWD's most constrained planning scenario D, characterized by high demand and reduced imported supplies, preliminary results indicate that by 2035, regional shortages or surpluses of up to approximately 500,000 acre-feet (AF) may occur (**Figure A-1)**. By 2045, the magnitude of potential shortages increases with preliminary results indicating up to 1 million acre-feet (MAF) of shortage may be possible (**Figure A-2**).

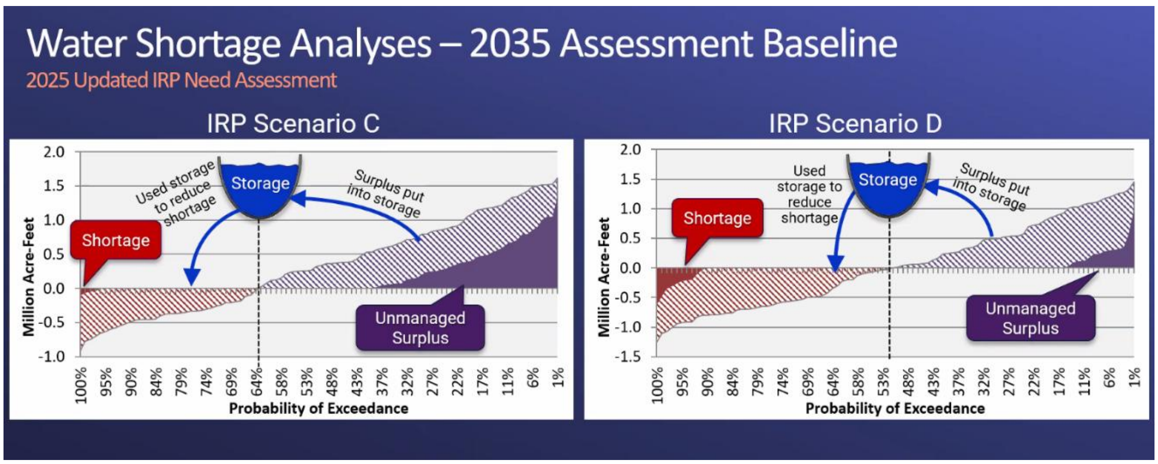


Figure A-1. Preliminary 2025 Updated IRP Needs Assessment, 2035
(Source: MWDOC Board Workshop November 5, 2025)

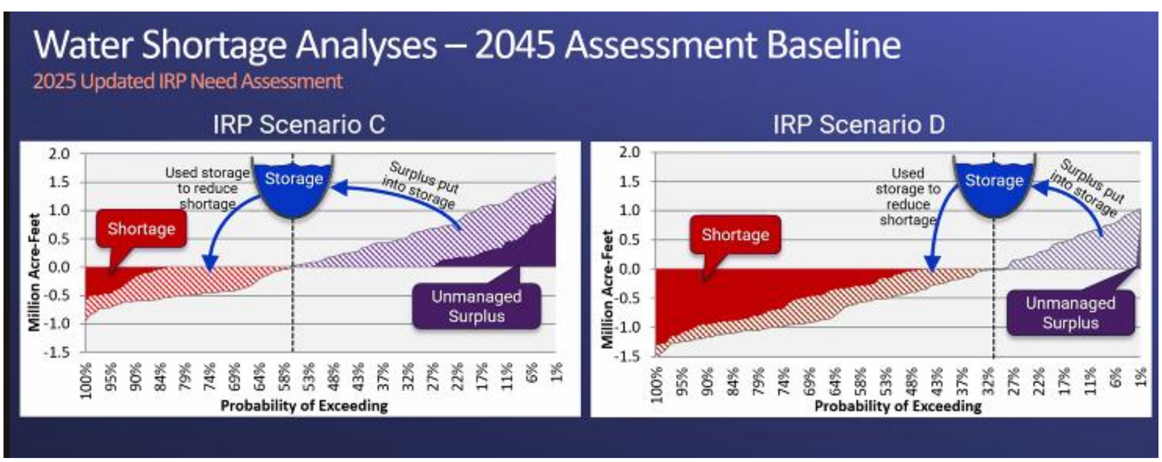


Figure A-2. Preliminary 2025 Updated IRP Needs Assessment, 2045
(Source: MWDOC Board Workshop November 5, 2025)

Figures A-1 and **A-2** further illustrate that a substantial portion of modeled shortage conditions (shown in red) is offset by surplus conditions (shown in purple) with use of regional storage. The hatched lines represent periods in which shortages are mitigated by water stored during surplus years, while solid red (shortage) and solid purple (surplus) areas indicate remaining shortages and net surpluses. MWD is addressing the remaining modeled shortage conditions, up to approximately 1.5 MAF under scenario D in 2045, through the CAMP4W process.

CAMP4W is intended to evaluate water supply projects based on need, reliability benefits, and cost-effectiveness, with the goal of producing, storing, and securing sufficient supplies to meet service areas demands under a range of future conditions. **Figure A-3** compares MWD 2020 and preliminary 2025 modeling. Preliminary results indicate that MWD's latest modeling shows that net shortages have increased in frequency. In addition to supply investments, the CAMP4W framework incorporates demand management strategies, including conservation and efficiency measures, which may further reduce projected supply gaps.

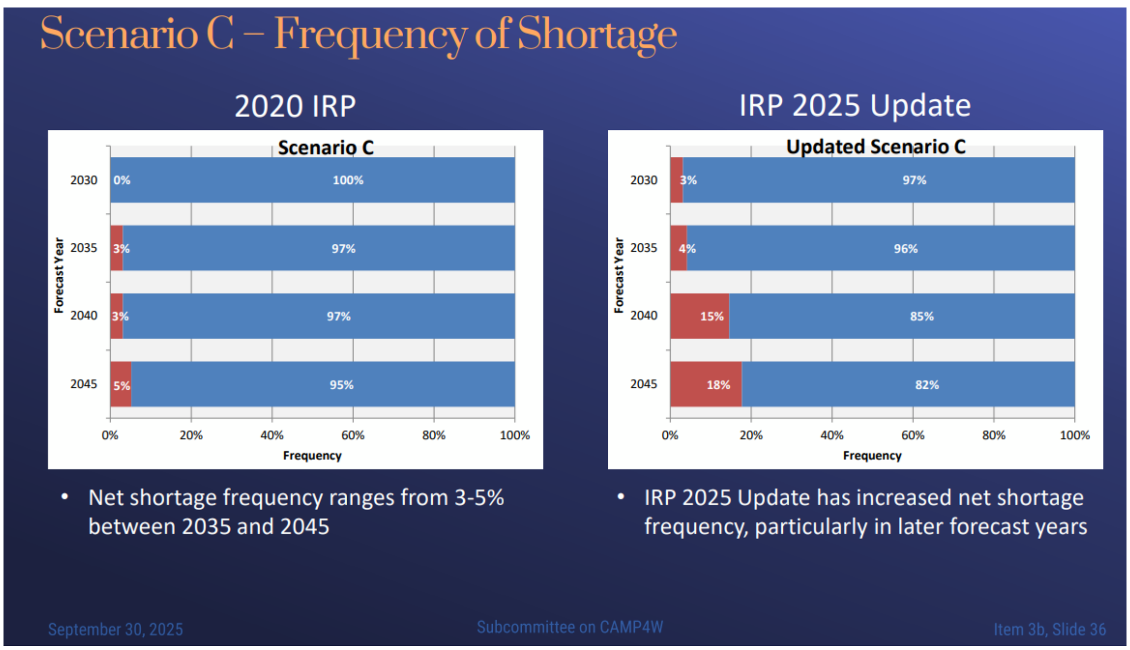


Figure A - 3. Comparison of 2020 to 2025 IRP Scenarios, Net Shortage
(Source: MWD CAMP4W Committee September 30, 2025)

Water supply projects currently proposed for evaluation under CAMP4W include large-scale regional initiatives such as PURE Water, the Delta Conveyance Project (DCP), expanded groundwater banking and water transfers, and local supply projects within the service area including desalination and water reuse projects.

2023 Orange County Water Reliability Study

Data from the most recent 2023 Orange County Water Reliability Study were obtained from the published report (**Table A-2**), and supplemented with additional information provided by MWDOC staff. Supplemental data included the past 10 years of water deliveries to MWD and MWDOC member agencies, which were used to estimate MNWD's average proportion of regional supply deliveries.

Unlike the MWD IRP, which relies on historical hydrology from 1922 to 2017, the MWDOC water supply modeling was developed using historical hydrology conditions spanning 1965 to 2021. MWDOC's supply scenarios were informed by a suite of sixteen widely recognized climate models and incorporated assumptions regarding the implementation of major regional supply projects. All MWDOC scenarios assume the following:

- The PURE Water Southern California project becomes operational in 2030, with yield varying by model; and
- A new Colorado River water transfer program is implemented with a capacity of up to 100,000 acre-feet per year (AFY).

In addition, MWDOC adjusted scenarios to account for expanding surface water storage opportunities (e.g., participation in Sites Reservoir) and the DCP. Results from the MWDOC 2023 and MWD 2020 supply projection were used to support the 2025 LRWRP supply analyses and development of the MNWD planning range.

It should be noted that certain assumptions in the 2023 study have since been updated. As of November 2024, the expected water delivery timeline for PURE Water Southern California has shifted to 2033, which may affect the timing of MWDOC's projected supply contributions in future updates.

MNWD Modeling Methods and Assumptions

All forecasts and projections presented in this report provide a framework for evaluating potential future water supply conditions (**Figure A-4**). These scenarios are not intended to predict a single outcome, rather they are designed to help the District understand and plan for a range of possible conditions. The scenarios evaluated in this report represent possible outcomes that could occur but are not certain nor necessarily likely.

Within this report, the term "probable" is used to describe outcomes that are more likely than the broader set of possible scenarios. Probable scenarios are based on refined assumptions that narrow projections to reflect the most realistic combinations of hydrologic conditions, customer demand, and project implementation timelines. While these scenarios are intended to represent expected conditions for long-range planning purposes, outcomes outside the evaluated range may still occur.

Future conditions will be influenced by changes in hydrology, climate, customer demands, regulatory requirements, and other underlying assumptions. By applying the best available data and incorporating observed historical responses to drought and shortage conditions, MNWD continually refines its modeling approach to better characterize likely future conditions and support informed, long-term water supply planning.

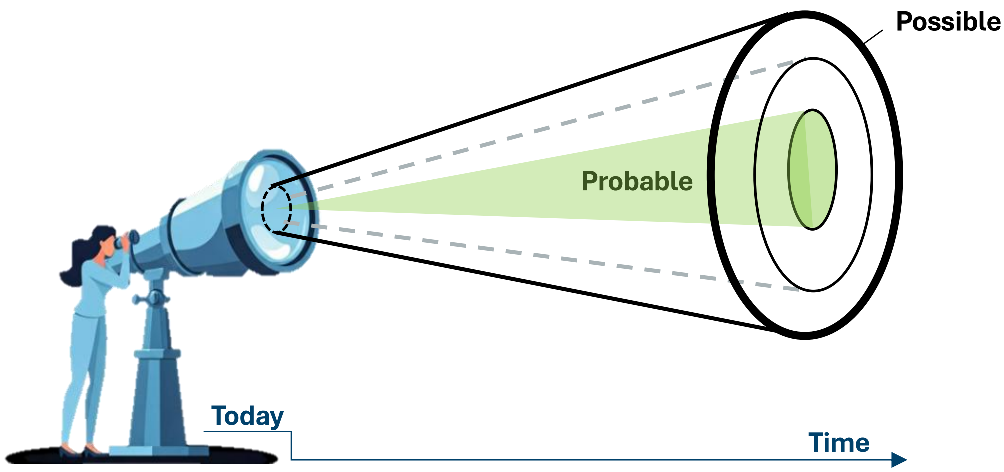


Figure A-4. Future Lens Assumptions: Possible and Probable Projections

Possible and Probable Projections

Probability is a branch of mathematics and statistics that quantifies likelihood of an event occurring. Higher probability values indicate a greater likelihood of occurrence based on the available data and underlying assumptions. In scenario-based modeling, analysts evaluate how frequently certain outcomes appear across model results, which provides insight into the relative likelihood of different future conditions within the modeled system.

