Truckee Meadows Water Authority

Quality. Delivered.

2025-2045 Water Resource Plan

To Our Customers

On behalf of Truckee Meadows Water Authority (TMWA), thank you for your interest in our community's water resources. TMWA's Water Resource Plan (WRP), updated every five years, analyzes future conditions and outlines strategies to meet the region's community's drinking water needs. The 2025-2045 WRP is the fifth version since TMWA's inception in 2001.

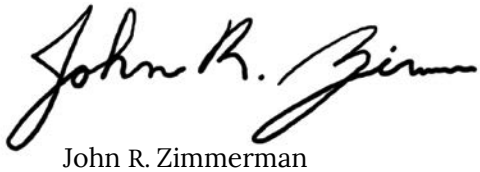
As the region continues to grow, customers often express concerns about the sustainability of water in the Truckee Meadows. This plan provides an overview of the data, science, and strategy used to ensure that there are sufficient water resources to meet population growth and climate variability over the next 20 years and beyond.

Due to decades of forethought and planning, the Truckee Meadows is fortunate to have an extremely resilient water supply. Central to the region's water reliability is the Truckee River Operating Agreement (TROA), which will have been implemented for ten years in December 2025. TROA provides multiple benefits, including allowing TMWA to store large quantities of drought supplies in upstream reservoirs for use during dry years.

While the region currently has sufficient water supplies, TMWA is always looking toward the future. New water resources are being developed, such as bringing Advanced Purified Water technology to the region to turn reclaimed water into drinking water through advanced treatment and natural filtration. TMWA is also expanding its aquifer storage and recovery to inject more treated surface water into groundwater basins to stabilize water levels and to store water for future use. These efforts and more will further the sustainable management of regional water resources.

The WRP is updated every five years, but TMWA—your community-owned water company—works every day to enhance the quality of life in the Truckee Meadows by delivering exceptional, customer-focused water services. It is a privilege to serve this community, and we look forward to answering any questions you may have about this plan.

Sincerely,



John R. Zimmerman

TMWA General Manager

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List of acronyms

AF: Acre Feet

AFA: Acre-feet Annually

AMI: Advanced Metering Infrastructure

APWF: Advanced Purified Water Facility

ASR: Aquifer Storage and Recovery

AWWA: American Water Works Association

BACF: Biological Activated Carbon Filtration

CFS: Cubic Feet Per Second

CIP: Capital Improvement Plan

CTMRD: Central Truckee Meadows Remediation District

DBP: Disinfection Byproduct

DIPS: Donner Interagency Partnership for Stewardship

DPR: Direct Potable Reuse

EDAWN: Economic Development Authority of Western Nevada

FIRO: Forecast-informed Reservoir Operations

FSR: Fish Springs Ranch

GAC: Granular Activated Carbon

GCM: General Circulation Model

GPCD: Gallons Per Capita Per Day

GPM: Gallons Per Minute

GWTF: Groundwater Treatment Facility

ISWPP: Integrated Source Water Protection Plan

JPA: Joint Powers Agreement

LAS: Liquid Ammonium Sulfate

MGD: Million Gallons Per Day

MTRWFP: Middle Truckee River Watershed Forest Partnership

NDEP: Nevada Division of Environmental Protection

NNWPC: Northern Nevada Water Planning Commission

NRS: Nevada Revised Statute

OTR: One Truckee River

PCE: Tetrachloroethylene

PFAS: Per- and Polyfluoroalkyl Substances

PLPT: Pyramid Lake Paiute Tribe

POSW: Privately Owned Stored Water

RCP: Representative Concentration Pathway

RSWRF: Reno Stead Water Reclamation Facility

RWMP: Regional Water Management Plan

SCADA: Supervisory Control and Data Acquisition

SNOTEL: Snow Telemetry

STMGID: South Truckee Meadows Improvement District

SWPA: Source Water Protection Area

TDS: Total Dissolved Solids

TMRPA: Truckee Meadows Regional Planning Agency

TMSA: Truckee Meadows Service Area

TMWA: Truckee Meadows Water Authority

TMWRF: Truckee Meadows Water Reclamation Facility

TRF: Truckee River Fund

TRIGID: Tahoe-Reno Industrial General Improvement District

TROA: Truckee River Operating Agreement

UNR: University of Nevada Reno

USACE: US Army Corps of Engineers

WCM: Water Control Manual

WDWR: Washoe County Department of Water Resources

WRP: Water Resource Plan

WRWC: Western Regional Water Commission

WTP: Water Treatment Plant

WUR: Water Usage Review

C1

Introduction

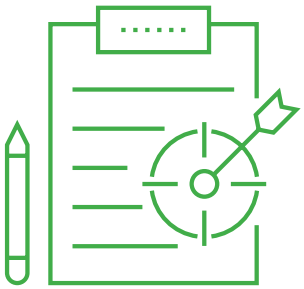
CHAPTER OVERVIEW

This chapter provides an overview of Truckee Meadows Water Authority (TMWA), from defining its current service area to identifying future goals and objectives. It provides an summary of TMWA's customer survey responses and plan update process. A section about regional challenges explains how population growth, climate, and regulations impact water resource management in the region.

CHAPTER AT-A-GLANCE

Highlights of Chapter 1 include:

1. The scope of TMWA's integrated planning
2. How and why TMWA was formed
3. The boundaries of TMWA's service area
4. Key aspects that influence TMWA's water resource planning
5. Regional challenges that may impact future planning
6. The role of public input into this plan



Plan Introduction

Truckee Meadows Water Authority's (TMWA) Water Resource Plan (WRP) is a planning and management plan that integrates into TMWA's facility and financial planning. This WRP document provides a water management outlook that spans a 20-year period and is updated every five years to remain relevant and applicable over time. This iteration is the 2025–2045 Water Resource Plan (2045 WRP), and it builds upon information developed in prior WRPs and other regional planning efforts. Covering how TMWA manages existing and future water resources for the region, it is also a valuable resource for TMWA customers who wish to better understand key aspects of the regional water supply.

TMWA's 2045 WRP describes how the utility will meet the drinking water supply needs of current and future customers in the Truckee Meadows, while factoring in population growth, economic cycles, climate conditions, regulatory changes, and available water supplies.

These important aspects of long-term water supply planning in the Truckee Meadows will be explained in detail throughout the plan, with a focus on the following key topics:

- **Ten years of the Truckee River Operating Agreement (TROA)**: Implemented in December 2015, TROA provides an operational framework that allows for greater flexibility in Truckee River operations and opportunities for additional upstream reservoir storage. This offers significant resiliency to drought. For example, during the most recent drought period, TMWA was able to store over 69,000 acre-feet (AF) of upstream drought supplies by the summer of 2022 in anticipation of continued drought conditions. This is more than double what could be stored pre-TROA, which amounted to almost enough in storage to meet a year's worth of regional water demand. In April of the following year, because of the wet winter, TMWA turned over 28,000 AF of credit water to the Pyramid Lake Paiute Tribe (PLPT) according to the terms of TROA, as drought conditions abated. This is a good example of how TROA is supposed to work, in that TMWA can build up and use drought storage when needed to meet customer demand during a drought. When the drought is over, that excess water is turned over to the PLPT as Fish Credit Water to help the fishery and ecological conditions of the Lower Truckee River. TROA has been implemented successfully for nearly a decade, greatly benefiting the regional water supply in the Truckee Meadows.
- **New service territory and regional growth**: The Truckee Meadows region continues to develop, and TMWA has been diligently working to

ensure there is a reliable water supply to meet future demand. Like previous versions, the 2045 WRP evaluates projected population growth and future water demand projections to assess the resiliency of the region's water resources over the next 20 years and beyond. The plan shows that TMWA has sufficient resources to meet the region's growing water demands.

- **Drought and climate planning**: Drought cycles are common in northern Nevada. A key component of the 2045 WRP builds upon the 2040 WRP by reassessing climate change models and analyzing how additional water resources could address future shortages. Using climate modeling and growth projections, TMWA can analyze potential future conditions to ensure a sustainable drinking water supply is available for the Truckee Meadows. This plan also includes an analysis of 500 years of historical Truckee River hydrology based on paleoclimatic data from a tree ring study to assess how current water resource management would perform under historic drought conditions.
- **Groundwater management**: Groundwater is an important component of the region's water supply, and TMWA actively manages wells in nine distinct groundwater basins in the region to ensure water levels remain stable. The 2045 WRP highlights TMWA's aquifer management programs and describes the possible water quality challenges associated with new groundwater development.
- **Future water resources and technological advances**: While this plan demonstrates that TMWA has sufficient water resources to meet customer demand beyond the 20-year planning horizon, developing new water resources to meet future needs often takes years and even decades. Regional collaboration is vital in this regard, and TMWA and its regional partners are proactively developing innovative new water resources to supplement existing resources. TMWA and the City of Reno are partnering to design and construct Nevada's first advanced purified water treatment facility to expand the use of reclaimed water resources for indirect potable reuse.
- **Source water protection**: Major wildfires in the northern Sierra Nevada Mountains in 2021 spurred TMWA to respond to potential threats to water quality and quantity by partnering with organizations to form the Middle Truckee River Watershed Forest Partnership (MTRWFP). The goal of this effort is to increase the pace and scale of forest restoration work to improve forest health and resilience, protect communities from wildfire impacts, and decrease the chance of high-intensity and high-severity wildfires from occurring near the region's critical drinking water sources of supply.

About TMWA

TMWA is a community-owned water utility overseen by a seven-member board of directors made up of elected officials from the City of Reno, City of Sparks, and Washoe County, as well as an appointed customer advisory committee. Formerly owned by Sierra Pacific Power Company, the water utility began operations as TMWA in June 2001 through a Joint Powers Agreement (JPA) between the City of Reno, the City of Sparks, and Washoe County. TMWA serves approximately 475,000 residents in the Truckee Meadows. TMWA's primary objective is to provide reliable, high-quality water service to its customers in an efficient, cost-effective manner.

One of the main purposes in creating TMWA, as described in the JPA, is to meet the "common

interest in assuring that water resources be developed and managed to fulfill the present and future water needs of the greater Truckee Meadows community" and "to assure sufficient water supply to meet the needs of existing and future development."

The Washoe County Department of Water Resources (WDWR) and the South Truckee Meadows General Improvement District (STMGID) water systems were successfully merged into TMWA, and consolidated operations began on January 1, 2015. This merger made TMWA the primary water purveyor for the Reno-Sparks metropolitan area and portions of unincorporated Washoe County, also known as the Truckee Meadows. As a result, TMWA provides water for over 90% of Washoe County's population.

TMWA's Service Area

TMWA's retail service area covers approximately 170 square miles. The service area expanded by approximately 50 square miles after the consolidation of WDWR and STMGID into TMWA. The service area is within the planning boundary of the Western Regional Water Commission (WRWC) and the Truckee Meadows Regional Planning Agency's (TMRPA) Truckee Meadows Service Area (TMSA), except for several remote satellite service areas in Washoe Valley and near Wadsworth, acquired through the WDWR merger. Figure 1-1 shows TMWA's current service area and key facilities. The Sun Valley General Improvement District and Parr Water System both purchase wholesale water from TMWA and operate their own distribution systems.

TMWA's service area includes nine hydrographic basins, including Lemmon Valley, Spanish Springs, Truckee Meadows, and small satellite systems in Washoe Valley, Pleasant Valley, the Tracy Segment, and Truckee Canyon. TMWA also manages groundwater in Honey Lake Valley as part of the Fish Springs Ranch Water Supply Project. Chapter 2 includes a map of the hydrographic basins.

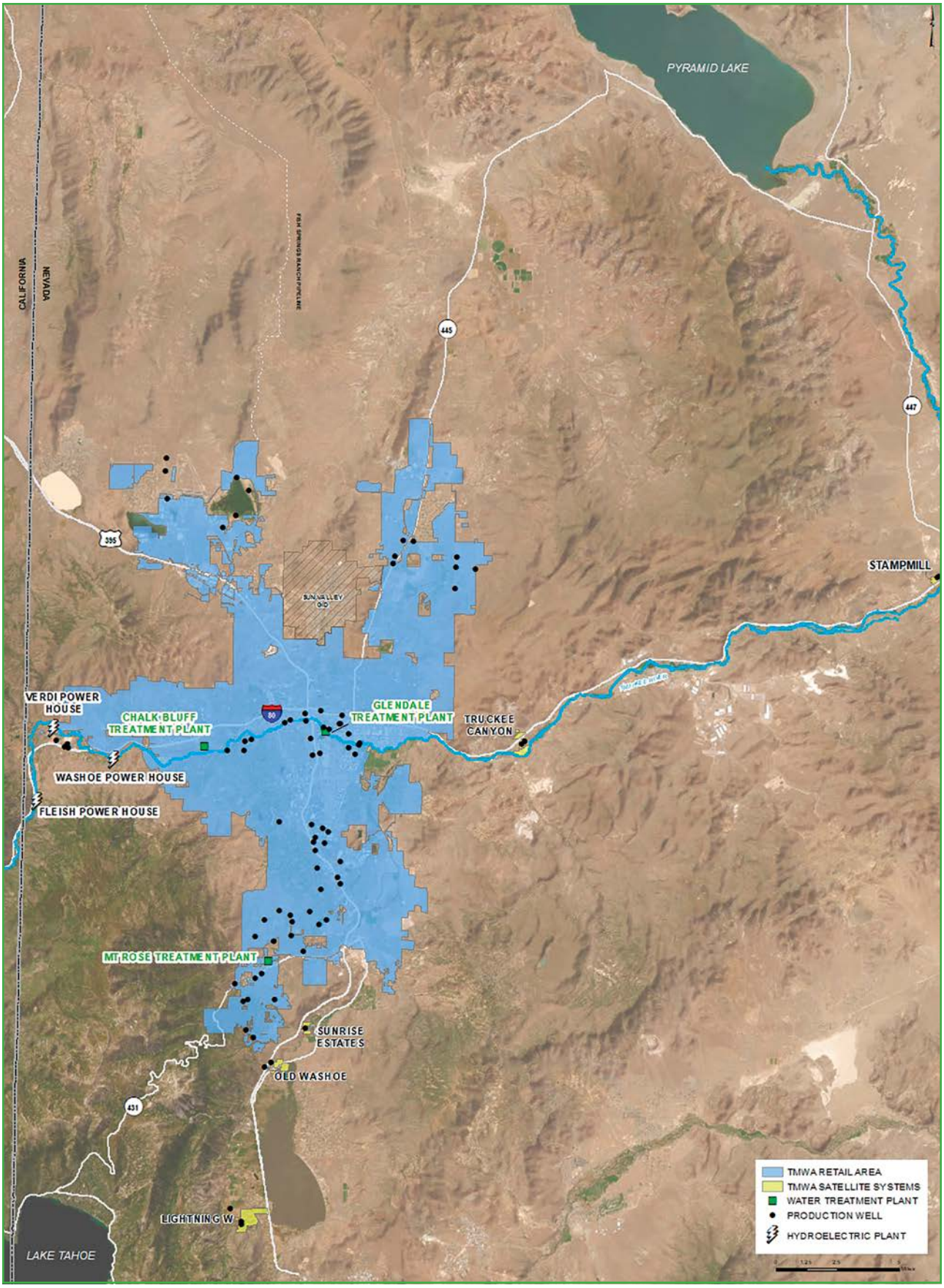


FIGURE 1–1: MAP OF TMWA'S SERVICE AREA, WATER TREATMENT PLANTS, ACTIVE PRODUCTION WELLS, (EXCLUDING FISH SPRINGS RANCH) HYDROELECTRIC PLANTS, AND SATELLITE SYSTEMS