It is important to distinguish, however, between the frequency of an outcome within a model and the probability that the same outcome will occur. Models simplify complex real-world systems by relying on assumptions related to hydrologic conditions, climate, regulatory frameworks, and customer demands, each of which may change over time. As a result, modeling results should be interpreted as indicators of potential future conditions rather than precise forecasts. Scenario forecast modeling is intended to identify what outcomes are more or less likely to occur based on the selected assumptions, not to predict future events.

Water supply projections are periodically updated to reflect new data and evolving conditions. At a minimum, supply assumptions are reevaluated every 5 years through the UWMP submittal process. In addition, most water agencies are required to prepare an Annual Water Supply and Demand Assessments (AWSDA), which project supply and demands for each upcoming year. If supply shortages are identified, measures must be implemented to offset these shortages.

As shown previously, regional supply modeling results can vary substantially depending on the historical hydrology applied (1922 to 2017 vs. 1965 to 2021) and the climate change assumptions incorporated. With this knowledge, MNWD evaluated a "probable" future condition or planning range that reflects a realistic range of outcomes based on current and best-available information.

For planning purposes, MWD supply projections, including potential new regional supply projects such as PURE Water Southern California and Colorado River transfers, were used to represent an upper bound of "least constrained supply conditions," while the maximum shortage conditions described further in Section D represent a lower bound for "most constrained supply conditions." MNWD's supply reliability modeling further refines this range by incorporating assumptions informed by historical hydrologic variability and observed demand patterns, resulting in a planning range that falls between these extremes (**Figure A-5**).

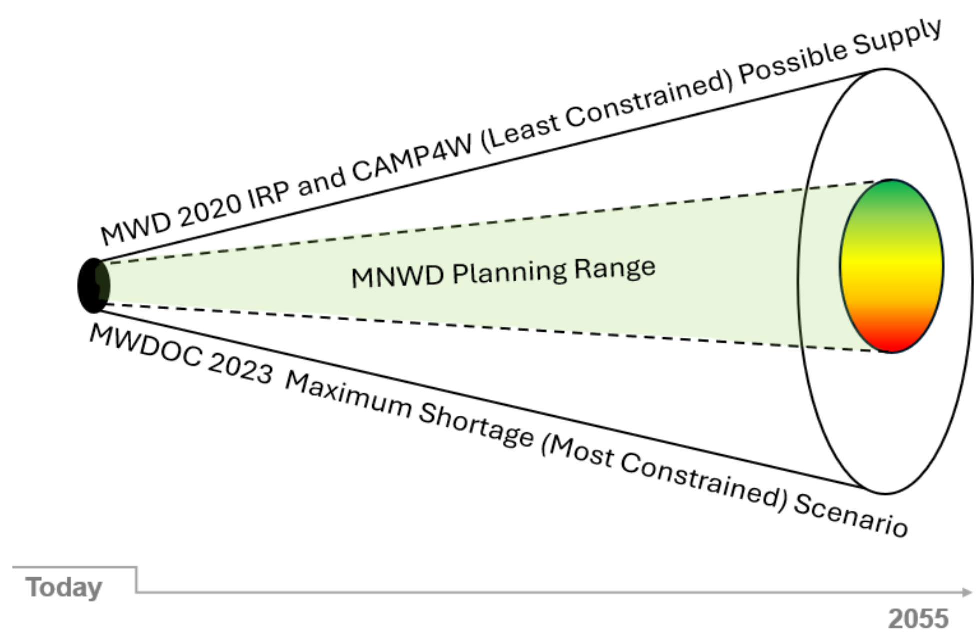


Figure A-5. MNWD Supply Projections, Probable Scenario Visual

MNWD's supply reliability modeling was developed using existing regional imported water supply availability results in combination with forecasted customer demand projections. Key assumptions underlying this scenario include the following:

1) A baseline supply of 24,000 AF, based on historical demands;
2) Customer demand projections reflecting mid-point to lower bound demand levels from 2025 to 2055;
3) Shortages can and will occur between 2025 to 2055;
4) A 20% reduction in customer demand in response to shortage conditions; and
5) Probable supply conditions for the MNWD Planning Range will exist within the regional models used for "least constrained" and "most constrained" scenarios.

The following sections describe the MNWD modeling assumptions in greater detail.

A. Historical Production and Water Deliveries

Historical water production and delivery records provide important insight into future ordering, purchasing, and delivery patterns. To capture these trends, MNWD obtained the most recent 10 years of water delivery data from MWD to its member agencies and from MWDOC to its member agencies. This data was used to determine MNWD's average proportion of regional imported water supplies and to inform the baseline assumptions used in the supply reliability modeling.

B. Proportional MNWD Water Supply

Over the past 10 years, water supplies delivered by MWD to MWDOC have ranged from approximately 100,000 AFY to more than 260,000 AFY, reflecting a mix of wet and dry hydrologic conditions. On average, MWDOC has received approximately 13.6% of total MWD supplies. To capture conditions representative of both wet and dry years, the full 10-year average was considered in the supply calculations. This average closely resembles the actual deliveries in FY 2015 and FY 2022, which are considered reasonable proxies for years experiencing regional supply shortages (e.g., multiple-dry years).

Over the same 10-year period, MNWD has received an average of approximately 14% of MWDOC deliveries by service area. In more recent years (2021-2024), MNWD's share has increased modestly, averaging approximately 15.8% of MWDOC deliveries. For consistency across proportional supply sources, MNWD's analysis utilizes the 10-year average share of MWDOC supplies when estimating imported water availability (**Table A-4**).

Table A-4. MNWD Proportion of MWDOC Supplies, Source: MWDOC Staff 2025

Year	Treated (AF)	Untreated (AF)	Grand Total	Total MWDOC Deliveries (AF)	MNWD Proportion
2014-15	26,786	0	26,786	225,498	11.9%
2015-16	23,425	0	23,425	172,534	13.6%
2016-17	19,399	3,463	22,862	187,723	12.2%
2017-18	17,299	8,326	25,625	262,475	9.8%
2018-19	15,754	7,689	23,443	167,370	14.0%
2019-20	15,070	7,115	22,185	157,128	14.1%
2020-21	17,110	7,675	24,785	140,555	17.6%
2021-22	16,945	7,359	24,305	185,651	13.1%
2022-23	11,948	7,773	19,721	132,826	14.8%
2023-24	10,645	8,372	19,017	98,577	19.3%
				10-Yr. Average	14.0%

Using these proportional allocations, MNWD's available water supplies were derived from the results of the MWD 2020 IRP Needs Assessment and the MWDOC 2023 Orange County Water Reliability Study. The results of this analysis are shown in **Table A-5.**

Table A- 5. MNWD Proportional Supply from 8 Regional Supply Scenarios

	Proportional Imported Water Available to MNWD						
	Planning Scenarios	**2030**	**2035**	**2040**	**2045**	**2050**	**2055**
2020 MWD	Scenario A	55,344	56,022	56,567	56,987	56,873	56,759
2020 MWD	Scenario B	70,784	71,427	71,750	71,864	71,792	71,788
2020 MWD	Scenario C	54,943	55,530	56,055	56,513	56,457	56,400
2020 MWD	Scenario D	69,064	69,671	69,954	69,969	69,759	69,619
2023 MWDOC	Warm/Wet	44,537	46,750	48,515	48,968	48,968	48,968
2023 MWDOC	Warm/Dry	41,338	42,801	44,143	44,593	44,692	44,791
2023 MWDOC	Hot/Dry	41,270	42,557	43,651	43,900	43,931	43,962
2023 MWDOC	MWD MAX Shortage*	15,665	14,113	12,561	11,009	9,457	7,905

**Assumes 24,000 AF before proportional, regional shortage is applied. Model result show low probability of occurrence.*

As shown in **Table A-5,** projected water supplies are sufficient to meet water demands under most MWD and MWDOC modeled scenarios. In the regional modeling, maximum shortages are the greatest level of shortage that occurs within each modeled scenario. Results from the MWDOC analysis indicated that maximum shortage events occurred approximately 1.5% to 1.9% of the time in 2030 and increase to 3.5% of the time by 2050. By comparison, regional shortages within the MWD service area of any size are projected to occur approximately 3.5% of the time in 2030 and increase to as much as 21% of the time by 2050. In the modeling, supply shortages occur only under the maximum shortage conditions, which are associated with a relatively low probability of occurrence.

It is anticipated that greater shortages by 2050 could occur and will be dependent on hydrological conditions as well as state and regional water supply projects implemented over the next 20-30 years. MWD's preliminary 2035 projections further substantiate these shortage conditions may be increasingly possible with more severe drought conditions in the future.

C. MNWD Assumed Base Supply and Relationship to Demands

MNWD is currently dependent on imported water supplies, which are ordered and delivered to meet customer demands. With the exception of unforeseen losses within conveyance systems, customer demand serves as a primary indicator for the volume of water supplied to MNWD, assuming sufficient regional supply is available. Therefore, all supply reliability modeling for MNWD is linked to projected customer demands, as described in ***Appendix C: Demand Technical Report*** of the LRWRP. Higher demands require more supplies to maintain water reliability.

For the purposes of this analysis, MNWD's base supply is conservatively assumed to be 24,000 AF, representing the average supply received over the most recent 3-year period. Under regional shortage conditions, it is assumed that this base supply represents the maximum volume available to MNWD prior to the application of any shortage or proportional cutback. For example, a regional shortage of 3,000 AF would result in 21,000 AF remaining supply available for MNWD.

This base supply assumption establishes a reasonable baseline for evaluating maximum shortage conditions before reductions are applied. While additional imported water will likely be available during shortage or outage events, particularly as other agencies increase reliance on groundwater and local resources, supply availability is uncertain and cannot be guaranteed. As a result, these assumptions are consistent with a conservative "worst-case" scenario planning approach.

The assumed base-supply is also consistent with MNWD's potable water demand forecasts (summarized in **Table A-6**), which indicate that annual demands are projected to range from 26,000 AF in the upper bound demand scenario and decrease to potentially 17,000 AF in the lower bound demand scenario over the 30-

year planning horizon. These demand projections are discussed in greater detail in ***Appendix C: Water Demand Technical Report***.

Table A-6. Imported Potable Water Demand Forecasts (2025-2055)

Scenario Results (AFY)	2025	2030	2035	2040	2045	2050	2055
Upper Bound	26,156	26,298	25,748	25,500	25,169	24,840	24,654
Mid-Point	23,205	23,066	22,235	21,704	21,090	20,477	20,009
Lower Bound	20,074	19,901	19,037	18,472	17,822	17,172	16,669
UWUO	23,442	24,589	22,765	22,111	22,384	22,658	23,021

D. Proportional MNWD Water Shortage: Maximum Shortage Event(s)

To evaluate the maximum potential shortage condition that MNWD could experience under existing forecasts and regional scenarios, the following assumptions were applied:

1) Use of the published maximum shortage conditions from MWD and MWDOC regional modeling;
2) Calculation of MNWD proportional share of regional shortage;
3) Assuming a base supply of 24,000 AF available to MNWD prior to application of shortages; and
4) Application of lower bound potable demand projections, including a 20% reduction in customer demand in response to maximum shortage conditions.

MNWD's Water Shortage Contingency Plan (WSCP) provides a structured framework for implementing demand reductions through conservation and mitigation measures. A WSCP Level 2 shortage corresponds to a 20% demand reduction in customer demand. Under a Level 2 WSCP declaration, customer demand response is assumed to decrease overall water use to partially offset projected supply gaps.

MNWD Supply Analysis Results

By evaluating eight published regional supply and shortage scenarios, MNWD identified the most probable future conditions for our long-term water supply planning purposes. These conditions are based on best available regional data and MNWD's updated customer demand projections. **Figure A-6** provides an overview of all scenarios considered, including the average of the four MWD 2020 Needs Assessment scenarios (A, B, C and D), the three MWDOC 2023 supply scenarios (Warm/Wet, Warm/Dry, and Hot/Dry), and the

2023 MWDOC maximum shortage scenario(s). These projections are expected to evolve as new data becomes available and as underlying assumptions are refined over time.