Plan Goals and Objectives

As the region's primary water provider, TMWA is responsible for ensuring water supply reliability for the Truckee Meadows. The WRP update process allows TMWA to assess changes to the system that have occurred over the previous five years and to ensure that water supplies are adequate under a range of future conditions. This section outlines the goals and objectives for the 2045 WRP.

Goals

- Ensure TMWA has adequate water resources to meet the community's needs over the next 20 years and beyond.
- Evaluate and implement innovative solutions to best manage water resources in the region.
- Maintain community confidence in TMWA's planning process.
- Recommend management strategies and polices to guide TMWA over the next five years.

Objectives

- Provide an overview of TMWA's current water resources and available water rights.
- Analyze alternative supply and demand scenarios to determine the resiliency of TMWA's resources.
- Assess potential impacts of climate change on regional water resources.
- Evaluate TMWA's current water management and conservation strategies and implement changes as future conditions warrant.
- Identify future water resource opportunities and water management strategies.
- Provide opportunities for input from the public and TMWA's Board throughout the planning process.

Plan Scope

TMWA updates its WRP every five years to address significant changes in the water system and region. TMWA follows an integrated planning approach, and several other planning documents are relied upon in conjunction with the WRP, including TMWA's Facility Plan and TMWA's Funding Plan (see Figure 1-2).

The scope of TMWA's water planning process, as defined by its JPA directive, does not provide for municipal sewer, water reclamation, flood control, storm water drainage, or groundwater remediation. Those functions are planned for by Reno, Sparks, and Washoe County.

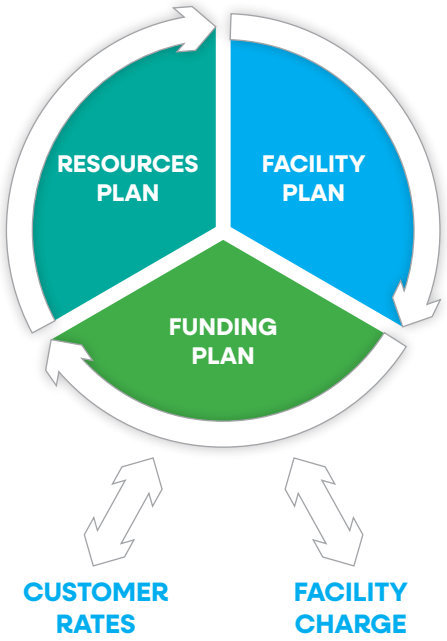


FIGURE 1-2: VISUAL REPRESENTATION OF TMWA'S INTEGRATED PLANNING APPROACH

All water-related utility planning efforts, including TMWA's WRP and TMWA's Facility Plan, are incorporated into the WRWC's Comprehensive Regional Water Management Plan (RWMP), most recently updated in 2021.

The WRWC is charged with improving water resource planning at the regional level (including water, wastewater, stormwater, and flood control) and facilitating coordinated resource management among the Truckee Meadows member entities.

Following an established process, the WRP focuses on planning and management of potable water supplies to meet existing and future water demand, within the scope of its existing retail service area (and other areas where it is deemed appropriate to receive TMWA water service).

TMWA Customer Survey Summary

Since TMWA was formed, semi-annual satisfaction surveys have been providing insight into customer experiences and perceptions of the utility. In 2022, the survey expanded to include questions about water resource management. Survey findings since then have revealed a solid tie between perceptions of water resource management and customer satisfaction.

The most recent survey analysis from over 1,500 customers (Fall 2024) demonstrates the awareness of TMWA's primary conservation program is very high, with 94% reporting they are aware of Assigned Day Watering. Additionally, 80% of customers expressed positive agreement with the statement, "TMWA's water supply is well managed."

Regarding questions about the future of TMWA's water supply, the following topics of interest were reported by most survey respondents:

71%
Maintaining the high quality of drinking water

64%
Keeping water affordable

52%
Have a sufficient water supply during drought

50%
Meeting the needs of a growing population

Concerns about drought and a growing population are frequently expressed in customer comments. The WRP is centered around these key topics, including strategies to ensure a sustainable water future as the region continues to grow.

Plan Update Process

Throughout the planning process, public feedback was gathered on the WRP and regional water resource matters. TMWA staff also received important perspectives from TMWA's Board of Directors (Board) throughout the update process. An initial presentation was provided to the Board in April 2024 to kick off the planning process for the WRP. An interactive display and presentation about the 2045 WRP was included at Smart About Water Day in May 2024. In August 2024, TMWA held a workshop with its Board to discuss recommended actions and management strategies for the 2045 WRP. At this workshop, recommended actions from the previous plan were reviewed, in addition to discussions about water rights, economic development, TMWA's regional influence, and innovative future water resources.

In April 2025, TMWA presented a draft plan to its Board. During May through July 2025, TMWA will present the draft WRP to its Standing Advisory Committee, the Northern Nevada Water Planning Commission (NNWPC), and public presentations. Additionally, TMWA is providing public access to the draft WRP and an electronic comment form for feedback on its website from May through July 2025. A final draft of the WRP will be presented to the Board in September 2025, with projected final approval in October 2025.

Regional Challenges

There are multiple regional challenges that require innovative and long-term water resource management solutions. TMWA's strategies to respond to the challenges described are explained in greater detail in the following chapters.

- **Population Growth**: The Truckee Meadows region has been steadily growing. Additionally, new businesses and industries are coming to the region. Growth impacts all aspects of regional water management from drinking water availability to wastewater effluent management. By working collaboratively with other regional entities on water issues arising around growth, TMWA aims to use resources efficiently and sustainably to reliably supply water to the region into the future. New growth outside of TMWA's existing service territory can be difficult to plan for and may have unexpected impacts on regional water resources. Those new growth areas potentially include the introduction of new developable lands due to the sale of federal lands, new uses of effluent reuse water (especially those that are outside of the Truckee River basin), and new industries with high water demands. TMWA is always working to stay ahead of these types of new growth patterns to ensure that the region's limited water resources are used sustainably and efficiently.
- **Climate**: Abnormal changes in weather patterns and prolonged droughts are key issues that may impact future water supplies. Temperatures are expected to continue to increase in the region, which impacts water demand, precipitation type, evapotranspiration, and more. Increased temperatures and decreased precipitation can also exacerbate high-intensity and high-severity wildfires, which can potentially cause water quality impacts to surface water resources. These potential issues must be considered when planning for future water resources for the community. Planning for droughts is inherent in all TMWA's water resource management strategies. This WRP analyzes how TMWA plans to address future climate uncertainty through a range of strategies from increasing aquifer storage and recovery to adding new off-river resources to forming partnerships to increase forest management work to protect the headwaters.

- **Regulations**: At a state and federal level, new regulations are arising around water quality and quantity. For instance, new federal water quality regulations for per- and polyfluoroalkyl substances (PFAS) have been established by the US Environmental Protection Agency with legally enforceable levels becoming effective in 2029. However, since compliance is determined every quarter using the previous 12 months of data, sources must be compliant by the end of 2027. Making sure TMWA's current water resources meet the increasingly stringent federal and state safe drinking water standards continues to be a challenge as new emerging contaminants are added to the drinking water standards. Potential new groundwater quantity regulations, related to water rights, can also make planning challenging. For example, sustainable groundwater withdraw amounts are based on perennial yield estimates. The accuracy of these estimates, and the associated permitted water rights is being assessed. TMWA closely follows how the Nevada State Engineer defines the perennial yield for each hydrographic basin, as these amounts may change over time. Through monitoring and modeling groundwater levels, TMWA strives to keep aquifers in balance with the best available data about groundwater recharge. Following all proposed regulations and legislative updates is an ongoing priority for TMWA staff and Board leadership.

Summary

The 2045 WRP builds upon previous plans and continues to establish the importance of long-range planning to address changing conditions in the Truckee Meadows. TMWA's service territory has grown significantly since its inception. Challenges faced by the region in 2025 are different from those faced when TMWA was first established in 2001. TMWA aims to provide a reliable, high-quality water supply for its customers, and the WRP is a critical guide to ensure TMWA continues to meet that goal. The following chapters describe TMWA's current water resources, current and future planning conditions, water conservation strategies, future water resources, watershed and environmental protection efforts, and recommended actions.

C2

Current Water Resources

CHAPTER OVERVIEW

This chapter details TMWA's current water resources: from surface water reserves stored in six upstream reservoirs to 86 production wells in nine groundwater basins around the Truckee Meadows. It also outlines the current management of the Truckee River, including the Truckee River Operating Agreement (TROA), and the ways TMWA manages its water rights. The region's diverse water resource portfolio allows TMWA to efficiently utilize available water by managing how surface water, groundwater, and storage reservoirs are used.

CHAPTER AT-A-GLANCE

Highlights of Chapter 2 include:

1. Management of the Truckee River and creek resources
2. TMWA's groundwater production
3. Groundwater recharge and management
4. TMWA's conjunctive use strategy
5. An overview of TMWA's surface water and groundwater rights
6. Reclaimed water use and advanced purified water development

This chapter describes TMWA's diverse portfolio of surface water and groundwater resources to ensure the region's water supply is resilient and reliable. Through the integrated operation of surface water treatment and groundwater production facilities, conjunctive use makes it possible for TMWA to reliably meet demands under drought and non-drought conditions. Lastly, a summary of TMWA's surface water and groundwater rights portfolio is presented, providing an overview of the water resources available to serve existing and future customers.

The Truckee River Watershed

A watershed is an area where runoff resulting from rainfall or snowmelt collects and drains to a common point, such as a river or lake. Reno and Sparks are in the Truckee River watershed, which spans California and Nevada and encompasses approximately 3,060 square miles. The Lake Tahoe Basin is part of the Truckee River watershed, with the Truckee River as the only outlet of Lake Tahoe. The length of the Truckee River is 121 miles from Lake Tahoe to its terminus at Pyramid Lake. This watershed is unique in that it does not flow to the ocean like many other watersheds in the United States. There are many tributaries to the Truckee River, including the Little Truckee River and Donner Creek in California and Hunter Creek and Steamboat Creek in Nevada.

The aerial photo included here shows Lake Tahoe on the bottom left and Pyramid Lake on the top right.

Surface Water Resources

The Truckee River is the primary source of water for the Reno-Sparks area, providing 80–85% of the region's drinking water. TMWA has two surface water treatment plants (WTPs) on the Truckee River: Chalk Bluff and Glendale. Chalk Bluff WTP is TMWA's largest, capable of producing approximately 90 million gallons per day (MGD) of treated water. Raw water at the Chalk Bluff WTP is treated via a conventional water treatment process through the settling of heavy solids, screening, flocculation and sedimentation, filtration, and chlorination. The plant is designed for modular expansions to have an ultimate treatment capacity of 120 MGD.

Glendale WTP is TMWA's supplemental treatment facility and can produce approximately 32 MGD. The plant is typically operated on a seasonal basis (May through October) to meet summertime demand. Additionally, groundwater from six wells can be pumped to Glendale to be treated for arsenic and blended with surface water to meet water quality standards for distribution into the system. Glendale WTP employs the same treatment process as the Chalk Bluff WTP.

Mt. Rose WTP is a small surface-water treatment plant that started operating in 2022. The plant treats Whites Creek water to supplement groundwater supplies on the Mt. Rose Fan in the south Truckee Meadows and produces up to 4 MGD when sufficient creek flows are available. This plant furthers TMWA's conjunctive use of its surface water and groundwater supplies, allowing TMWA to rest production wells (passive recharge) and use surface water to meet

CHALK BLUFF WATER TREATMENT PLANT

customer demand. Additionally, the Mt. Rose WTP allows for the injection of treated surface water into the aquifer (active recharge). This improves water resource sustainability in the area and allows for groundwater level recovery. Groundwater elevations were in decline when the area was completely reliant on the groundwater supply to serve residents (prior to water utility consolidation).