Figure A-7 also illustrates MNWD's Planning Range, shown by the green shaded area. This range reflects the application of MNWD-specific assumptions, including base supply, demand projections, and anticipated demand response under shortage conditions. As shown, supply is anticipated to meet demands under all scenarios except under the maximum shortage scenario. Under the most constrained assumptions (maximum shortage event for South Orange County), supply shortages could appear as early as 2030. In such an event, MNWD would implement a WSCP Level 2 shortage, reducing customer demand by approximately 20%. Even with this demand reduction, a residual supply gap up to approximately 3,800 AF may remain. This maximum shortage scenario has a low probability of occurrence; MWDOC estimates an occurrence probability of less than 1.9% in 2030 and less than 3.5% through 2050. It is important to note that MWD's preliminary 2035 projections further substantiate the increased likelihood and severity of shortage events that may be possible under severe drought conditions.

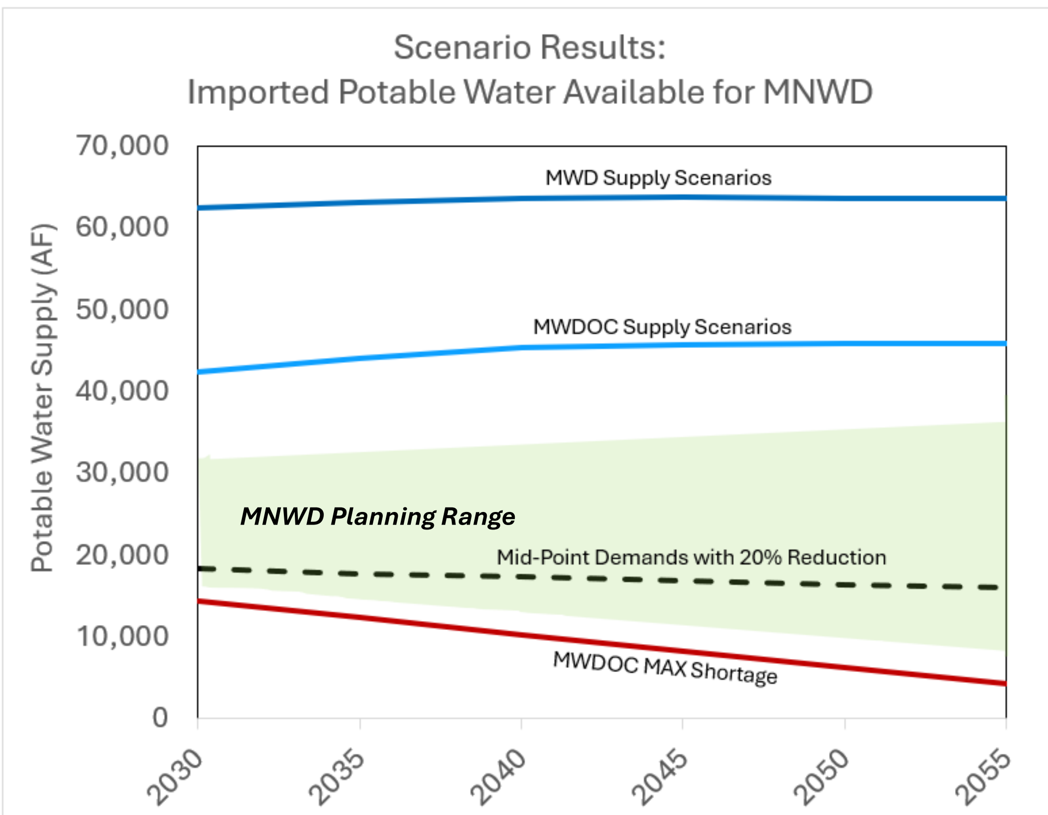


Figure A-6. Overview of MNWD Supply Scenario Results

To estimate the "probable" water supply outlook, MNWD evaluated both the "least constrained" supply assumptions from MWD's 2020 IRP Needs Assessment and the "most constrained" shortage projections from MWDOC's 2023 Water Reliability Study. The resulting MNWD Planning Range reflects MNWD's assessment that future conditions are unlikely to align with the most optimistic projections, while also not expected to reach the most severe modeled shortage conditions.

Under extreme drought conditions, water agencies throughout California actively implement conservation and emergency response measures. As demonstrated during recent droughts, statewide water management relies on coordinated actions to safeguard public health and safety, while balancing limited supplies. Ongoing efforts at the local, regional, and state levels, including expanded local supply development, increased regional storage, and innovative water management strategies are expected to reduce the likelihood and severity of extreme shortage outcomes over time.

The least constrained supply scenario is inherently optimistic as it assumes the successful implementation of multiple projects that are not yet fully constructed or operational. Conversely, the most constrained shortage scenario represents conservative planning conditions that are less likely to occur given active regional and local initiatives to manage water. Taking these limitations into account, MNWD applied District-specific assumptions to define the most probable planning scenarios, which serve as a basis for evaluating potential supply gaps and water reliability (**Figure A-7**). This approach serves to identify reasonable actions for MNWD to consider, without overdeveloping supplies, while maintaining flexibility to adapt to changing hydrologic conditions and the implementation of planned projects throughout the state.

MNWD Water Supply Reliability Results

Under the "less constrained" scenario of the MNWD Planning Range, available supplies are sufficient to meet projected customer demand throughout the planning horizon. To evaluate water supply reliability, MNWD therefore assessed the "more constrained" scenario of the MNWD Planning Range and compared projected supplies against forecasted demands. The difference between projected supply and demand was used to inform potential water reliability.

When projected supplies meet or exceed demand, supply reliability is considered reliable. When projected supplies fall short of demand, the resulting reliability decreases, with the unmet portion representing a supply gap, to be addressed through conservation, alternative supplies, or mitigation measures.

Table A-7 summarizes the results for the "more constrained" scenario of the MNWD Planning Range supply. Under these conditions, minor supply gaps may begin to emerge as early as 2034, approximately 100 AF. However, it is important to note that it is anticipated that a WSCP Level 2 is already in effect. By 2055, the analysis indicates that supply shortfalls could increase to approximately 3,800 AF on top of the presumed WSCP Level 2 response actions already in place.

Table A-7. Probable Future Range of Supply Reliability

YEAR	Lower Bound Demands with 20% Reduction (AF)	MNWD Planning Range "More Constrained" Supply (AF)	Difference (AF)
2030	15,921	16,530	609
2031	15,820	16,252	432
2032	15,720	15,974	254
2033	15,619	15,695	76
2034	15,519	15,417	-102
2035	15,229	15,139	-90
2036	15,150	14,861	-289
2037	15,070	14,583	-487
2038	14,990	14,304	-686
2039	14,910	14,026	-884
2040	14,778	13,748	-1,030
2041	14,698	13,470	-1,228
2042	14,618	13,192	-1,426
2043	14,538	12,913	-1,625
2044	14,458	12,635	-1,823
2045	14,258	12,357	-1,901
2046	14,177	12,079	-2,098
2047	14,097	11,801	-2,296
2048	14,017	11,522	-2,495
2049	13,937	11,244	-2,693
2050	13,737	10,966	-2,771
2051	13,657	10,688	-2,969
2052	13,576	10,410	-3,166
2053	13,496	10,131	-3,365
2054	13,416	9,853	-3,563
2055	13,335	9,575	-3,760

Even after applying a reasonable 20% demand reduction, the analysis indicates that supply gaps may increase over time through 2055. The same analysis was performed using the mid-point and upper bound demand forecasts, each assuming a 20% reduction in customer demand. On average, mid-point demand projections are approximately 2,600 AF higher per year than the lower bound demand scenario, while upper bound demand projections are approximately 5,750 AF higher per year than the lower bound demand scenario. When upper bound demand projections are combined with the "more constrained" supply assumptions, the resulting supply shortage in 2055 increases to approximately 10,150 AF (**Table A-8**). This information is further supported by MWD's 2035 and 2045 preliminary scenarios that indicate an increase in shortages are more prevalent compared to what they projected in 2020.

Table A- 8. Results of "More Constrained" Supply and Varying Demands, Supply Gaps

	Potential Supply Gaps (AF)		
YEAR	Lower Bound Demand	Mid-Point Demand	Upper Bound Demand
2030	NA	-1,922	-4,508
2035	-90	-2,649	-5,459
2040	-1,030	-3,615	-6,651
2045	-1,901	-4,515	-7,778
2050	-2,771	-5,415	-8,906
2055	-3,760	-6,432	-10,148

This outcome supports MNWD's Water Policy goal of 10,000 AF of emergency dry-year storage as a conservative planning benchmark. However, for the purposes of the 2025 LRWRP, MNWD relies on the mid-point and lower bound demand scenarios. The MNWD Planning Range is based on the evolving regional supply models, best available information (including anticipated implementation of regional supply projects), and the probability ranges evaluated in the MWDOC 2023 Water Reliability Study. With this range, a supply gap of 3,800 to 6,450 AF represents the most reasonable outcome for MNWD to consider for future planning purposes.

As previously discussed, in the event of a state and regional shortage, coordinated conservation actions would be implemented across water agencies to conserve water. Therefore, the upper bound demands (as currently forecasted) and MNWD Planning Range "more constrained" supply conditions are unlikely to occur simultaneously. If this scenario were to occur, management actions would be expected to substantially reduce customer demand and mitigate the impacts.

Conclusions and Recommendations

MNWD evaluated a broad range of future water supply conditions using the "least constrained" supply projections from MWD's 2020 IRP Needs Assessment and the "most constrained" shortage projections from MWDOC's 2023 Water Reliability Study. Together, these datasets represent the most optimistic and severe "possible" future water supply conditions. Historical evidence indicates that actual outcomes related to hydrology, customer demand, and regional project implementation fall between these extremes.

Based on this understanding, MNWD developed a "probable" supply scenario, the MNWD Planning Range, which reflects conditions between the "less constrained" and "more constrained" projections. This scenario incorporates a 20% demand reduction during shortage conditions and assumes that regional and local water supply projects are implemented over time. Under the "less constrained" scenario of this MNWD Planning Range, available supplies are sufficient to meet MNWD's projected demands. Under the "more constrained" shortage conditions, supply shortages may begin as early as 2034, initially approximately 100 AF, and could increase to as much as 6,450 AF by 2055. These maximum shortage conditions have a low probability of occurrence, occurring less than 2% by 2030 and less than 4% by 2050 in the MWDOC 2023 Water Reliability analysis.

Regional hydrologic trends show that earlier snowmelt, more intense runoff events, and reduced summer baseflows will continue to affect the reliability of imported water supplies. These shifts reduce the effectiveness of traditional seasonal storage system and are expected to increase both the frequency and magnitude of shortages later in the planning horizon. In response, MNWD continues to pursue a diversified portfolio of near-term, emergency, and long-term strategies to improve water reliability.

Near-Term Reliability

MNWD will continue efforts to maintain and incrementally improve annual average potable water reliability in the range of approximately 31 to 60 days, consistent with District's existing Water Policy goal. This includes continued support to MWD to cost effectively improve water reliability for Southern California. In addition, the District will continue implementation of cost-effective demand management and water efficiency programs, which play a critical role in extending available supplies during droughts and emergency conditions.

Storage

MNWD will continue to identify and evaluate cost-effective opportunities to expand dry-year storage, with a long-term planning objective of up to 10,000 AF. Increased storage capacity would enhance operational flexibility, allow surplus water to be captured during wet periods, and help mitigate supply shortfalls during extended droughts or multi-year shortage events.

Long-Term Reliability

To reduce reliance on imported supplies and address potential supply gaps beyond 2040, MNWD will continue to evaluate opportunities to develop up to 15 percent of total demand from local water supply sources. Local supply development, along with regional partnerships, represents a key long-term strategy for improving resilience under increasingly variable climate conditions.

Collectively, the strategies of demand management, expanded storage, and local supply development are intended to close identified supply gaps and strengthen water resilience over time. Continued coordination with MWD, MWDOC, and regional partners, along with future updates to the CAMP4W, LRWRP, and regional supply assessments will allow MNWD to refine assumptions, incorporate updated hydrologic data and project schedules, and adjust planning strategies as conditions evolve. These conclusions and recommendations are consistent with MNWD's Water Policy goals and the technical findings documented throughout this report and **Appendix B: Water System Technical Report**.