TMWA has a robust monitoring and operating plan to manage Whites Creek water, which has been approved by the Nevada State Engineer and accepted by the Federal Water Master and Nevada Division of Wildlife. To ensure the Whites Creek ecosystem remains healthy and all downstream water rights are satisfied, minimum bypass flows and flushing flows below the Mt. Rose WTP are required.

Truckee River Watershed and the Truckee River Operating Agreement (TROA)

The Truckee River watershed is predominantly snow fed. Mountain snowpack acts as a natural reservoir, accumulating in the winter and melting in the spring and summer months when more water is needed downstream for irrigation and outdoor watering. The Truckee River is the only outlet from Lake Tahoe and is regulated by a dam at Tahoe City that controls the top 6.1 feet of the lake, equaling 744,600 acre-feet (AF) of storage. Truckee River flows are highly dependent on Lake Tahoe's surface elevation at any point in time throughout the year.

MT. ROSE WATER TREATMENT PLANT

In addition to Lake Tahoe, other reservoirs within the Truckee River watershed include Donner Lake, Independence Lake, Stampede Reservoir, Boca Reservoir, and Prosser Reservoir (Figure 2-1). TMWA owns water rights in Donner and Independence Lakes, referred to collectively as TMWA's Privately Owned Stored Water (POSW). Together, this amounts to 27,000 acre-feet annually (AFA) of surface water storage. In dry years, when river flows are low and additional water resources are required in the Truckee Meadows, POSW can be released to help meet those demands.

TROA, implemented in December 2015, governs how the Truckee River system is operated. The Federal Water Master manages reservoir releases and the flow of water in the Truckee River system to ensure requirements under TROA are satisfied for all water rights holders, including TMWA. TROA ratified the interstate allocation of water between California and Nevada, ensuring Nevada will receive 90% of Truckee River water.

The required flow rates at the state line are known as Floriston Rates. These rates of flow are measured at the US Geological Survey (USGS) Farad Gage, near the California-Nevada border, and require flows of 500 cubic feet per second (CFS) from March through September and 400 CFS from October through February. Floriston Rates can be reduced under certain TROA conditions. Reduced Floriston Rates require either 300 CFS or 350 CFS at the Farad Gage and go into effect from November 1 through March 31, whenever the water surface elevation of Lake Tahoe is lower than 6,226 feet. When the Floriston Rates are met, the needs of all the downstream water right holders can be served as governed by the Orr Ditch Decree and regulated by the Federal Water Master.

FIGURE 2-1: DIAGRAM OF THE TRUCKEE RIVER SYSTEM

The Federal Water Master is responsible for releasing water from Lake Tahoe and the other federal reservoirs (Stampede, Boca, and Prosser) as needed to meet Floriston Rates until this water is depleted. Lake Tahoe is considered the best barometer regarding the health of the region's water supply. When the elevation of Lake Tahoe approaches its natural rim (6,223 feet), Floriston Rates drop off shortly thereafter. When Lake Tahoe's elevation drops below the natural rim, water stops flowing from the lake into the Truckee River. Under TROA, a drought situation occurs when Floriston Rates are not projected to be maintained past October 31st, or the projected elevation of Lake Tahoe on or before November 15th will be less than 6,223.5 feet. TROA requires the Federal Water Master to determine by April 15th of every year whether a drought situation exists based on the above criteria. Figure 2-2 presents the history of recorded month-end elevations for Lake Tahoe from 1986-2024.

TROA provides for modified river and reservoir operations that provide multiple benefits for water users, including benefits to threatened and endangered fish and significant improvements in drought storage for TMWA. TROA also satisfies provisions of the Truckee-Carson-Pyramid Lake Water Rights Settlement Act signed by Congress in 1990. The five signatory parties of TROA include California, Nevada, TMWA, the Pyramid Lake Paiute Tribe (PLPT), and the US Department of the Interior.

TROA addresses two key elements that differentiate it from former operations: 1) the ability of a water right holder, such as TMWA, to exercise a portion of its water rights by storing water (credit water) that would otherwise have been released from storage or passed through the reservoirs to the Truckee River; and 2) the ability to exchange (or trade) stored water between Truckee River reservoirs. TROA allows TMWA to accumulate more stored water and carry over these drought reserves when droughts persist through multiple years. Over time, TMWA has

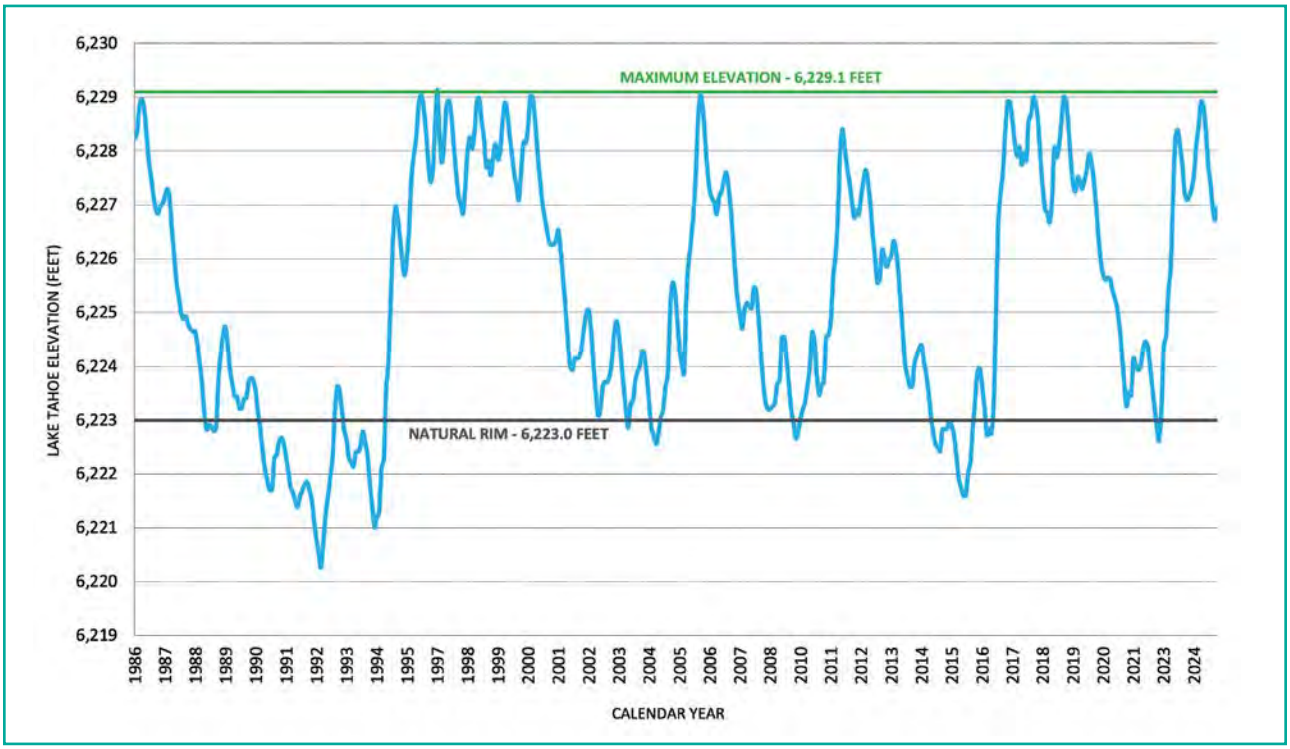


FIGURE 2-2: LAKE TAHOE ELEVATIONS FROM 1986 TO 2024

the potential to accumulate significant drought reserves, ensuring the Truckee Meadows will be protected from prolonged droughts compared to operations prior to TROA being implemented.

Operationally, during a designated drought, when Floriston Rates cannot be met especially during the summertime peak demand season, TMWA may require the release of POSW and other stored water and possibly increase groundwater pumping. When a drought persists, TMWA is able to increase its stored water under TROA and carry over these reserves in upstream reservoirs as credit water from one year to the next. There are several categories of stored municipal credit water under TROA, including emergency, firm, and non-firm. Emergency and firm storage do not suffer evaporative losses unless it is the only water in a reservoir, whereas non-firm water shares evaporative losses proportionately with all other water in a reservoir and can spill when a reservoir fills. In non-drought years, TMWA's non-firm stored water above the base amount is automatically converted to fish credit water, which can be used by PLPT for the recovery of endangered fish and to support the fishery in the lower Truckee River.

Groundwater Resources

PRODUCTION WELLS

TMWA has groundwater production wells throughout the Truckee Meadows and surrounding basins. Groundwater supplements surface water supplies and provides water to the satellite water systems where surface water is not available. The utility operates and maintains 86 active production wells in nine distinct hydrographic basins, with 71 wells available to meet customer demand in TMWA's main service area and 15 wells that provide water to the satellite systems. TMWA's wells range in capacity from approximately 100 gallons per minute (GPM) to 3,000 GPM.

Generally, TMWA relies on surface water as much as possible year-round to satisfy customer demand and only begins activating groundwater production wells later in the spring when outdoor irrigation increases demand, and as needed during drought years. Some production wells, located at the far reaches of the distribution system, may continue to pump during the winter months to meet customer demand and provide greater system reliability.

TMWA operates a wellfield in Honey Lake Valley, Nevada which is a product of the Fish Springs Ranch Water Supply Project completed by Vidler Water Company in 2008. The basin is located approximately 38 miles north of the Reno-Sparks area. The project is currently permitted to provide up to 8,000 AF of groundwater supply to the Truckee Meadows region each year.

TMWA must contend with production well capacity declines over time. Capacity declines are typically caused by well screen plugging resulting from chemical reactions that occur between the groundwater, aquifer material, and well screen material. To mitigate this, TMWA manages an annual well rehabilitation program. This program actively monitors each production well and prioritizes well rehabilitation based on observed production declines. Drilling a new well to mitigate the loss of groundwater production is considered a last resort due to the expense associated with large-diameter well drilling. However, when replacement wells are necessary, they are constructed with superior casing and screen material to increase well longevity. TMWA's groundwater supplies act as an additional resource to the main surface water delivery system and must be diligently maintained for system redundancy.

SATELLITE SYSTEMS

TMWA operates five satellite systems that are solely dependent on groundwater, and therefore, the wells operate year-round in these areas. These satellite systems were developed as stand-alone subdivisions which required sufficient groundwater resources to meet the full build-out requirements of the development. Three of these systems (Sunrise, Old Washoe Estates, and Lightning W) are in the Pleasant Valley and Washoe Valley areas south of Reno. The Truckee Canyon system is located at Mustang just east of Sparks, and the Stampmill system is located near Wadsworth.

GROUNDWATER QUALITY

Several hydrographic basins that provide source water to TMWA have degraded groundwater quality due to natural or man-made contaminants. TMWA treats groundwater where water quality issues exist, as all water delivered to customers must meet the standards set by the US Environmental Protection Agency, Nevada Division of Environmental Protection (NDEP), and Northern Nevada Public Health.

To mitigate groundwater quality concerns in the Truckee Meadows hydrographic basin (Basin 87), TMWA works with the Washoe County Central Truckee Meadows Remediation District (CTMRD) to monitor the historic tetrachloroethylene (PCE) plume; five TMWA wells continue to be treated for PCE. Treatment for PCE is completed at the wellhead via air-stripping. Several of the wells contaminated with PCE also have high levels of naturally occurring arsenic and must be treated at the Glendale WTP.

In the Spanish Springs hydrographic basin (Basin 85), nitrate from septic tanks and natural sources continues to increase in shallow groundwater in the western portion of the valley. A groundwater treatment plant is being considered for the area, which is described in Ch. 5. In the Lemmon Valley hydrographic basins (Basin 92A and 92B) there are solvent-related contaminant concerns, and TMWA is working with NDEP to monitor the plume.

ACTIVE AND PASSIVE RECHARGE

TMWA implements both active and passive groundwater recharge to help restore groundwater levels and support natural recovery of the aquifer. Active recharge is the process of injecting treated surface water into the ground during the winter months when demand is lower. Groundwater is stored in the aquifer and used during summer months and drought years.