Appendix B: Water Systems Reliability Technical Report

moulton niguel water district

Water Systems Reliability Technical Report

System Analysis

System reliability is the ability to continue to meet customer demands during unplanned outages or emergency circumstances that impact access to water. Unlike supply reliability, which is influenced by changes in hydrologic variability and climate conditions, system reliability depends on the resilience of physical infrastructure, facilities, and redundancies in water distribution systems. MNWD currently relies on imported water provided by Metropolitan Water District of Southern California (MWD), through the local wholesaler Municipal Water District of Orange County (MWDOC). **Figure B-1** indicates the service areas boundaries of all three agencies.

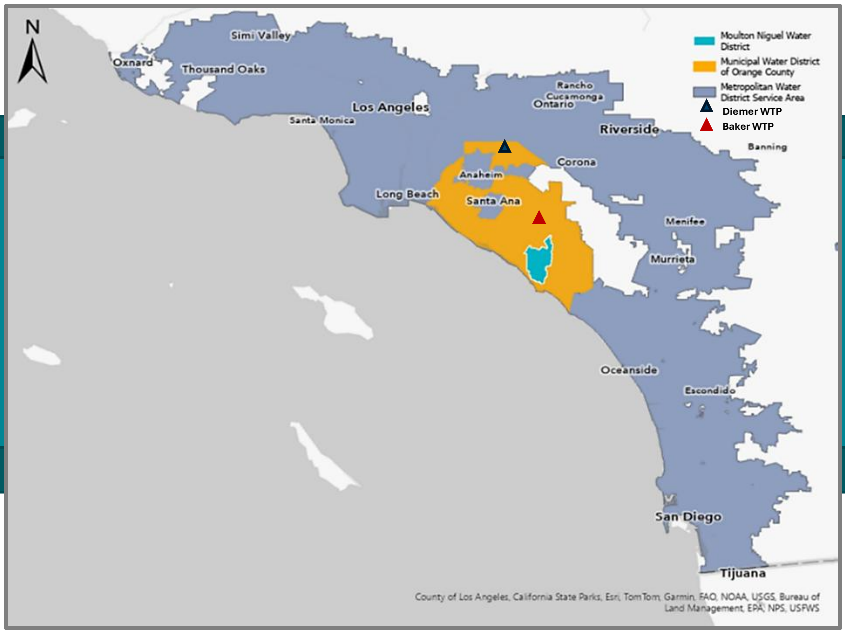


Figure B- 1. Service Area Boundaries and Major Treatment Plants

MNWD's imported water is treated at the MWD's Robert B. Diemer Water Treatment Plant (WTP) located north of Yorba Linda or at the Baker WTP in Lake Forest. Baker WTP was built to provide a redundant treatment facility. On average approximately 70 percent of the District's water supplies are treated at Diemer WTP, and the remaining 30 percent of water supplies are treated at Baker WTP. The District's current Water Reliability Policy goals are to provide at least 31-days and up to 60-days of annual average potable water supply in the case of a Diemer WTP outage, to evaluate cost effective supplies of up to 15 cfs of emergency water, and to evaluate and consider options for phasing in up to 10,000 acre-feet (AF) of dry-year storage.

System Hazards

Water system hazards may include but are not limited to infrastructure outages at major treatment facilities, seismic impacts on regional conveyance systems (e.g., major water transmission pipelines), equipment failures, cyberattacks on operation systems, fire impacts, as well as climate hazards previously identified in **Appendix A** for drought. **Figure B-2** identifies the main system hazards of concern for MNWD and customer supplies.

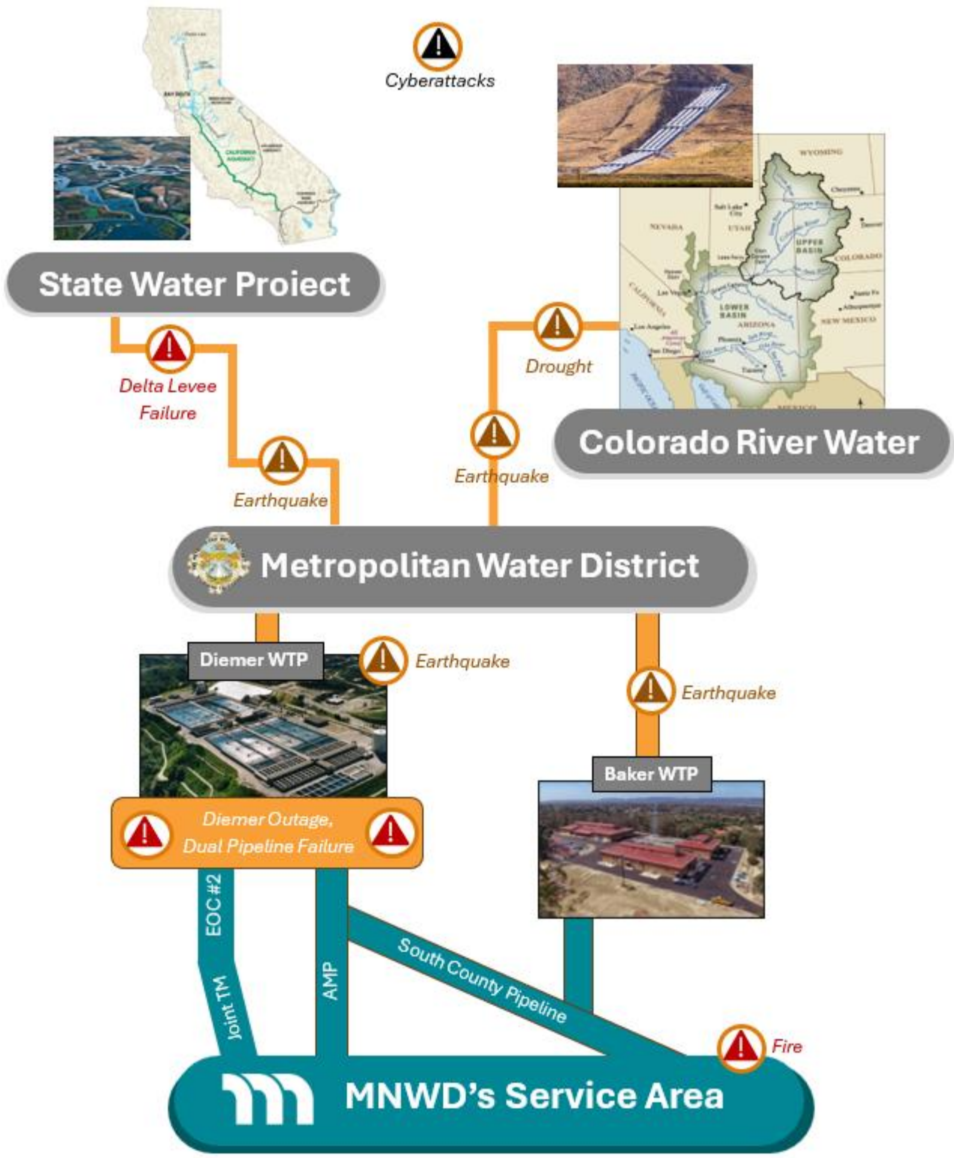


Figure B- 2. Water System Reliability Hazards

Water imported through the State Water Project (SWP) originates in the Sacramento–San Joaquin River Delta (Delta). The Delta is vulnerable to seismic risk due to nearby active fault systems, including the San Andreas and Hayward faults located west of the Delta. A significant seismic event could cause catastrophic failure of Delta levees, many of which are already susceptible to flooding and subsidence, potentially resulting in seawater intrusion and disruption of water deliveries. The proposed Delta Conveyance Project (DCP) is intended to improve the reliability of the State Water Project (SWP) by constructing a single-tunnel conveyance system within the Delta, helping to protect California's largest water supply system–which serves approximately 27 million people– from earthquakes and climate-driven weather extremes.

For Colorado River supplies, extreme drought conditions reduce the overall availability of water and constrain when releases can occur from Lake Powell and Lake Mead. These conditions can affect reservoir operations and system capacities (**Figure B-3**). Since 2000, the Colorado River Basin has experienced prolonged and varying degrees of drought. In extreme conditions with critically low reservoir elevations, a theoretical scenario referred to as "double dead pool" could occur in which water levels at both dams fall below the minimum elevations required for releases. Such a scenario would suspend hydroelectric generation and disrupt water deliveries to millions of customers downstream in California, Nevada, Arizona, and Mexico. While Colorado River Operations are designed to prevent this situation from occurring, it is recognized as an overall risk to the supply system.

Figure B- 3. Lake Mead, Colorado River Drought Conditions

Within the MWD service area, a major seismic event could disrupt operations at the Diemer WTP and Baker WTP, as well as their associated conveyance pipelines. In response, MWD and MWDOC have implemented a range of initiatives to prepare for seismic hazards, including the seismic resilient water supply task force, a joint emergency response plan, and targeted mitigation measures to alleviate damage and service interruptions. These initiatives are documented in the most recent MWD Seismic Resilience Report and MWDOC Multi-Jurisdictional Hazard Mitigation Plan. Additionally, MWD and MWDOC have recommended local agencies maintain emergency supplies for up to 60 days, in the case of a Diemer WTP outage. While disruptions to the SWP or Colorado River system may impact operational flexibility at Diemer WTP and Baker WTP, MWD maintains local emergency storage available—such as Diamond Valley Lake in Riverside County—to support water deliveries during upstream system disruptions.

Water Storage Capacity

MNWD currently has a maximum internal potable water storage capacity of 218 AF (61 MG) within reservoirs and tanks that are owned and operated by MNWD. Due to operational constraints, these facilities are typically maintained at 75% of total capacity and are not expected to be at full capacity simultaneously. As a result, an estimated 164 AF (53 MG) is available for internal system storage. In addition to internal storage, MNWD has access to 40 AF (13 MG) of potable water storage in El Toro Reservoir (R6) and approximately 276 AF (90 MG) available in Upper Chiquita Reservoir–managed by Santa Margarita Water District. Collectively, these sources provide an average of roughly 480 AF (156 MG) of potable water for emergency use in the event of system outage (**Figure B-4**).

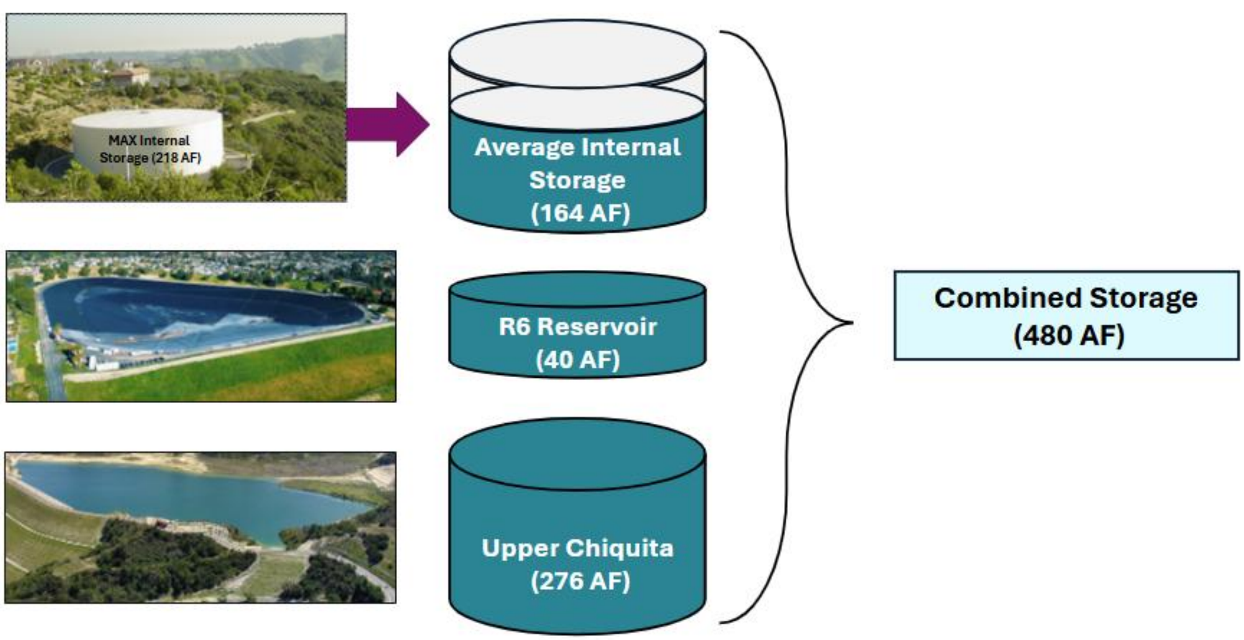


Figure B- 4. MNWD Combined Potable Water Storage

MWDOC recommends that member agencies plan for a potential outage of up to 60 days at Diemer WTP (**Figure B-5**). In addition, modeling conducted by MWD and MWDOC indicates that under catastrophic seismic scenarios outages lasting up to 6 months are possible. The duration is dependent on the location, extent, and timing of damage to critical infrastructure within the State Water Project or Colorado River Aqueduct systems.