FOG OVER FISH SPRING RANCH (HONEY LAKE VALLEY, NV)

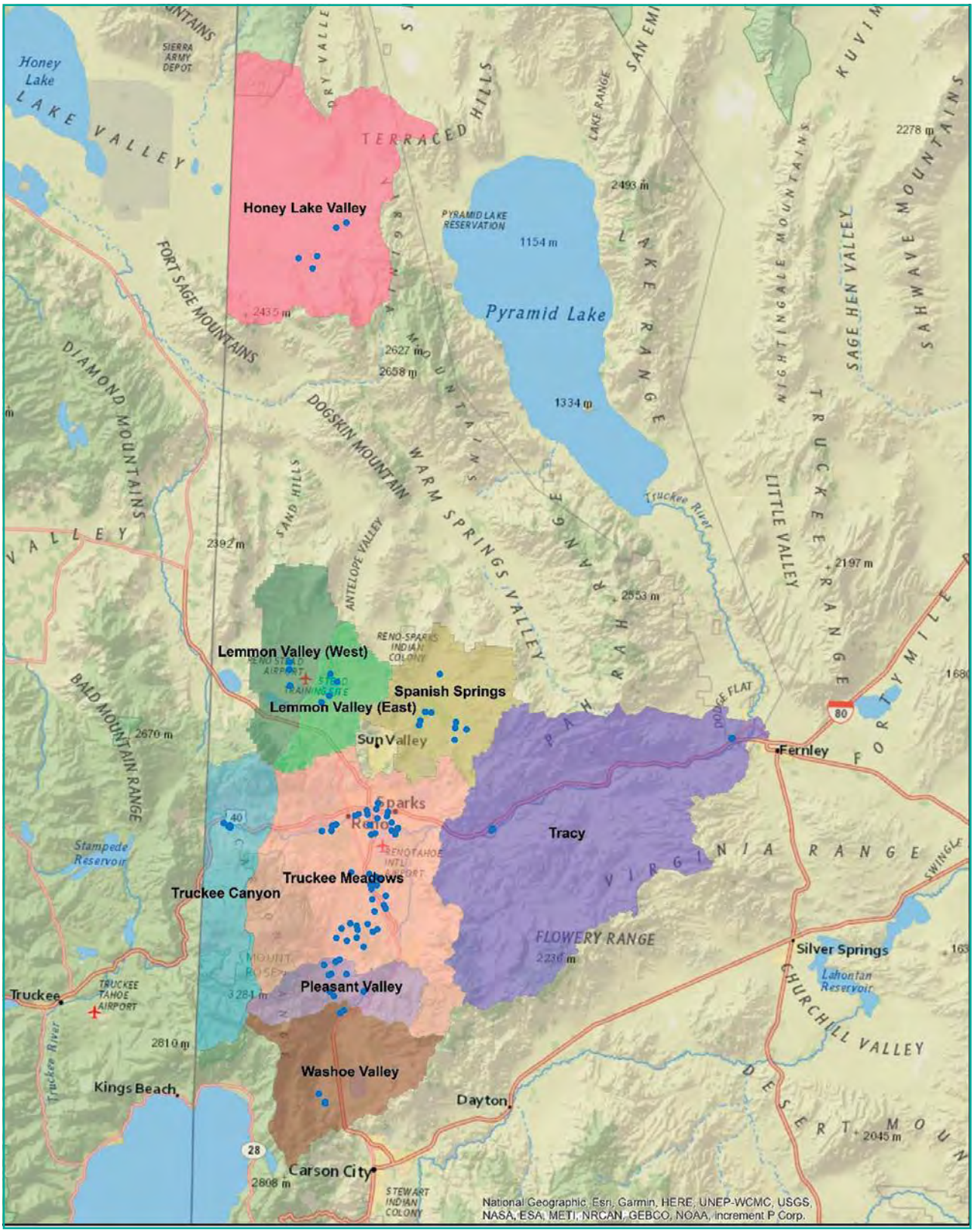


FIGURE 2–3: MAP OF HYDROGRAPHIC BASINS AND TMWA WELLS

The storage of surface water in the aquifer is known as aquifer storage and recovery (ASR). ASR can help increase water supplies and is being further developed to increase TMWA's overall storage portfolio. For planning purposes, TMWA developed ASR targets range from approximately 3,000 AFA (current capacity) to 5,500 AFA (three-to-five-year planning period).

TMWA has expanded surface water infrastructure to areas previously reliant solely on groundwater which allows TMWA's wells to be rested in a process known as passive recharge. Passive recharge supports TMWA's ongoing efforts of maintaining sustainable groundwater resources through the application of conjunctive use and ASR. TMWA's active and passive recharge program has helped improve or stabilize groundwater levels in TMWA's service area. See Figure 2-3 for the location of each hydrographic basin.

The recharge program is evaluated by TMWA on an annual basis and modified to provide the maximum benefits to aquifer health and water quality. The State of Nevada permits TMWA's ASR program, which requires extensive monitoring to ensure groundwater quality is maintained. Expansion of TMWA's ASR program is discussed in Ch. 5.

TMWA's ASR program is key in helping maintain groundwater levels across the region, but the formation of disinfection byproducts (DBPs) during storage can be problematic. To address this issue, TMWA completed multiple studies to explore the efficacy of two pretreatment methods: granular activated carbon (GAC) adsorption and injection of liquid ammonium sulfate (LAS) to reduce the free chlorine residual. Both treatment methods are effective in mitigating DBP formation, and TMWA will continue to explore these options, as well as others, to ensure high water quality is maintained and the ASR program can be expanded.

GROUNDWATER LEVELS

Groundwater levels are evaluated across all nine hydrographic basins managed by TMWA. In most basins, groundwater levels are stable or trending upward. The only area exhibiting a downward trend is the Fish Springs Ranch (FSR) area in Honey Lake Valley (Basin 97). This decline is attributed to TMWA's increased groundwater production (over a minimal baseline amount of pumping) from the FSR wellfield, which began in 2019 to test system functionality, enhance basin monitoring, and offset groundwater pumping in the North Valleys. Despite the observed decline, aquifer conditions in Basin 97 remain within acceptable thresholds. Additional details on aquifer status for each of the nine basins can be found in Appendix A.

Conjunctive Use

Conjunctive use allows TMWA to optimize surface water, groundwater, and drought reserves to maximize the efficient use of water resources systemwide. This strategy allows sustainable management of resources under both drought and non-drought conditions.

The majority of TMWA's water supply (80–85%) used to meet annual demand comes directly from the Truckee River. Chalk Bluff WTP's ability to operate year-round allows TMWA to efficiently utilize its surface water resources in any type of year, thereby preserving groundwater for use during the peak summertime demand months. In the summer months of the driest years when Floriston Rates cannot be met, privately owned stored water from Independence and Donner Lakes and credit water from upstream reservoirs can be released to help meet customer demand. TMWA has only had to use a small amount of its

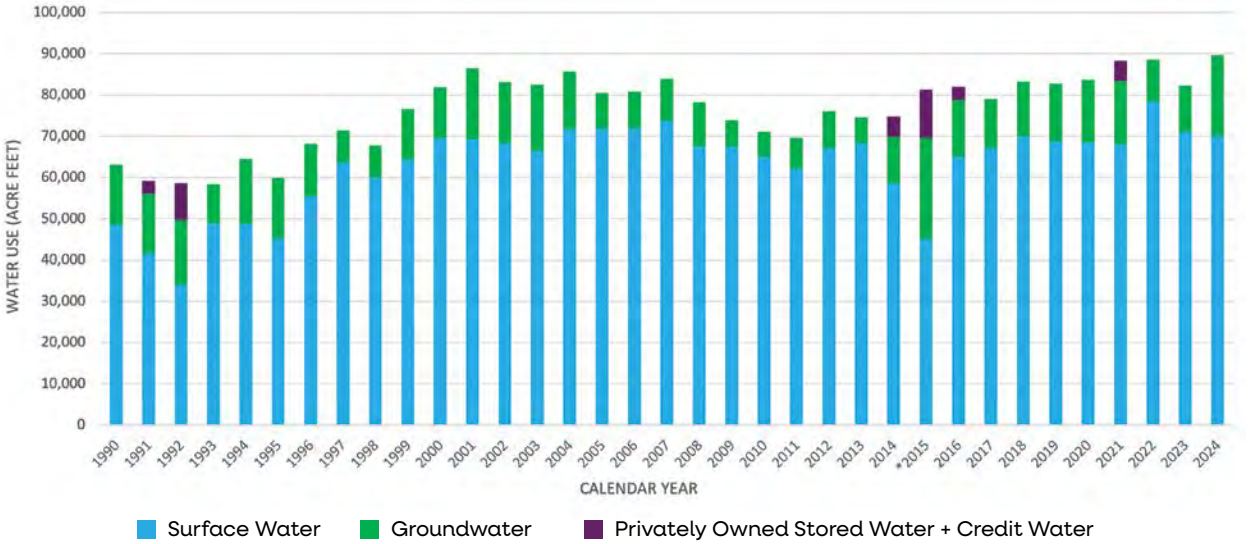


FIGURE 2–4: SOURCES TO MAKE ANNUAL TMWA WATER SUPPLY FROM 1990 TO 2024

stored water in six of the last 30 years, including 2015 which had the lowest snowpack year on record. Figure 2-4 shows the historical sources of TMWA's water supply on an annual basis.

Advanced Purified Water Facility At American Flat

The Advanced Purified Water Facility (APWF) at American Flat is an indirect potable reuse and groundwater recharge initiative led by a regional partnership between TMWA and the City of Reno. This project will diversify the region's water supply and prove up a technology that can be used elsewhere in the Truckee Meadows in the future to further increase water resources for the region. Projects like this are among a growing trend across the country, especially in the arid western states.

The APWF will provide a new water supply and groundwater bank that can be relied on during even the most severe drought periods, in addition to providing an effluent management solution for the Reno Stead Water Reclamation Facility (RSWRF).

For the last 16 years, the University of Nevada, Reno, environmental engineering consultants, and regional water and wastewater agency staff have conducted research and testing of advanced water treatment technologies. Reno began the effort in 2008 by investigating the technical feasibility of treatment processes that are more suitable than reverse osmosis to Nevada's geographic location and environment.

The APWF includes the conveyance of Category A reclaimed water from RSWRF across Lear Boulevard to the APWF. The APWF treatment process includes ozone disinfection, coagulation/flocculation, biological activated carbon filtration (BACF), GAC, per- and polyfluoroalkyl substances (PFAS) treatment, and UV Disinfection (Figure 2-5). Finished water will be conveyed to the American Flat injection well site prior to groundwater injection. The APWF facility is designed for continuous flows of up to 2 MGD.

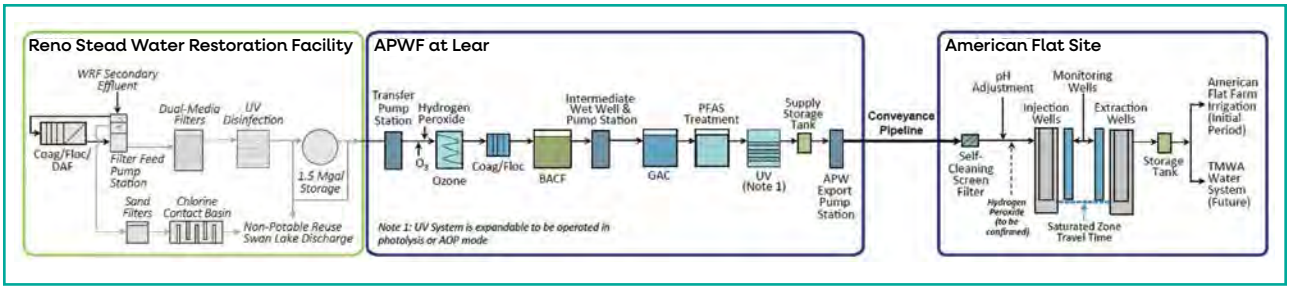


FIGURE 2–5: DIAGRAM OF TREATMENT PROCESS FOR THE APWF AT AMERICAN FLAT PROJECT

The City of Reno and TMWA have many outreach strategies including presenting at professional conferences, providing regular website updates, bill inserts, email updates, local news articles and interviews, a mobile educational trailer with graphics and displays, community and neighborhood meetings, and tours of other project sites with elected officials. In addition to past outreach activities, the APWF is being designed to have a public education center with exhibits and learning material for community tours.

The APWF project is expected to begin construction in 2026 and be operational by 2030.

Water Rights

AVAILABLE WATER RIGHTS

The Orr Ditch Decree (the Decree), issued in 1944, adjudicated water rights to the Truckee River and its tributaries. The Decree sets the total volume of mainstem and tributary water rights at approximately 226,000 AF. Although water rights can be divided and converted from one use to another (e.g., agriculture to municipal use), the total number of surface water rights available from the Truckee River cannot change from the amount of water rights set by the Decree.

Originally, most water rights were for agricultural purposes within the Truckee Meadows. The Decree also granted municipal water rights to TMWA's predecessor, Sierra Pacific Power Company. These decreed municipal water rights, along with storage from Donner and Independence Lakes, were used to satisfy customer demand until the 1960s.

Since that time, TMWA and its predecessor have been acquiring decreed agricultural water rights, either through direct purchases or contributed by new development, and converting them to municipal use through the State Engineer's change application process. Figure 2-6 shows the conversion of decreed agricultural rights to municipal use over time. To date, TMWA has acquired over 73,000 AF of mainstem Truckee River agricultural rights and converted them to municipal use to meet the wholesale and retail will-serve commitments of its customers. Additionally, TMWA has also acquired approximately 9,000 AF of creek rights tributary to the Truckee River, mostly all converted to municipal use. Therefore, a total of approximately 82,000 AF of Truckee River decreed water rights have been converted to TMWA. Presently, TMWA estimates there are approximately 42,000 AF of mainstem Truckee River rights, mostly in decreed agricultural use, available for future dedication for municipal use.

Although TMWA is allowed to annually exercise, or pump, the total volume of groundwater rights described in Table 2-1, it actively manages its groundwater pumping within each basin to maintain the long-term sustainability of the aquifers. This strategy considers water rights,

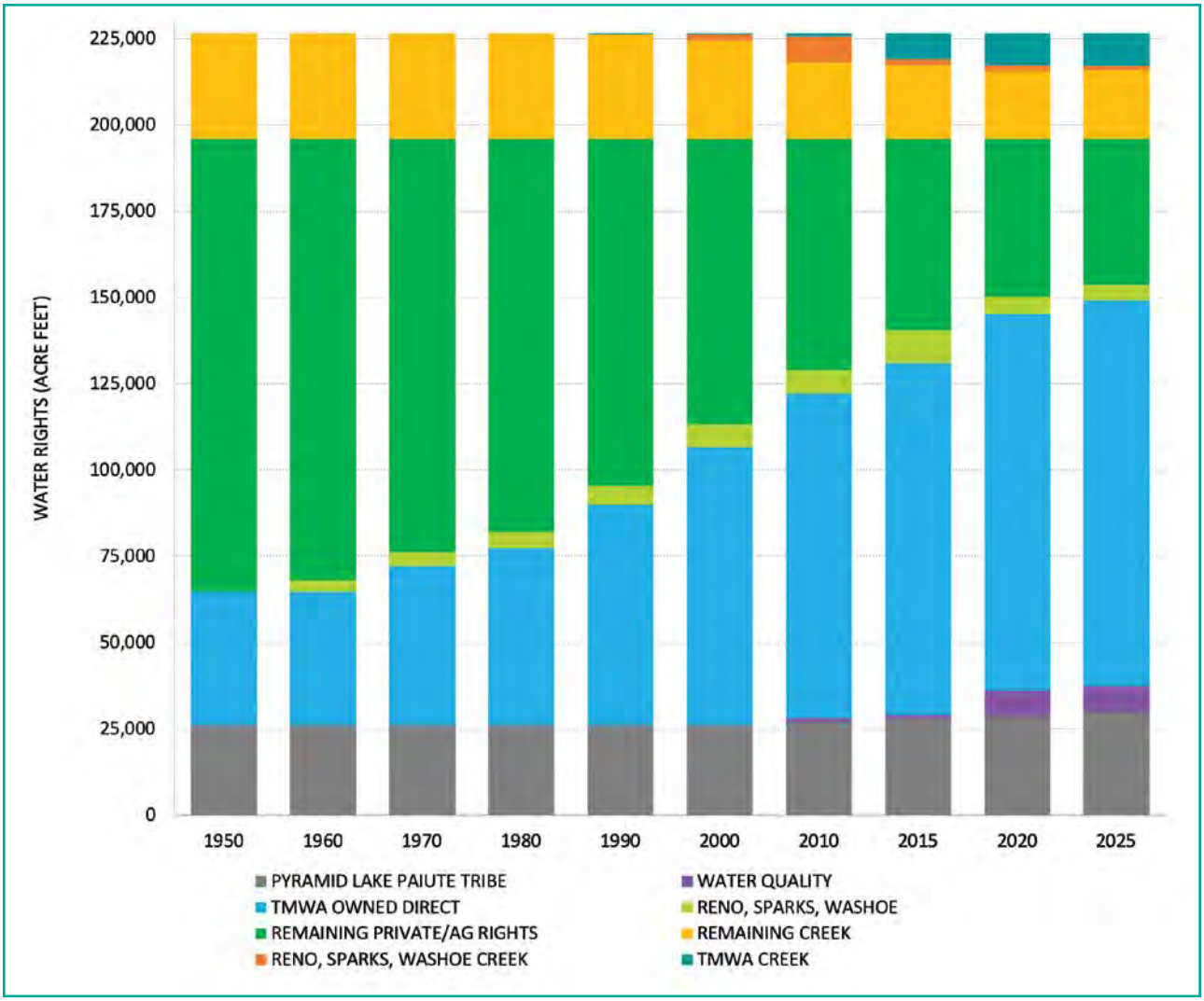


FIGURE 2–6: CONVERSION OF TRUCKEE RIVER WATER RIGHTS OVER TIME

historical groundwater pumping, water levels, and climate variability. For example, TMWA's total annual groundwater pumping over the last five years has ranged from 10,558 AFA to 15,943 AFA, which demonstrates the variability in pumping depending on whether it is a wet year or a drought year. TMWA's conjunctive use program, plus active and passive recharge, promotes sustainable groundwater management.

As summarized in Table 2-1, TMWA's surface and groundwater resources, plus TMWA's POSW in Donner and Independence Lakes, comprise the water rights portfolio that makes up the water supply for TMWA's customers.

RULE 7

TMWA continuously works to maintain and improve the yield it receives from its existing water rights–decreed, converted agricultural rights, POSW, and groundwater–to generate a water supply that will meet the current and future needs of its customers. TMWA holds sufficient water rights to meet customer demand (89,600 AF of demand in 2024).

To meet the additional water demand resulting from growth and new development, TMWA requires applicants for new or modified water service to dedicate acceptable water rights to TMWA to obtain a will-serve commitment. A will-

TABLE 2–1: TMWA WATER RIGHTS

TMWA WATER RIGHTS	ACRE FEET
Surface Water–Original M&I decreed rights	38,806
Surface Water–POSW	27,000
Surface Water–Converted decreed ag. rights	82,396
Total Surface Water Resources	**148,202**
Groundwater Rights By Basin	
Tracy	524
Spanish Springs	3,708
Truckee Meadows	23,845
Pleasant Valley	3,860
Washoe Valley	219
Truckee Canyon–Verdi	337
West Lemmon Valley	944
East Lemmon Valley	1,570
Honey Lake Valley–Fish Springs Ranch	8,000
Total Groundwater Resources	**43,007**
TOTAL WATER RESOURCES	**191,209**

serve commitment is a letter from TMWA stating that it has sufficient water resources to provide the requested water delivery and that the project is within TMWA's service territory.

Before accepting a water right for a will-serve commitment, TMWA researches a water right's source, priority, quantity, dry-year supply and yield, and ownership. In this manner, TMWA ensures that existing commitments can be sustained in perpetuity. Alternatively, developers can purchase an allocation of water rights from TMWA's inventory of uncommitted water rights. Rule 7 water rights are TMWA's bank of uncommitted resources made available to sustain growth in our region. The price for purchasing an allocation from TMWA's inventory is based on TMWA's costs incurred in acquiring, processing, and maintaining the water rights.

Reclaimed Water

TMWA does not directly supply reclaimed water but actively works with regional partners to utilize reclaimed water in efficient and innovative ways. Reclaimed water is derived through the wastewater treatment process, producing effluent water that is suitable for reuse in many applications that are regulated by NDEP.

Reclaimed water has been used for irrigation throughout the Truckee Meadows for years. One of the local benefits of using reclaimed water is that it conserves potable (drinking) water and provides a reliable, drought-resistant water source, even in times of restriction and conservation. Reclaimed water currently represents an approximately 10% offset to the region's potable water used for irrigation demand (Table 2-2).

Reclaimed water also provides a more predictable way to help water reclamation facilities ensure compliance with discharge permit limitations

Nevada Water Law Basics

Generally, groundwater and surface water rights in Nevada are administered and managed by the State Engineer. Nevada water law follows the prior appropriation doctrine (also known as "first in time, first in right"), which stipulates that those who first appropriated a quantity of water and put it to beneficial use have the right to continue to use that water. Irrigation, mining, recreation, industrial, and municipal uses are examples of beneficial uses. Senior water rights holders (i.e., those with earlier priority dates) are protected even if new uses for a water source are allocated. Junior water right holders cannot impinge on the rights of senior water right holders. TMWA holds surface water rights to legally divert water from the Truckee River and groundwater rights to pump groundwater to provide water service to customers.

TABLE 2–2: 2024 RECLAIMED WATER USE IN THE TRUCKEE MEADOWS

FACILITY	ACRE FEET
Truckee Meadows Water Reclamation Facility (Reno/Sparks Customers)	4,431
Truckee Meadows Water Reclamation Facility (TRIGID Customers)	489
South Truckee Meadows Water Reclamation Facility	3,023
Reno-Stead Water Reclamation Facility	630
Total Reclaimed Water Usage	**8,573**

when compared with river discharge or other effluent management strategies. However, in most cases, the use of reclaimed water requires return flow replacement water rights to be dedicated to a use known as instream flow. This practice allows for the effluent water to be used while not harming downstream water right holders, as described below.

Return Flow Management

Commercial and industrial development downstream of the Truckee Meadows has been increasing. The Tahoe-Reno Industrial Center (TRI Center) and other developments require water for potable and non-potable uses. Once built out, TRI Center expects to have 10,000 AFA of non-potable demand and approximately 2,300 AFA or more of potable demand. The Cities of Reno and Sparks have agreed to deliver up to 4,000 AFA of reclaimed water to the TRI General Improvement District (TRIGID) for resale to customers in TRI Center. When effluent generated at the Truckee Meadows Water Reclamation Facility (TMWRF) is used as reclaimed water and not returned to the Truckee River, secondary permits require a return flow component to the Truckee River from other water sources. Daily accounting is performed and tracked by both TMWA and the Federal Water Master per the Orr Ditch Decree.

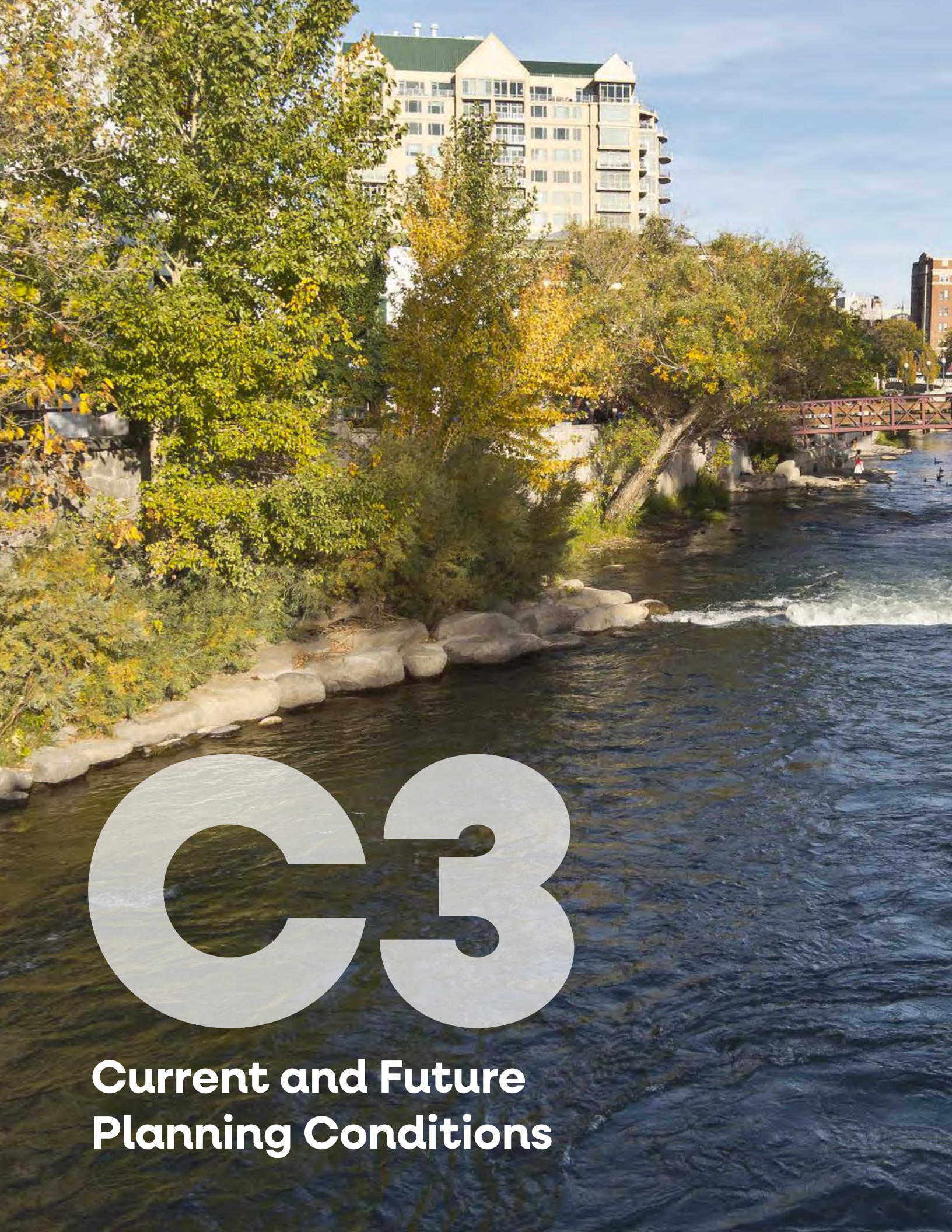
To promote the efficient use of Truckee River resources, Reno, Sparks, and TMWA collaborated to create a Return Flow Management Agreement with TRIGID in 2018. Since then, TMWA has helped manage the return flow water rights to the Truckee River to ensure that the river and downstream water rights holders are not adversely impacted.

In July 2024, TMWRF started delivering effluent for TRIGID to meet their customer's demand. This new source of water has proven beneficial to TRIGID and their customers due to both quantity and quality parameters for their varied commercial and industrial customers. The return flow requirements associated with TRIGID's demands, are met with a combination of TRIGID's Truckee River resources, Nevada Department of Transportation's resources, and TMWA's resources. As allowed by TROA, TMWA has certain water resources that can support reclaimed water service and are either not subject to the return flow requirement (i.e., groundwater component and POSW) or resources which otherwise can satisfy the return flow requirement to the Truckee River. This promotes the efficient use of regional water resources.

Beyond TRIGID's new use of effluent from TMWRF, TMWA is tasked with tracking the water demands and ensuring the correct amount of return flow water is left in the river so that downstream users are not affected by the reuse of TMWRF water. Recycled water provides multiple benefits by reducing TMWRF capital and operating expenses, while at the same time benefiting Truckee River water quality. TMWA's management of return flow replacement water rights for TRIGID helps keep natural Truckee River water flowing in the Truckee River at equivalent flow rates as if water was discharged from TMWRF as treated effluent. This example of return flow management not only helps protect river water quality, but it also maintains the same amount of flow in the river through a mixture of both groundwater and surface water sources. Recycling water in this way helps address the water demand for TRIGID, addresses effluent water management challenges, and satisfies TMWRFs required return flow amounts, as administered by the Federal Water Master.