Figure B- 5. Diemer Water Treatment Plant, Yorba Linda

During a Diemer outage, MNWD would use supplies from one of three main sources:

1) Combined available emergency storage (480 AF or 156 MG, see **Figure B-4**);
2) Baker WTP (supplied by Lake Mathews with 26 AF/day available); and
3) The Emergency Interconnection with Orange County Water District (Irvine Ranch Water District – Existing, City of Santa Ana – Proposed).

The existing Emergency Interconnection is currently contracted until 2030, after which the contract expires. A new Emergency Interconnection Project is currently proposed with the City of Santa Ana for 10-14 cfs of capacity for emergency use.

Emergency Supply

Emergency supply capacity for South County varies seasonally, ranging from 0 to 18.5 cubic feet per second (cfs), with no guaranteed capacity during the summer months. MNWD has capacity rights for 58.93% of the South County total, equivalent to approximately 0 to 10.9 cfs (**Table B-1**). This corresponds to approximately 0 to 22 AF per day (~7 MGD) of emergency supply available for use by MNWD. Additional supplies may be available through MWD, depending on system conditions and operational constraints.

Table B - 1. Emergency Interconnection Contract, MNWD Flow Rates

Average Flow Rate Reserved for MNWD (cfs)					
Emergency Contract Years	**2010-2014**	**2015-2019**	**2020-2024**	**2025-2029**	**2030**
Jan	14.7	12.7	10.9	9.4	0
Feb	15.6	13.6	12.1	10.9	0
Mar	15.0	13.0	11.5	10.0	0
Apr	12.1	9.4	7.4	5.3	0
May	10.6	7.1	4.4	1.8	0
Jun	9.1	4.1	0.9	0.0	0
Jul	7.7	0.9	0.0	0.0	0
Aug	7.7	0.9	0.0	0.0	0
Sep	7.1	0.0	0.0	0.0	0
Oct	9.1	3.8	0.6	0.0	0
Nov	10.6	7.7	5.0	2.7	0
Dec	12.4	10.6	8.8	6.8	0

Based on the contract provisions, emergency deliveries are limited to a maximum duration of 30-days, with up to 1,768 AF available per emergency event for MNWD. The following analysis assumes that the full 30-day emergency supply would be made available and delivered in the case of a qualifying outage.

Days of Reliability

MNWD uses a metric known as "days of reliability" to evaluate system reliability and estimate how long available supplies could meet customer demands during an outage. The days of reliability calculations incorporate assumed internal storage (480 AF), average daily customer demands across the service area (57 AF/day based on FY 2024 data), and available emergency and unimpacted supply sources, including the Emergency Interconnection and guaranteed capacity in the Baker WTP.

Depending on the severity of an emergency, MNWD may implement a Water Shortage Contingency Plan (WSCP) Level 2 Shortage, which targets a 20% reduction in customer demand through conservation measures and public information campaigns. Based on the existing emergency interconnection contract and use of the Baker WTP, the estimated days of reliability would range from approximately 26 days without demand reductions to 43 days with a 20% reduction in water use. **Figure B-6** and **Figure B-7** illustrate the days of reliability by month and with a 20% demand reduction, respectively.

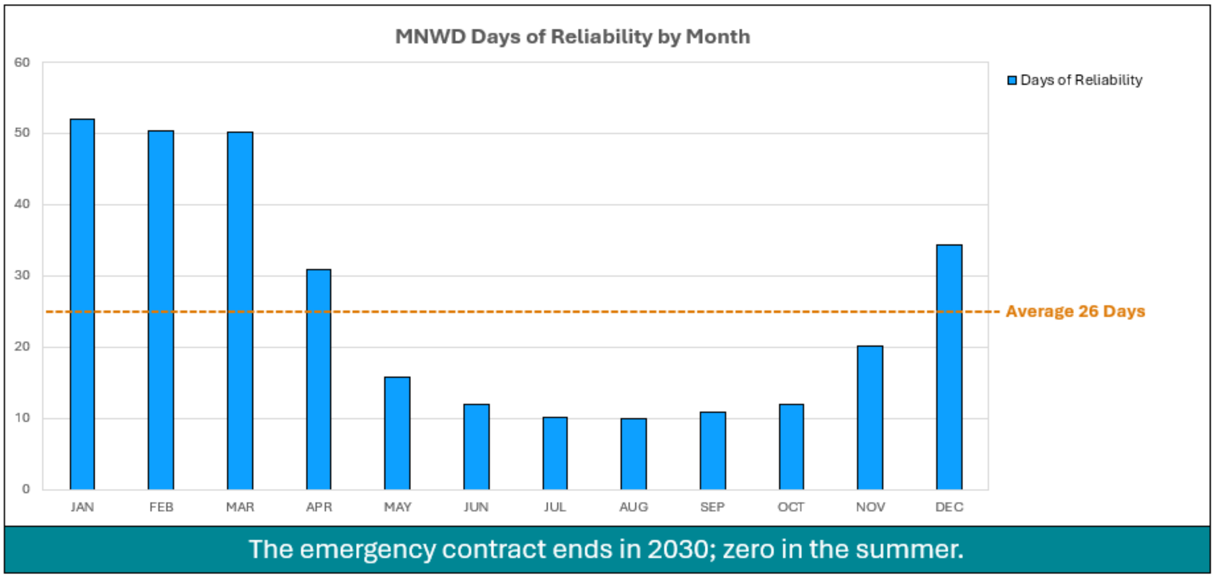


Figure B- 6. Days of Reliability without Demand Reductions

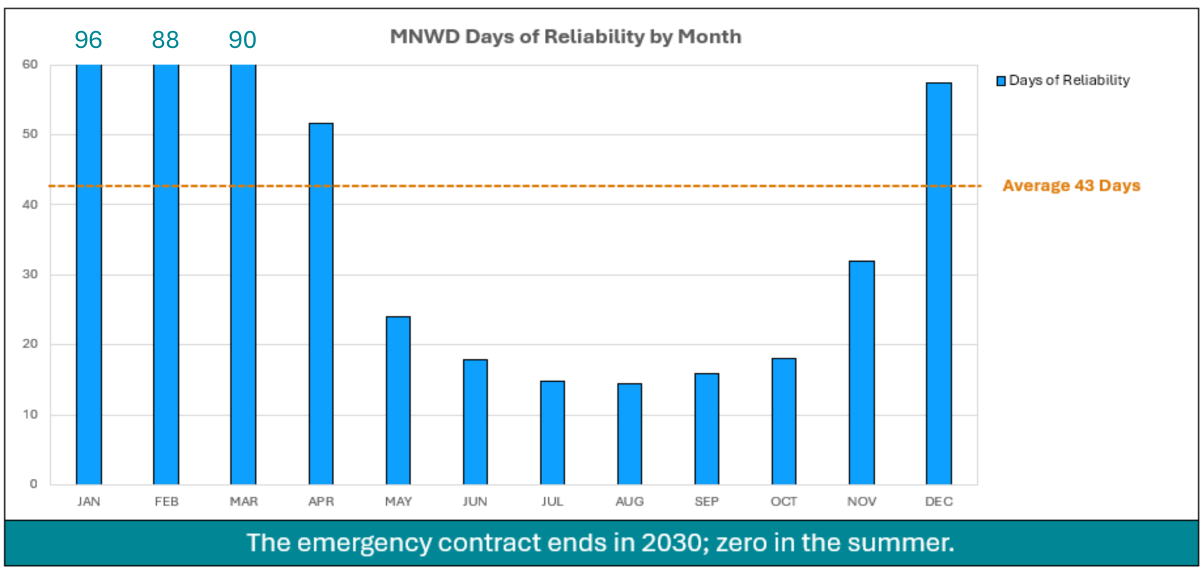


Figure B- 7. Days of Reliability with 20% Demand Reductions

MNWD evaluated seasonal variability in days of reliability to account for monthly changes in both emergency interconnection capacity and customer water demand. Customers usage is generally lower in the winter months and higher in the summer months, driven primarily by increased outdoor irrigation demands. The following analysis compares days of reliability across supply sources using three scenarios: the annual average, 3-month winter average, and 3-month summer average with a 20 percent demand reduction in place (**Figure B-8**).

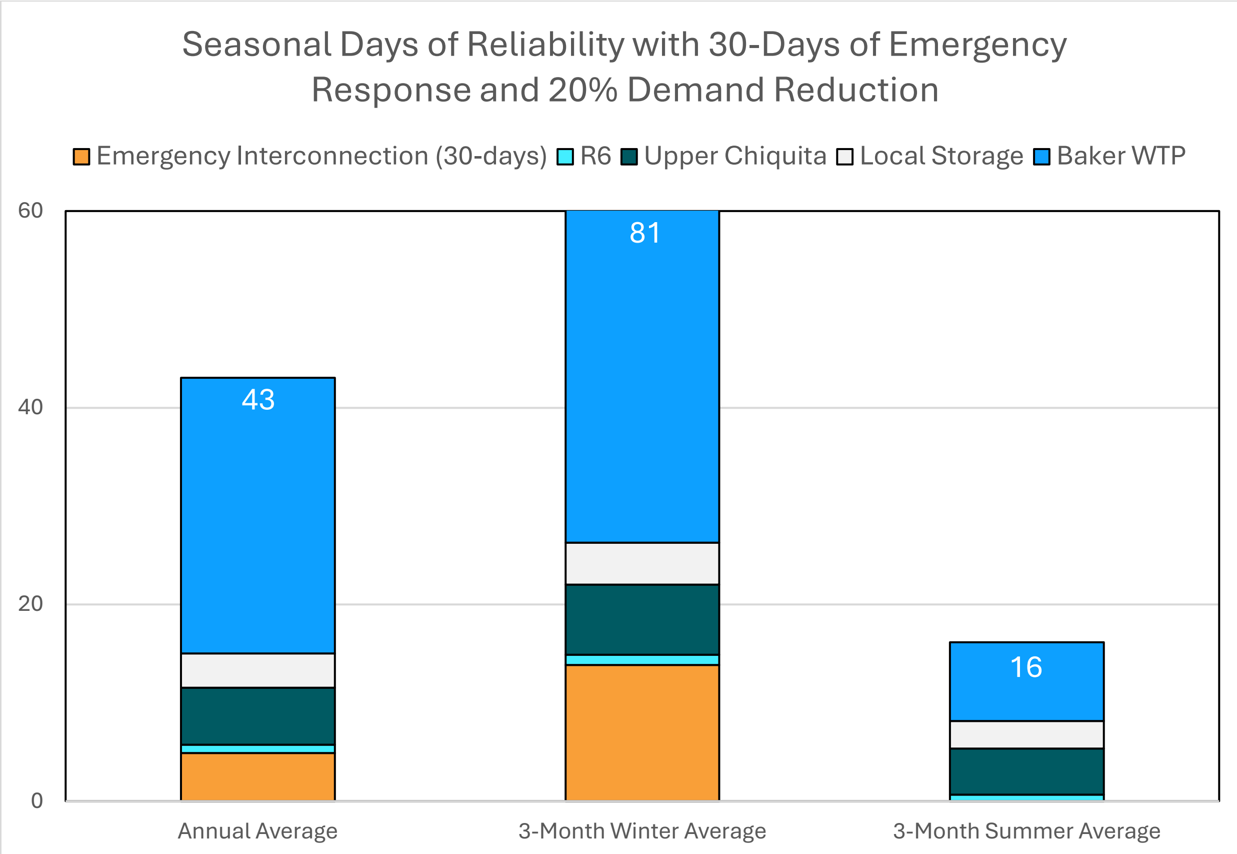


Figure B- 8. Seasonal Days of Reliability for Existing Contract with 20% Demand Reduction

Figure B-8 illustrates that during the winter months (December, January, and February) emergency supplies could support up to approximately 81 days of reliability with a 20 percent demand reduction. During winter, average customer demands are approximately 48 AF per day. In contrast, summer (July, August, and September) demand increases substantially due to outdoor irrigation, averaging approximately 74 AF per day. Under these higher-demand conditions, days of reliability are reduced to approximately 16 days with a 20 percent demand reduction.

In addition to seasonal demand variability, MNWD evaluated days of reliability under varying interconnection contract conditions and levels of emergency supply availability. The existing Emergency Interconnection Agreement includes schedule reductions in available flow capacity (cfs) every 5 years and is set to expire in 2030, see **Table B-1**. **Figure B-9** presents the resulting average annual days of reliability under three scenarios: the existing contract through 2030, no emergency contract in place beginning in 2031, and the proposed Santa Ana Emergency Interconnection contract at 10 cfs of capacity.

If the proposed Santa Ana Emergency Interconnection is implemented, with up to 10-14 cfs of available capacity, additional emergency supplies would be accessible and overall days of reliability would be significantly improved.

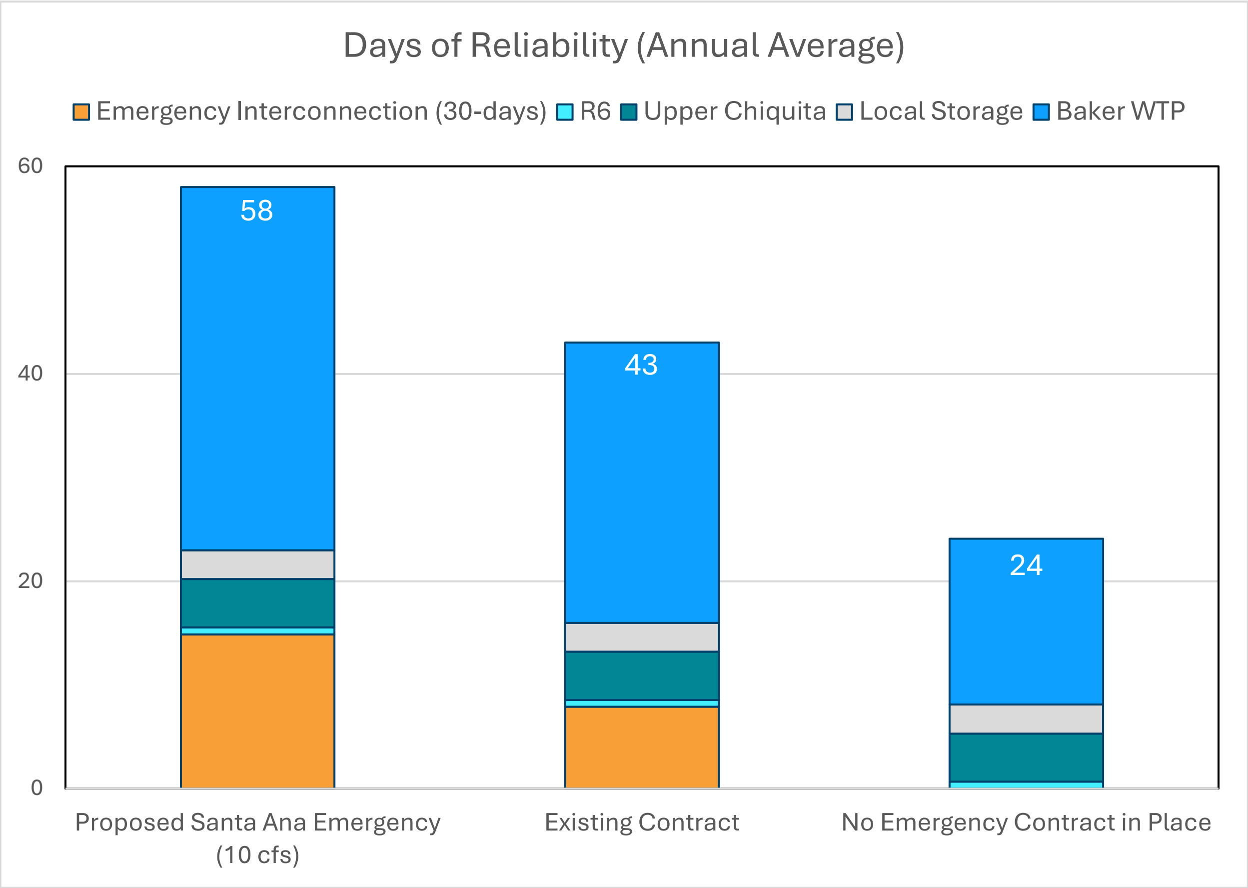


Figure B- 9. Days of Reliability, Across Emergency Contracts with 20% Demand Reduction

The Santa Ana Emergency Interconnection has been evaluated and determined to be technically feasible; however, no formal agreement with the City of Santa Ana has been executed for the proposed capacity. Coordination with MWD and other stakeholders regarding potential implementation is ongoing. As shown in **Figure B-9**, implementing the proposed emergency interconnection at 10 cfs would increase days of reliability from approximately 43 days under current contract provisions with a 20 percent demand reduction, when no emergency capacity is available during summer months, to 58 days with a 20 percent demand reduction in place. This improvement would significantly enhance system reliability and resilience during dry-season emergencies caused by natural hazards that disrupt imported water conveyance.

Conclusions and Recommendations

MNWD continues to proactively evaluate and implement strategies to strengthen water system reliability. Multiple projects are currently in development that would further enhance the District's ability to maintain service during unplanned outages. As demonstrated in the system reliability analysis, MNWD currently has an estimated 26 days of water reliability, on average, in the event of a Diemer Water Treatment Plant outage. Reliability increases to 43 days with a WSCP Level 2 in place. This level of reliability aligns with the District's 31-to-60-day annual potable water reliability policy goal and can be further improved through expanded conservation measures and access to additional emergency supply capacity.

Customer Demand Reductions

The analysis also indicates that system reliability is most constrained during the summer months, when peak seasonal demand limits available supplies to approximately 16 days with a 20 percent demand reduction in place, assuming average summer usage. During an emergency, customer demand would likely be reduced by 20 percent or more, consistent with the District's WSCP, thereby extending available supplies through conservation actions and emergency response measures.

Available Emergency Supplies for System Outages

On average, approximately 480 acre-feet (AF) of potable water is available through local internal storage. To further enhance long-term reliability, it is recommended that MNWD continue evaluating projects that expand dry-year storage toward the District's 10,000 AF Water Policy goal and pursue partnerships that provide additional emergency capacity through interconnections. The proposed Santa Ana Emergency Interconnection is one such opportunity currently under consideration and would contribute to achieving the District's 15 cfs emergency supply capacity policy goal.

MNWD will continue to advance local water supply, emergency preparedness, and system resilience projects to address potential vulnerabilities and close remaining system reliability gaps. Collectively, these efforts are intended to improve system reliability toward a planning target of approximately 31 to 60 days, depending on the nature, timing, and severity of an emergency event, as well as seasonal demand conditions. Continued investment in storage, interconnections, and water efficiency programs will be critical to strengthening the District's ability to respond effectively to a wide range of scenarios.

Appendix C: Water Demands Technical Report

moulton niguel water district

Water Demands Technical Report

Water Demands

Accurately forecasting future demand is essential for planning MNWD's long-term water supply needs. This technical appendix documents the approach used to forecast water demand in the MNWD service area from 2025 through 2055. These water demand projections include residential, commercial, and irrigation water use – capturing the full scope of potable and recycled water demand within the District's boundaries.

Water demand is shaped by several interconnected factors, including:

- **Demographics** – Characteristics of the service area population, such as the number and types of housing units (single-family and multifamily), household size, and irrigated landscape areas.
- **Socioeconomic Factors** – Elements like income levels and unemployment rates.
- **Water Use Efficiency** – Conservation measures and programs aimed at reducing water waste, including efficiency ordinances and initiatives.
- **Weather Conditions** – Climate factors such as temperature, evapotranspiration, and rainfall patterns.

Historical Water Demands

Total water production (imported and recycled) since 2007 has been on an overall decline even as population has increased across the service area, as shown in **Figure C-1**. In the past decade, MNWD customers reduced their consumption by nearly 8,000 acre-feet (AF) – significantly reducing the need for imported drinking water supplies. The total daily use in 2007 was approximately 198 gallons per capita per day (GPCD). By the end of 2025, water use per capita (potable and recycled) declined to 121 GPCD. Weather, drought, and economic conditions play a role in the year-to-year demand fluctuations. However, the overall decline in imported drinking water and GPCD can largely be attributed to active demand management, such as MNWD water conservation programs, a budget-based rate structure, increase in water efficiency by recycled water customers for irrigation, and customer water use awareness as a response to past droughts.

MNWD delivers approximately 5,500 AF of recycled water annually for irrigation accounts within its service area. Recycled water offsets the need for imported water supplies and currently accounts for more than 20% of the District's annual water demands. In addition, MNWD's water efficiency programs achieve approximately 1,500

AFY on average in water savings (potable and recycled) when considering 30-year water savings lifecycle from turf removal and 10-year water savings lifecycle from devices.

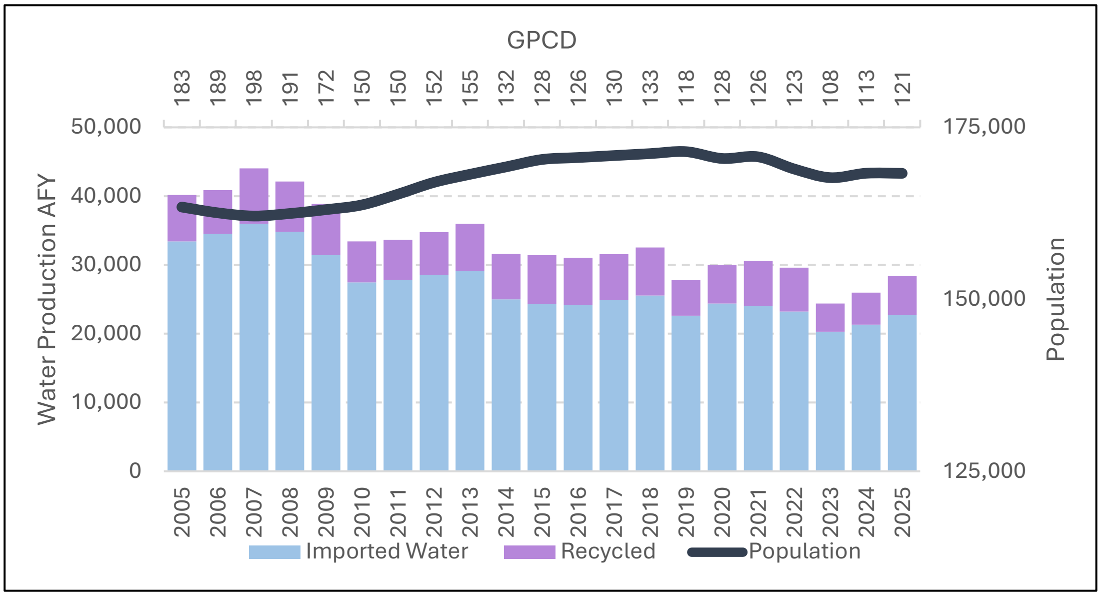


Figure C- 1. Historical Water Production and Population Growth from 2005-2025

Water Use by Customer Classes

Total water use in MNWD's service area is comprised of the following categories:

- **Single-Family Residential** – Represents single-family detached homes and attached single-family homes and townhomes with individual meters.
- **Multifamily Residential** – Represents apartments, condominiums, and townhomes with master meters for the entire building or complex.
- **Commercial** – Represents businesses, schools, hospitals, and governmental customers.
- **Potable Irrigation** – Represents large landscape users with dedicated irrigation meters such as common residential landscaping (e.g., homeowners associations), parks, medians, and greenbelts.
- **Recycled Irrigation** – Represents all non-potable recycled water users, including golf courses, parks, and large residential landscape areas.
- **Other** – Represents water that is sold through hydrants, typically for construction use.