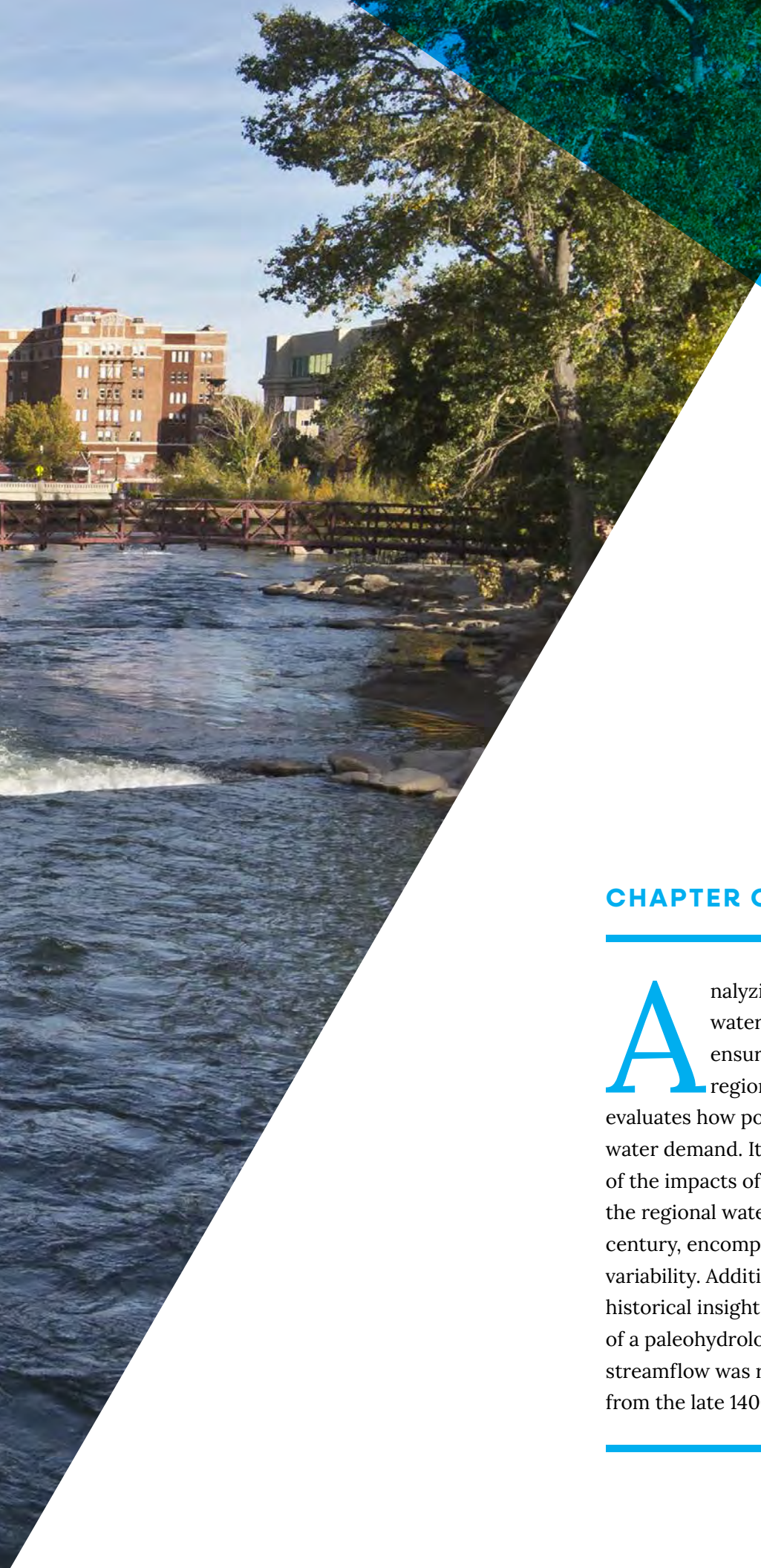
Summary

TMWA holds sufficient water rights to meet current customer demand as well as future customer demand over the next 20 year planning horizon. TMWA's water rights portfolio contains a mix of Truckee River, creek water, and groundwater resources. Water from the Truckee River makes up most of the water supply for the Truckee Meadows. With the implementation of TROA, TMWA has more flexibility to store additional water in upstream reservoirs, which can be released as needed. Through conjunctive use, TMWA maximizes the use of surface water in wet years, thereby preserving groundwater capacity for high demand periods. In dry years, TMWA can utilize a combination of increased groundwater pumping and releases from drought storage when Truckee River flows are reduced. While TMWA manages its existing resources, it will continue to evaluate additional, viable resources to ensure that the region has a resilient and sustainable water supply. Through greater utilization of the area's effluent resource, TMWA is maximizing the region's available resources.



C3

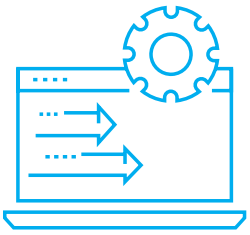
Current and Future Planning Conditions



CHAPTER OVERVIEW

Analyzing factors that can impact future water supply and demand is critical to ensuring continued reliability of the region's drinking water. This chapter evaluates how population growth will affect future water demand. It also describes TMWA's analysis of the impacts of climate change scenarios on the regional water supply through the end of the century, encompassing a wide range of hydrologic variability. Additionally, this analysis includes historical insight into droughts, referencing results of a paleohydrology study where Truckee River streamflow was reconstructed using tree ring data from the late 1400s through 2003.

CHAPTER AT-A-GLANCE



Highlights of Chapter 3 include:

1. 20-year water demand projections
2. How TMWA has managed water resources through historic droughts
3. An overview of historic droughts from the 1400s to present
4. How aquifer storage and recovery can increase resiliency to climate variability
5. Future growth and development in the Truckee Meadows
6. Water system resiliency during emergencies

This chapter presents projections of increased customer demand due to future development and evolving water use patterns in the region. Additionally, it provides an overview of current and future planning conditions in the Truckee Meadows and examines the reliability of TMWA's water supply under historical conditions and projected future drought scenarios based on climate change projections. It also explores drought severity in the Truckee River system based on paleohydrologic conditions derived from new research on tree ring data.

TMWA's primary goal is to maintain a reliable water supply for its current and future customers under a broad range of potential future conditions over the 20-year planning horizon and beyond. The historic hydrologic record over the past 125 years provides valuable insight into the extreme variability of regional water supply conditions. However, given the potential impacts of climate change, examining alternative future scenarios to assess how the region's water supply may be affected is also important. While TMWA is skilled at managing water resources in a highly variable climate, it recognizes that new adaptive strategies may be necessary to ensure a reliable water supply in an uncertain future.

Future Water Demand Projection

To estimate future annual water demand in the Truckee Meadows, TMWA creates water demand models using the following data sources: Washoe County population, historical water services in TMWA's service area, and historical water use data. Population growth is the basis for projecting the number of future water service connections. TMWA's population projection is based on a logistical growth curve and provides an estimate of population equilibrium, assuming current trends and conditions continue. Using its population projection, TMWA creates water demand projections by modeling future water services in each customer class.

As shown in Figure 3-1, TMWA's 20-year projection estimates that water demand will increase 18% from approximately 90,378 acre-feet (AF) in 2025 to 107,178 AF in 2045. Annual water demand can be quite variable and fluctuate significantly from one year to the next due to seasonal weather patterns, such as hot, dry summers or cool, wet springs.

TMWA's forecast is statistically similar to the Truckee Meadows Regional Planning Agency's (TMRPA) Consensus Forecast, which is used in

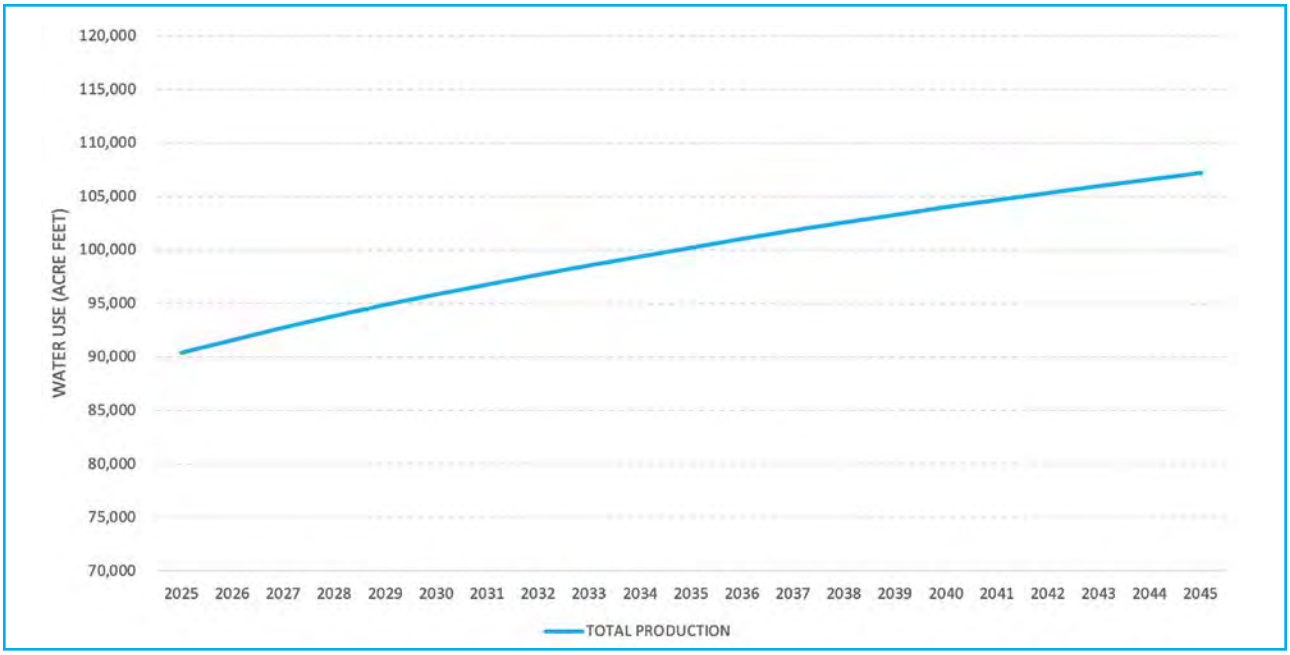


FIGURE 3–1: TMWA'S WATER DEMAND PROJECTION FOR 2025 TO 2045

regional planning for Washoe County. The total water demand projection for all of Washoe County derived from the 2024 Consensus Forecast shows a demand of 113,873 AF in 2044. This forecast differs from TMWA's because it is a projection for all of Washoe County, whereas TMWA's forecast only covers its service area. The Western Regional Water Commission (WRWC) assesses this forecast to ensure the sustainable water yield will be sufficient to meet projected water demands, as described later in the chapter.

Droughts

The Truckee River is a crucial component of the overall water supply for the Reno-Sparks area, which is located in the driest state in the country. The Truckee Meadows receives an average of only 7.5 inches of rain annually. Due to its proximity to the Sierra Nevada mountains, the climate in northern Nevada is marked by highly variable weather patterns with alternating periods of wet and dry years. Water supply planning based on historical droughts is crucial in helping TMWA plan for future water policies and resources.

Why Is Snowpack So Important?

A good indicator of an impending dry year is snowpack accumulation. Measured on April 1st of each year by the Natural Resource Conservation Service (NRCS), the snow water equivalent (SWE), or the water content of the snowpack, is used to forecast the amount of water that will run off each spring to help fill upstream reservoirs and provide river flows. The NRCS uses snow telemetry (SNOTEL) sites (see photo below) throughout the mountains that have automated equipment that measures snowpack. These measurements are key for TMWA to effectively manage its reservoirs and water supply each year.