As shown in **Figure C-2**, residential uses (single-family and multi-family) account for 60 percent of all water use during an average year. **Figure C-2** provides a break-down of water use by MNWD's main water use sectors for the years 2020-2024. Single-family use is the largest sector using 13,781 AFY (52 percent of the total average water use), followed by recycled irrigation use at 5,497 AFY (21 percent), potable irrigation uses at 2,783 AFY (10 percent), commercial use at 2,081 AFY (8 percent), and multifamily use at 2,380 AFY (9 percent). Other water was on average 12 AFY representing less than 0.05 percent of the total water use.

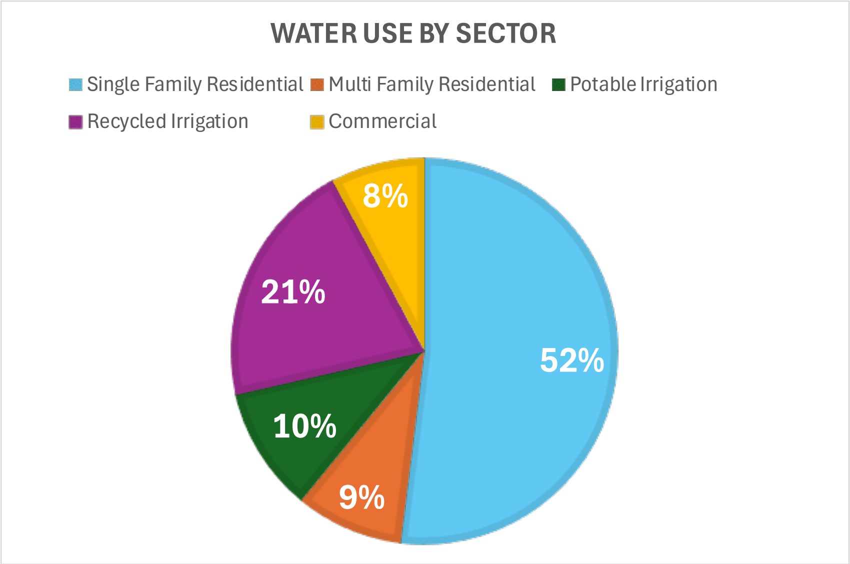


Figure C- 2. Average Water Use by Water Sector from 2020-2024

Water Demand Forecasting Methodology

Scenario Planning for LRWRP Demand Forecasting

To estimate the impacts of major factors that influence water demands, a multivariate forecasting model was developed with forecasts out to 2055. MNWD uses a water budget–based rate structure. Customer water budgets are determined using factors such as landscape area, evapotranspiration, indoor GPCD, and household size. Multivariate forecasting models were applied to project various potential outcomes by incorporating multiple dynamic variables, including factors that influence customer water budgets over time. The MNWD model uses historical total monthly water production (including both imported drinking water and recycled water) as the dependent (or predictive) variable, and the following independent (or explanatory) variables:

- **Annual Population –** The demand forecasting model uses updated annual population estimates for the MNWD service area, sourced from the Orange County Annual Population Estimates from the Center of Demographic Research (CDR). These figures are based on the State Department of Finance (DOF) revisions to city and county estimates for 2025. Updated population data indicates a slight decline in the MNWD service area compared to the previous CDR estimates despite an increase in dwelling units.

- **Indoor Gallons per Capita per Day (GPCD)** – A measure of water used per person per day. The model currently applies indoor GPCD to account solely for indoor water use per capita. The indoor GPCD values incorporated in the model are based on MNWD's current indoor water budget of 55 gallons per capita per day and reflect assumed per capita consumption ranging from 55 to 45 GPCD, consistent with observed customer use.

- **Evapotranspiration** – Evapotranspiration (ET) is water that is lost each day to the environment due to evaporation and plant transpiration. ET will vary due to factors such as length of day, wind, humidity, and temperature. MNWD's outdoor water budget considers irrigable area per parcel, daily ET, landscape factors (combination of plant factors and irrigation efficiency). In the past 10 years, ET saw an average increase of 0.3 inches per year. The model assumes 0.4 inches increase in ET in warmer years and 0.2 inches increase in ET in cooler years.

- **Outdoor Landscaping Factor** – Is the ratio of supplemental water needs based on the irrigation system and plant types. Different plants have varying water needs ranging from 0.1 for native plants to 1.0 for turf grass. MNWD assumes a 0.7, 0.8 and 1.0 landscaping factors, accounting for average mix of plant types, average irrigation efficiency, and water source type.

- **Water Loss** – The quantity of water that is unaccounted for (e.g., not captured in customer billing) in a water supply system, typically measured in gallons per connection per day. Water loss is derived from annual audits, report records, as well as calculations from case-by-case scenarios (e.g., hydrant flushing versus water leaks). The water loss numbers incorporated in the model are based on future regulatory requirements and MNWD's recent water loss value from audits.

- **Conservation Factors** – The water savings per acre foot (AF) is measured by turf removed and calculated per water efficient device installed. Water savings from turf removal is assumed to be 15 gallons per square foot the first year the turf removal is implemented and 42 gallons per square-foot from the second year and onwards. Water savings from devices are assumed to be 26 acre-feet per year based on available data.

- **New Development Water Demand** – New development water demand is calculated using a combination of population growth and land use. New development projections are prepared by MNWD's development services team, who works closely with cities within the service area. **Table C-1** outlines anticipated development across the service area over the next ten years. Across all known projects in the next ten years, there is a net increase of approximately 3,300 dwelling units and 620,000 square feet (sq. ft.) of commercial development. In addition, CDR projects an additional development of approximately 1,000 dwelling units from 2035 to 2050. However, since these are not based on known development projects, these were not included in the demand model at this time. Overall, there is an anticipated growth of approximately 4,300 dwelling units over the planning horizon.

Table C - 1. MNWD Estimated New Development and Demand Increase (2025-2036)

Anticipated Development Year	Project Locations	New Dwelling Units	Increase in Commercial Development (Sq. ft)	Increase in Water Demand (AF/Year)
2026-2036	Aliso Viejo	1,200	160,000	200
2027-2036	Laguna Hills	200	0	40
2026-2036	Laguna Niguel	1,000	220,000	200
2027-2036	Mission Viejo	900	240,000	150
2036-2050*	Across the Service Area	1,000	To Be Determined	To Be Determined
*Based on CDR development projections from 2035 to 2050; however, these are not based on specific development projects and are not included in the demand model at this time.				

State Regulations – Urban Water Use Objective Scenario

California's Urban Water Use Objective (UWUO) is a regulatory framework established to advance long-term water use efficiency across urban areas in the state (California Code of Regulations, Title 23, Division 3, Chapter 3.5: Urban Water Use Efficiency and Conservation). Enacted in 2018 and codified in Title 23 of the California Code of Regulations, the UWUO represents a shift from emergency conservation measures to a more sustainable, performance-based approach to water use management. Under this framework, the State Water Resources Control Board (SWRCB) sets efficiency aggregate standards for four primary components: residential indoor water use, residential outdoor irrigation, commercial landscape dedicated meter irrigation, and real water loss within utility distribution systems. These standards are combined to create a customized water use target (the Urban Water Use Objective, UWUO) for each retail urban water supplier.

The UWUO approach allows urban water suppliers flexibility in achieving their objectives while holding them accountable for state-mandated efficiency targets. This framework encourages the adoption of water-efficient technologies, conservation programs, and proactive system maintenance to minimize leaks and waste. By incorporating climate variability, land use, and population growth into the calculation of water use objectives, the UWUO supports a resilient and adaptive water management strategy. Ultimately, the goal of the UWUO is to promote long-term water sustainability in California's urban communities, helping them prepare for ongoing water supply challenges.

Under current regulations, the residential indoor water use standard is 47 GPCD by 2025, decreasing to 42 GPCD in 2030. For residential outdoor irrigation, the plant factor standard is 0.8 from 2025 to 2034, then lowers to 0.63 from 2035 to 2039, and drops further to 0.45 starting in 2040. Special landscape areas, as well as outdoor irrigation and recycled water areas, are required to maintain a plant factor of 1.0 beginning in 2025. The UWUO calculator incorporates the State Water Board's water loss standard of 26.5 gallons per connection per day. The regulatory timeline for indoor GPCD, landscape factor, and water loss standards based on the UWUO are described further in Section D UWUO Scenario.

Figure C-3 and **Figure C-4** illustrate the indoor and outdoor regulatory standards as per the UWUO.

Figure C- 3. Indoor Regulatory Standards

Figure C- 4. Outdoor Regulatory Standards

Demand Forecasting Tool and Long-Range Scenarios

The demand forecasting tool projects water demands up to 30 years into the future. It incorporates a variety of variables to develop these forecasts, including historical water use, ET, future development projections, water loss, conservation measures, and population changes, as described in the previous section.

The model adjusts ET values to reflect climate variability by using higher ET values during warmer, drier years, and lower ET values during cooler, wetter years. In addition, the model integrates regulatory targets, such as indoor water use goals (measured in GPCD) and outdoor plant factor standards. MNWD developed four scenarios: Upper Bound, Mid-Point, Lower Bound, and a scenario evaluated using the Urban Water Use Objective Estimator tool. This tool enables the District to project water use while incorporating evolving regulatory requirements and helps assess whether MNWD's forecasted demand will comply with future standards.

These scenarios were designed to capture a range of potential future demand conditions and to account for uncertainties such as climate variability and evolving conservation efforts. The Lower Bound scenario reflects demand levels close to current usage; however, drier years may lead to higher water use in the future. Whereas wetter years may conversely reduce demand. These fluctuations, along with regulatory compliance requirements, will significantly influence future water demand.

By considering these variables across the selected scenarios, MNWD can better estimate a range of potential future water demands and ensure alignment with regulatory objectives in the years ahead. **Table C-2** describes each scenarios key assumptions.

Table C - 2. Demand Tool Inputs and Forecasting Scenarios

Model Inputs by Planning Scenario	Upper Bound Demand Tool	Midpoint Demand Tool	Lower Bound Demand Tool
Indoor GPCD (Anticipated Planning Range)	55	50	45
Outdoor Landscaping Factor (Residential)	0.7	0.7	0.5
Outdoor Landscaping Factor (CII)	0.7/0.8/1.0	0.7/0.8/1.0	0.6/0.7/0.8
Outdoor Landscaping Factor Recycled (CII)	1	0.8	0.7
Water Loss (Real)	26.5 gal/service connection/day	21.1 gal/service connection/day	15.7 gal/service connection/day
New Development Demand	Increase of 3,300 Dwelling Units and 620,000 commercial square feet		
Turf Removal (Acres)	150,000	250,000	300,000
Annual ET increase (inches)	0.2	0.3	0.4
Precipitation (inches)	NA	NA	NA

The recycled water demand for upper bound, midpoint, and lower bound scenarios is set at the District's actual 2024 recycled water demand, with projections showing a steady increase of 10 acre-feet per year, reflecting the gradual recycled water demand growth observed in past trends and key performance indicator analysis. Recycled water connections are not projected to increase substantially in future years, due to a level of saturation and build-out already achieved for recycled water customers. Over the past 5-years, new customer usage has ranged from 5-15 AF depending on their use type. Therefore, the model assumes a slow increase in recycled water demand to match remaining new customer projections as well as recycled water use patterns. Recycled water customers are a sizeable percentage of the District's customers participating in conservation programs such as turf removal activity and smart irrigation controllers. As such, increases in water efficiency by recycled water customers are anticipated.

A. Upper Bound Scenario:

In the upper bound forecasting scenario, the base model year's total water demand is calculated as the average of past ten years of total water production which is approximately 30,000 acre-feet, capturing the hotter, and drier years with higher potable water demand. New development projections are based on estimates prepared by the District's engineering department, which are kept the same across all scenarios modeled. The following assumptions apply:

Indoor GPCD – The demand forecasting tool considers indoor water use of 55 GPCD in this scenario, consistent with the current indoor water budget of MNWD customers.

Landscaping Factor – As shown in **Table C-2,** the upper bound landscaping factor assumptions are the same as the District's existing indoor and outdoor water budget standards and is not expected to increase in future years.