PHOTO: JEFF ANDERSON

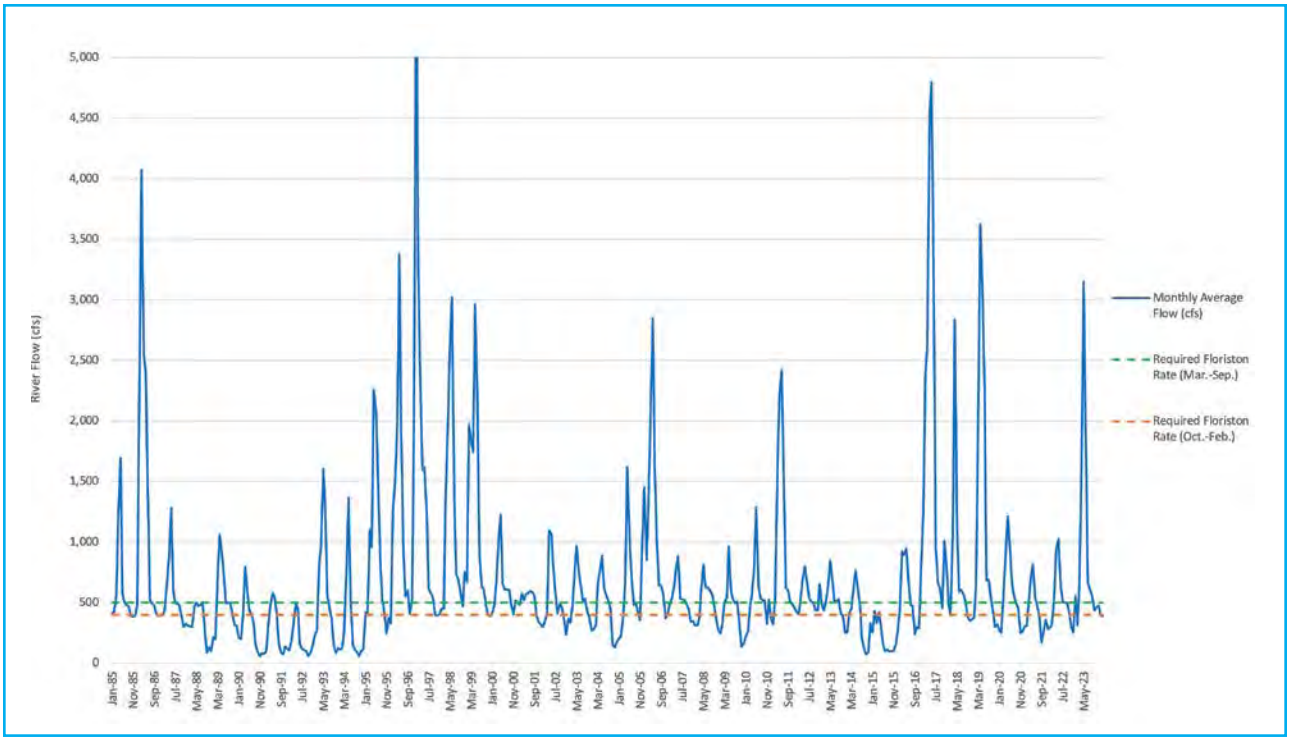


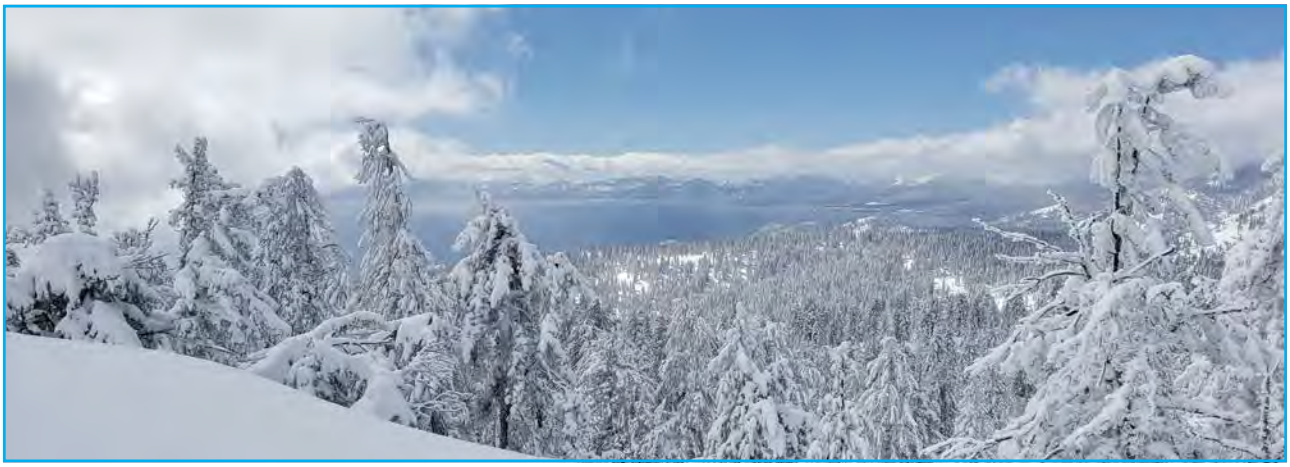
FIGURE 3–2: AVERAGE MONTHLY TRUCKEE RIVER FLOWS AT USGS FARAD GAGE FROM 1985–2024

Since 1985, there have been multiple droughts varying in severity within the Truckee River system: 1987–1994, 2001–2004, 2007–2010, 2012–2016, and 2020-2022. The 1987–1994 drought was the worst drought in over 115 years and has been the basis for TMWA's drought planning to date. Although the 2012–2016 drought was unprecedented in terms of its severity (2015 had the lowest recorded snowpack and runoff in history), it was shorter in duration than the eight-year 1987–1994 drought.

Over the past five years, the region has experienced three drought years (2020-2022), one significantly above-average water year (2023), and a near average year (2024). Understanding the historic hydrology of the Truckee River helps TMWA plan for the future. When upstream reservoirs are full (including Lake Tahoe), required rates of flow (Floriston Rates) can usually be met for the first two to three years of a prolonged drought, regardless of its severity. As a drought persists and Lake Tahoe approaches or goes below its natural rim, river flows will decrease soon thereafter, especially during the critical irrigation season. When upstream storage is depleted and springtime runoff is well-below average in successive years, Floriston Rates have dropped as early as the middle of April (2015) (Figure 3-2).

Water levels in Lake Tahoe are depleted gradually over two to three years in an extended drought but can refill rapidly with a large precipitation event or a large snowpack year, thereby ending a drought period. An example of this occurred most recently in 2023. At the beginning of December 2022, Lake Tahoe was almost half a foot below its natural rim and ended up coming within 8/10th of a foot from filling completely by July 2023. This was a significant recovery year and effectively ended the 2020-2022 drought.

In the past, TMWA's drought reserves have been used to meet customer demand during critically dry years. Donner and Independence Lakes, TMWA's privately-owned storage reservoirs,



WINTER IN THE LAKE TAHOE BASIN

typically fill each spring; however, Donner Lake may not reach full capacity in extremely dry years. During periods of extreme drought, TMWA has had to use drought reserves to meet customer demand as early as June (2015). Figure 3-3 shows that TMWA has only had to use its stored water to meet customer demand six times over the last three decades. Even in years when Floriston Rates fall short or cannot be met during the irrigation season, flows in the Truckee River are typically sufficient to meet wintertime demand by late fall (since TMWA's wintertime customer demand is approximately a quarter of that in the summertime).

Paleohydrologic Droughts

While TMWA has experienced periods of extreme drought in recent years, well-documented mega droughts have also occurred in the Truckee River

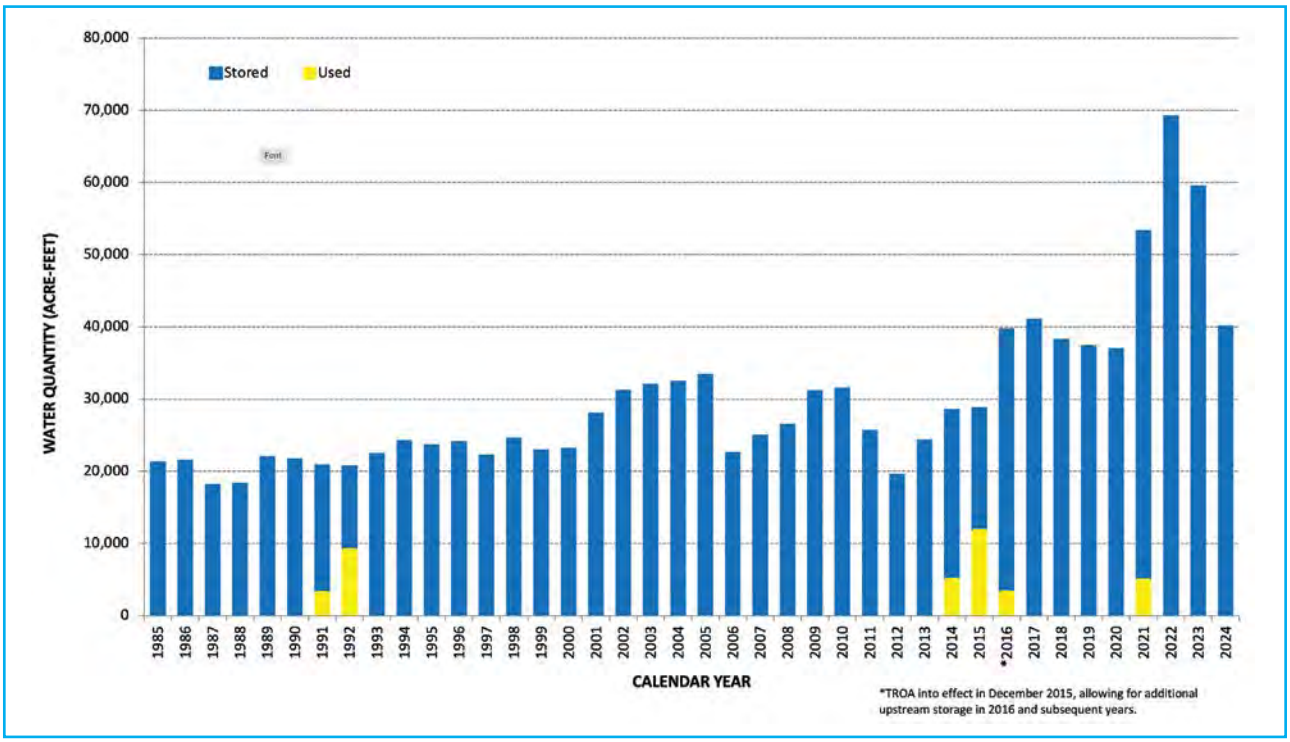


FIGURE 3–3: TMWA MAXIMUM UPSTREAM STORAGE VS. THE AMOUNT OF STORED WATER USED FROM 1985 TO 2024

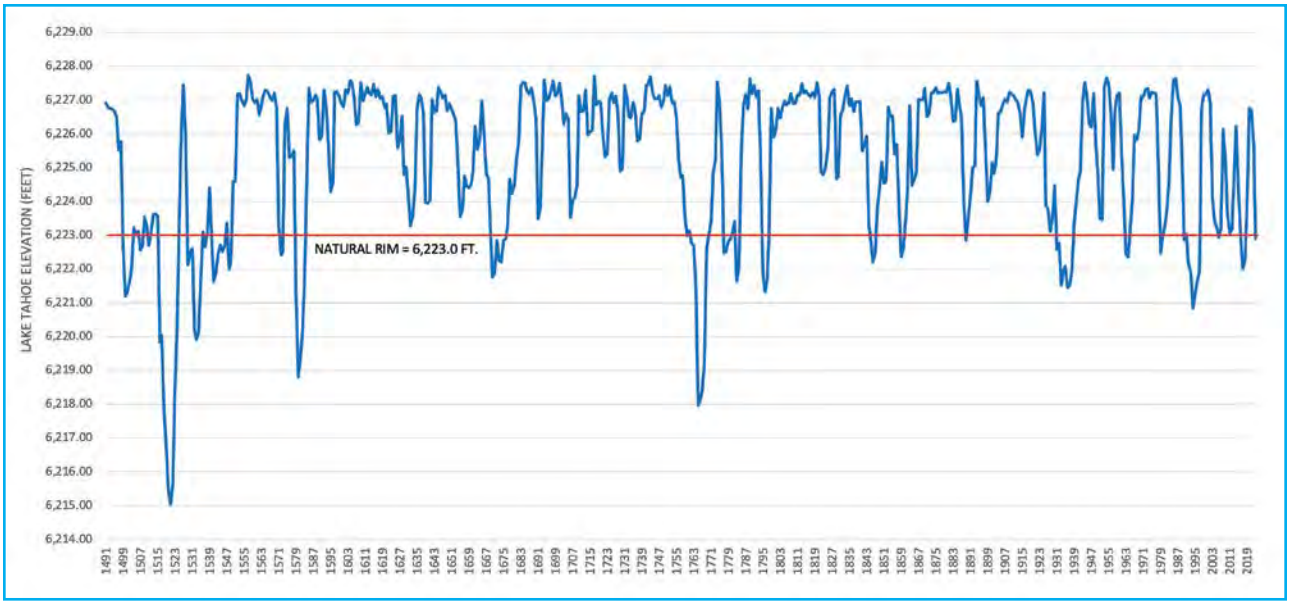


FIGURE 3–4: LAKE TAHOE MINIMUM ANNUAL ELEVATION (1491–2021)

basin prior to modern record keeping, which were much more severe. The term paleohydrology refers to hydrologic data that occurred before the existence of observed or gaged records. A 513-year (1491-2003) reconstruction of annual paleohydrologic streamflow was recently developed using a combination of tree-ring chronologies for the Truckee River at Farad (CA-NV state line)[1]. Running these constructed streamflows through the Truckee River Operating Agreement (TROA) planning model helps shed light on how droughts over the recent historical period (1901-2024) compare with droughts of the paleohydrological period over the previous 400 years (1491-1900) under current rules and required reservoir operations in the Truckee River system. The model incorporates the current system of dams and reservoirs on the Truckee River system (including Lake Tahoe dam) and the operational constraints under TROA.

In both intensity and duration, droughts during the paleohydrologic period (1496–1900) far exceeded those experienced in recent history (1901–2024). Results suggest that significantly longer and more severe droughts occurred during this period, including a 30-year event (1496–1526) when Lake Tahoe would have remained below its natural rim for over ten consecutive years, resulting in an elevation at least eight feet below the natural rim under current reservoir operations (Figure 3-4). This drought may have also been part of a much longer dry period (1496–1554), briefly interrupted by a few average years and one wet year.

Figure 3-4 further illustrates two additional droughts that were more severe than any in recent history. During the 1575–1586 drought, Lake Tahoe would have remained below the rim for over five years, dropping four feet below the rim. Similarly, during the 1755–1774 drought, the lake would have been below the rim for over ten years, with water levels dropping more than five feet at its lowest point.

Streamflow reconstructions for the paleohydrologic period provide valuable insight into the extreme hydrological variability of this region. Both the elevation of Lake Tahoe (Figure 3-4) and annual discharge at the USGS Farad gage experienced a high degree of variability in

[1]*Harris, V.M., and A.Z. Csank. 2023. A new 500-year reconstruction of Truckee River streamflow. Dendrochronologia*, 79, 126093.

the volume, timing, and form of precipitation over the previous 500 years. These trends are also observed under current and future climate scenarios, which is why TMWA will continue to monitor and adapt to hydrologic and climatic variability in the region.