Water Loss – Water loss is estimated at 26.5 gallons per connection per day, in line with the UWUO regulatory goal. This figure is higher than the District's current water loss rate and is used in the upper bound scenario to represent a higher demand.

Turf Removal – Turf removal is projected at 150,000 acre-feet, which represents the lower end of turf removal volumes over the past five years. This estimate is used to assume minimal conservation efforts, which result in higher overall demand.

Evapotranspiration – Upper bound ET is projected to increase by 0.2 inches per year, slightly below the ten-year historical annual average increase. Since turf removal and ET are correlated (i.e., higher ET typically drives more turf removal due to increased watering needs), a lower turf removal assumption leads to a correspondingly lower ET projection in this scenario.

B. Midpoint Scenario:

In the midpoint forecasting demand scenario, the base model year's total water demand is calculated as the average of past five years of total water usage which is approximately 28,000 acre-feet. Projections for new development are the same across all scenarios. The following assumptions apply:

Indoor GPCD – In this scenario, the tool assumes an indoor water budget of 50 GPCD to account for potential future regulatory standards, which is lower than the District's current indoor water budget of 55 GPCD. The modeled GPCD reflects observed customer use.

Landscaping Factor – This scenario reflects the current outdoor water budget standards, with the landscaping factor for recycled water being projected to decline over time to meet the Urban Water Use Objective regulatory outdoor standard.

Water Loss – Water loss in the mid-point scenario is estimated at 21.1 gallons per connection per day, representing a midpoint between the District's current water loss rate and regulatory targets.

Turf Removal – Turf removal is assumed to total 250,000 acre-feet, aligning with the District's five-year average. Turf removal is positively correlated with ET; therefore, the mid-point scenario assumes a higher ET factor than the upper bound scenario. Specifically, ET is projected to increase by 0.3 inches per year, consistent with the historical 10-year average – higher than the ET increase assumed in the lower bound.

C. Lower Bound Scenario:

In the Lower Bound demand forecasting scenario, the model base year's total water demand is calculated as the average of past three years of total water usage, approximately 26,000 acre-feet. For Lower Bound the following assumptions apply:

GPCD – The demand forecasting tool assumes an indoor water budget of 45 GPCD, which is lower than the District's current water budget of 55 GPCD. The modeled GPCD reflects observed customer use.

Landscaping Factor – For outdoor irrigation, the model incorporates landscaping factors as shown in **Table C-2** for residential, commercial, and recycled water customers. The factors are anticipated to decline compared to the District's current water budget, based on Urban Water Use Objective regulatory standards.

Water Loss – Water loss is estimated at 15.7 gallons per connection per day, reflecting the District's current water loss rate. This reduction in water loss is the result of ongoing efforts by District staff, including proactive leak detection and repair programs. The District's dedicated leak detection team has contributed significantly to reducing system losses over the past few years. The lower bound demand scenario incorporates the District's improved water loss performance, using the current water loss rate, as determined by 5-year averages.

Turf Removal – Turf removal is projected at 300,000 acre-feet, representing the upper end of turf removal levels observed over the past five years. Assembly Bill 1572, which prohibits the irrigation of non-functional turf with potable water, takes effect in 2027 and will be phased in through 2031. This legislation is expected to accelerate turf removal in the near term. ET is projected to increase by 0.4 inches per year, slightly higher than the historical trend observed in the past decade. Although higher ET would typically increase outdoor water demand, the increased level of turf removal offsets this effect. The combined interaction of higher ET and reduced irrigated turf area supports the lower overall demand forecast assumed in this scenario.

D. UWUO Scenario:

In 2018, California enacted legislation creating a new framework for setting urban water conservation standards (California Code of Regulations, Title 23, Division 3, Chapter 3.5: Urban Water Use Efficiency and Conservation). This legislation requires the state to establish water efficiency standards for four key areas: (1) residential indoor water use, (2) residential outdoor water use, (3) commercial landscape dedicated irrigation use, and (4) real water loss in utility distribution systems. These standards are used to calculate the Urban Water Use Objective (UWUO) for each retail urban water supplier.

MNWD evaluated its demand forecasts using the UWUO calculator developed by the Alliance for Water Efficiency (AWE). This tool enables the District to project water use while incorporating evolving regulatory requirements. The analysis also helps assess whether MNWD's forecasted demand will comply with future standards.

Under current regulations, the residential indoor water use standard is 47 GPCD by 2025, decreasing to 42 GPCD in 2030. For residential outdoor irrigation, the plant factor standard is 0.8 from 2025 to 2034, then lowers to 0.63 from 2035 to 2039, and drops further to 0.45 starting in 2040. Special landscape areas, as well as residential and commercial outdoor potable are required to meet a landscape factor of 0.8/0.63 and 0.55 and recycled water areas, are required to maintain a plant factor of 1.0 beginning in 2025. The calculator incorporates the State Water Board's water loss standard of 26.5 gallons per connection per day. **Table C-3** shows regulatory timeline of requirements for indoor GPCD, landscape factor, water loss based on UWUO which is incorporated in the demand forecasting model.

The tool accounts for climate variability by modeling both high and low ET and precipitation scenarios. Overall, the demand projections generated using the AWE tool indicate that MNWD's future water use should trend below the state's UWUO regulatory standards. The UWUO scenario is illustrated in **Table C-3** and **Figure C-5**.

Table C - 3. Demand Forecasting Scenario: Urban Water Use Objectives

Model Input	2025	2030	2035	2040
Residential Indoor (GPCD)	47	42	42	42
Landscape Efficiency Factor Residential Outdoor, Potable	0.8	0.8	0.63	0.55
Landscape Efficiency Factor CII Outdoor, Potable	0.8	0.8	0.63	0.45
Landscape Efficiency Factor Special Landscape Area, Potable & Recycled	1.0			
Landscape Efficiency Factor CII Outdoor, Recycled	1.0			
Water Loss	26.5 gal/service connection/day			
Evapotranspiration	0.3	0.2	0.2	0.2
Precipitation	23.5”	11.5”	11.5”	11.5”

LEF = Landscape Efficiency Factor

Source: California Code of Regulations Title 23. Waters Division 3.5, Urban Water Use Efficiency and Conservation

E. Water Demand Projections:

Table C-4 presents the demand projections for each scenario outlined by customer sector, shown in 5-year intervals. **Figure C-5** provides a comparison of each scenario. Each sector’s projections include estimates of water loss, which refers to the physical losses from the distribution system due to leaks, breaks, and overflows. By including all four demand scenarios, MNWD accounts for uncertainties and variations in future water demand. Factors such as customer conservation efforts and water use efficiency may fluctuate over time, influencing overall water consumption and supply needs. Future demand may not follow historical patterns, therefore, analyzing multiple scenarios as shown in **Figure C-5** and **Table C-4** helps the District prepare for a range of possible futures and supports resilient long-term water supply planning.

Table C - 4. MNWD Future Water Demand Forecast Scenarios (Potable and Recycled)

Year	2025	2030	2035	2040	2045	2050	2055
Total Upper Bound Demand (AFY)	31,052	31,244	30,744	30,546	30,265	29,986	29,850
SFR	17,132	17,225	16,865	16,702	16,486	16,270	16,148
MFR	2,982	2,998	2,935	2,907	2,869	2,832	2,810
Irrigation	3,426	3,445	3,373	3,340	3,297	3,254	3,230
Recycled	4,896	4,946	4,996	5,046	5,096	5,146	5,196
Commercial	2,589	2,603	2,549	2,524	2,492	2,459	2,441
Other	27	27	26	27	25	25	25
Total Midpoint Demand (AFY)	28,101	28,012	27,231	26,750	26,186	25,623	25,205
SFR	15,199	15,108	14,564	14,216	13,814	13,412	13,106
MFR	2,645	2,629	2,535	2,474	2,404	2,334	2,281
Irrigation	3,040	3,022	2,913	2,843	2,763	2,682	2,621
Recycled	4,896	4,946	4,996	5,046	5,096	5,146	5,196
Commercial	2,297	2,283	2,201	2,149	2,088	2,027	1,981
Other	24	24	22	22	21	22	20
Total Lower Bound Demand (AFY)	24,970	24,847	24,033	23,518	22,918	22,318	21,865
SFR	13,149	13,035	12,469	12,099	11,673	11,247	10,918
MFR	2,288	2,269	2,170	2,106	2,032	1,958	1,900
Irrigation	2,630	2,607	2,494	2,420	2,335	2,249	2,184
Recycled	4,896	4,946	4,996	5,046	5,096	5,146	5,196
Commercial	1,987	1,970	1,885	1,829	1,764	1,700	1,650
Other	20	20	19	18	18	18	17
Year	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**	**2055**
Total UWUO Demand (AFY)	28,338	29,535	27,761	27,157	27,480	27,804	28,217
SFR	15,354	16,106	14,911	14,483	14,661	14,841	15,079
MFR	2,672	2,803	2,595	2,521	2,552	2,583	2,624
Irrigation	3,071	3,221	2,982	2,897	2,932	2,968	3,016
Recycled	4,896	4,946	4,996	5,046	5,096	5,146	5,196
Commercial	2,321	2,434	2,254	2,189	2,216	2,243	2,279
Other	24	25	23	21	23	23	23

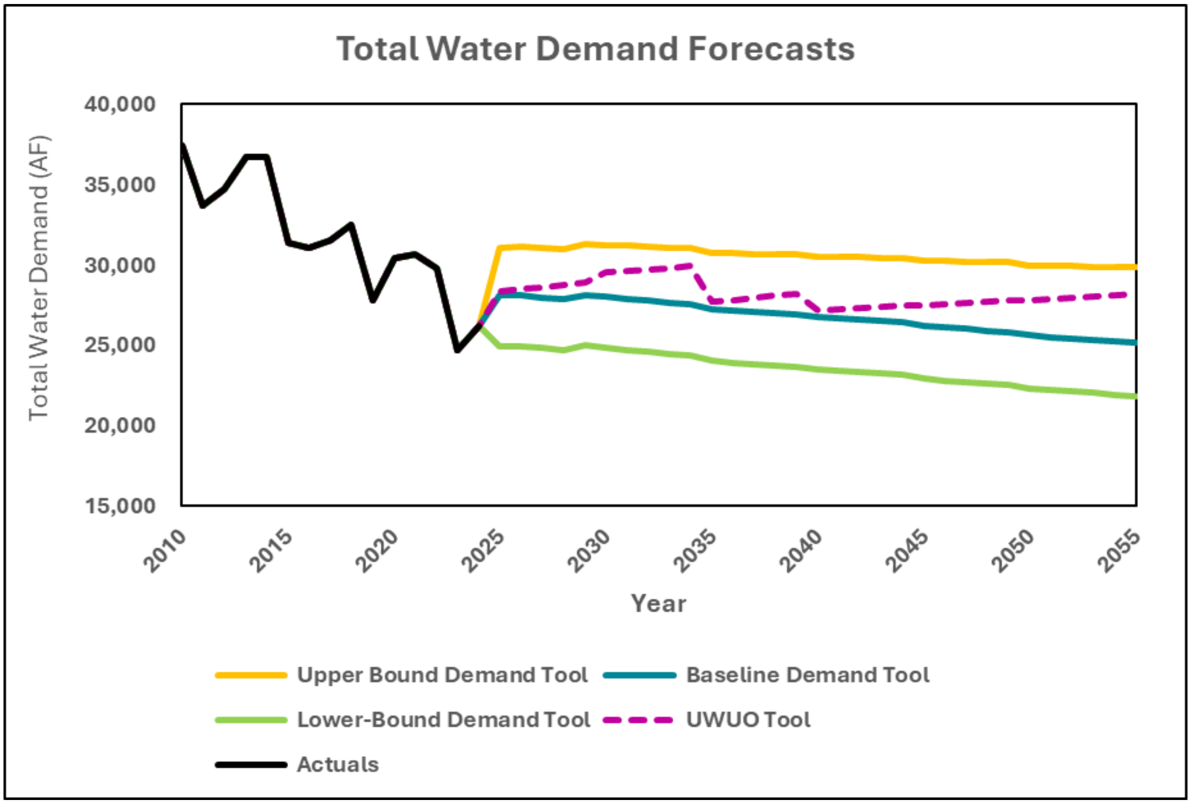


Figure C- 5. Total Water Demand Forecasts Scenarios