Climate Change

While the Truckee Meadows' climate is characterized by cyclical patterns of high and low precipitation, changing climatic conditions may prove more challenging for water supply reliability in the future. Climate change is defined as shifts in global or regional weather conditions that persist over multiple decades or longer[2]. To design effective water supply strategies to adapt to potential shifts in future climate conditions, TMWA incorporates the best available scientific information regarding regional climate change into its planning process. It is uncertain how exactly the climate will change in the Truckee Meadows and the surrounding region, but altered precipitation and temperature patterns have the potential to affect both water supply and demand.

The Lake Tahoe and Truckee River basins are snowmelt driven systems where snowpack accumulates during the winter and melts during the spring and summer months. Climate science suggests that regional temperatures are expected to continue to warm, which is consistent with the increase observed in Nevada over the past several decades (Figure 3-5). As temperatures continue to warm, less snow may accumulate and runoff may occur earlier, significantly altering the timing of peak streamflow runoff. There is uncertainty about how the magnitude and timing of precipitation will change, but the overall consensus is that more variability is expected in the future.

TMWA's 2040 WRP incorporated scenario-based climate change modeling through 2098. The 2045 WRP expands on the existing climate change

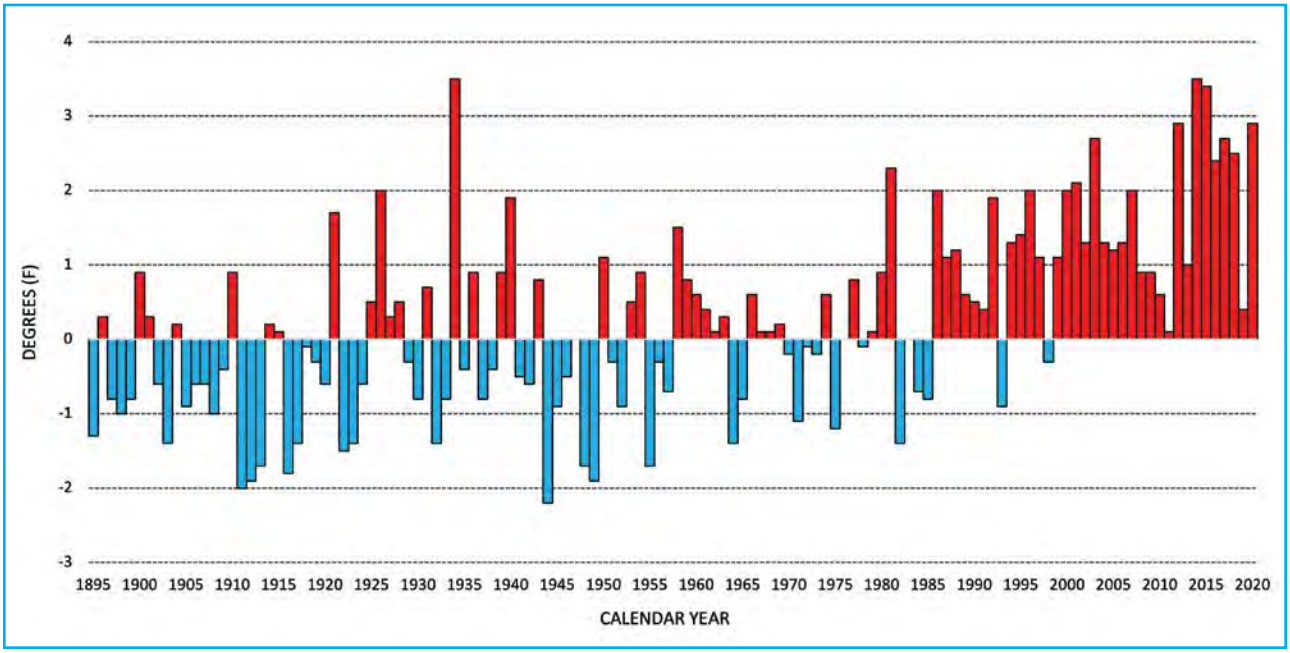


FIGURE 3–5: AVERAGE TEMPERATURE DEPARTURE FROM AVERAGE FOR NEVADA FROM 1895 TO 2024 (SOURCE: NOAA)

[2]*Gonzalez, P., G.M. Garfin, D.D. Breshears, K.M. Brooks, H.E. Brown, E.H. Elias, A. Gunasekara, N. Huntly, J.K. Maldonado, N.J. Mantua, H.G. Margolis, S. McAfee, B.R. Middleton, and B.H. Udall. 2018. Southwest. In Impacts, risks, and adaptation in the United States: Fourth national climate assessment, Volume II. U.S. Global Change Research Program, Washington, DC, USA, pp. 1101–1184. doi: 10.7930/ NCA4.2018.*

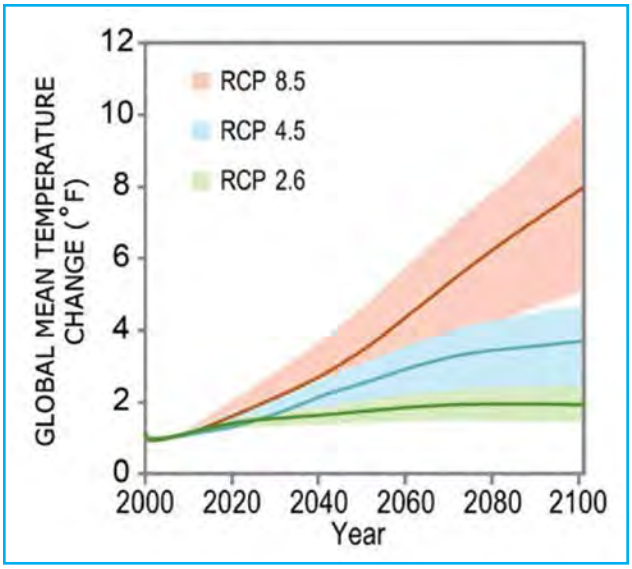


FIGURE 3–6: PROJECTED GLOBAL MEAN TEMPERATURE CHANGE UNDER EACH RCP – RCP 4 .5 AND 8 .5 ARE USED IN THIS WRP (SOURCE: FOURTH NATIONAL CLIMATE ASSESSMENT, VOLUME 1)

modeling in the previous plan to assess how future water resources, such as aquifer storage and recovery (ASR), could help improve the region's resilience to climate change.

The climate change scenarios use General Circulation Models (GCMs), which are mathematical models that simulate the physics of the global climate system. The models are typically downscaled to a smaller area, such as the northern Sierra Nevada, to predict the impacts of climate change under a range of possible greenhouse gas emissions scenarios. Rather than relying on one model, an ensemble (or collection of models created by different climate scientists) is used to predict possible future conditions. The same eight GCM's utilized in the 2040 WRP modeling were applied to the 2045 WRP modeling because previous studies determined they are the best representation of potential climate futures for the Truckee River system[3]. The results presented in this plan reflect the GCM with the smallest amount of Floriston Rate water available for diversion in each year (i.e., the worst of the eight GCM projections for each year in terms of the amount of surface water available for diversion). This approach provides a prudent and conservative estimate of the water supply available annually by requiring alternative sources (i.e., upstream reservoir storage, groundwater, and ASR) to meet a large portion of the water demands under the worst GCM.

An additional component of climate modeling consists of Representative Concentration Pathways (RCPs). A RCP is a scenario that represents a future greenhouse gas concentration trajectory. Higher RCP scenarios result in higher temperatures and increased associated impacts (Figure 3-6). TMWA used two RCP scenarios representing moderate (RCP 4.5) and very high (RCP 8.5) emissions to provide a range of possible future climatic conditions for the Truckee River basin. The moderate emissions scenario (RCP 4.5) represents greenhouse gases stabilizing in the mid-21st century, whereas the very high emissions scenario (RCP 8.5) has emissions increasing to the end of the century. These scenarios were used in conjunction with the GCM ensemble and future demand projections.

The demand projection for the WRP estimates the 20-year demand. To look beyond the 20-year planning period to test the reliability and sustainability of TMWA's water resources, a long-term water demand projection through 2098 was run through the Truckee River planning model under both the RCP 4.5 and RCP 8.5 climate change scenarios. Based on TMRPA's master planning effort projecting future development based on zoning and regional land use scenarios, TMWA generated a demand projection of approximately 140,000 AF near the end of the century. It is important to note that this demand projection is hypothetical and is only used for water supply scenario modeling purposes within this plan.

[3]*Erkman, C., S. Coors, A. Powel, and P. Noe. 2020. TMWA Climate Change Analysis. Precision Water Resources Engineering.*

Future Water Supply Scenarios

Building off the scenario-based climate change modeling in the 2040 WRP, TMWA assessed how future water resource strategies could alleviate water supply shortages identified in the moderate emissions scenario (RCP 4.5) and very high emissions scenario (RCP 8.5). Adjustments made to the 2040 WRP modeling and applied to the 2045 WRP modeling include:

1. Adding minor increases to future groundwater supply capacity based on new treatment plants.
2. Integrating aquifer storage and recovery (ASR) supplies into future water supply modeling scenarios.

ASR was modeled utilizing observed and anticipated daily and annual well injection capacities across five groundwater storage zones. ASR supplies were also assumed to decline annually based on additional groundwater losses occurring when water is stored underground. Results of the updated modeling simulations are described in the following sections. All modeling scenarios also include the benefits of TROA, including reservoir operations and TMWA's increased ability to store drought reserves.

MODERATE EMISSIONS SCENARIO

Under the more moderate emissions scenario (RCP 4.5), where carbon emissions are projected to continue increasing until 2050 and then level off, results suggest there would be no water supply shortages in any of the eight GCMs until the year 2088, which shows a supply shortfall of

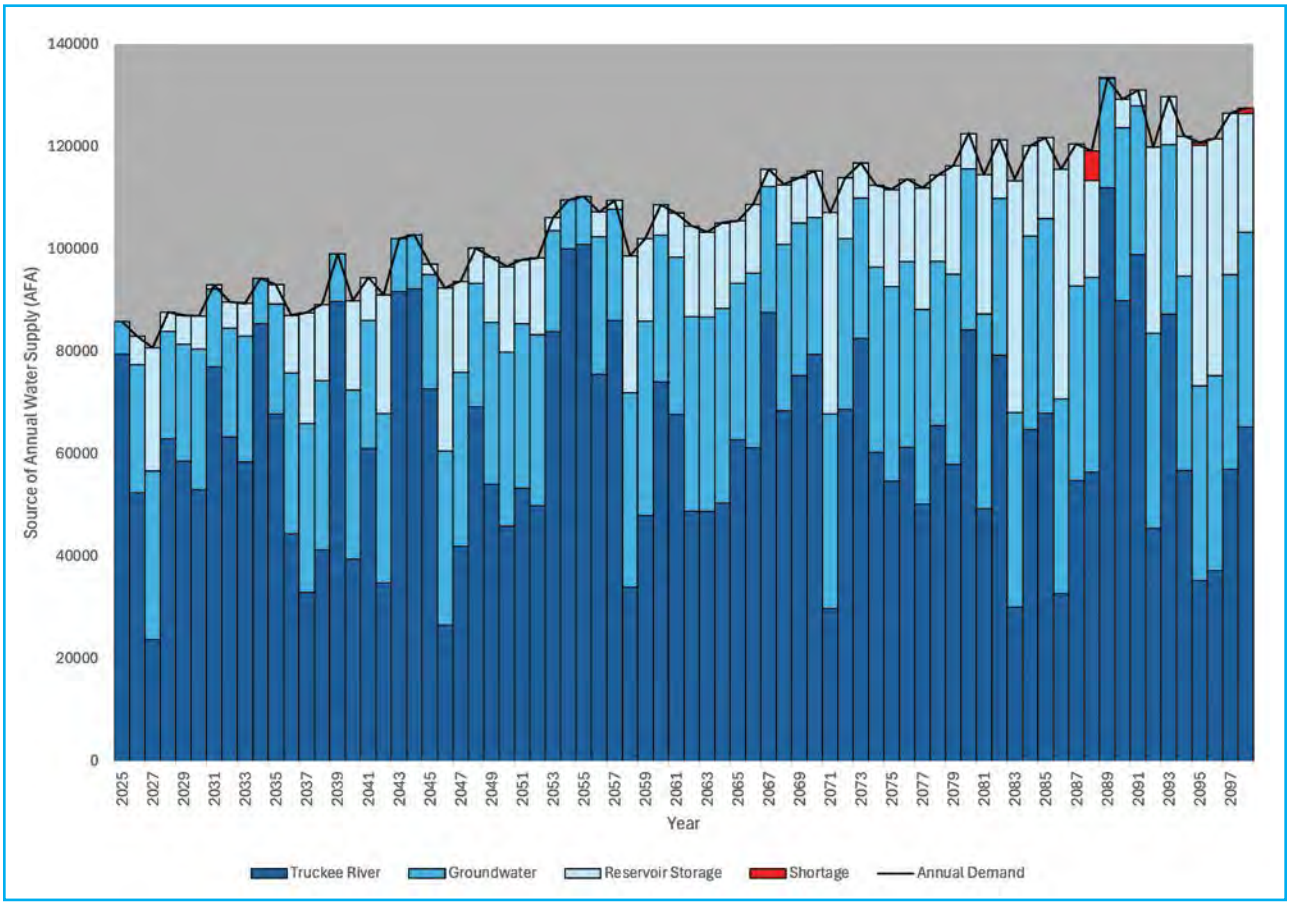


FIGURE 3–7: TMWA PROJECTED ANNUAL SOURCES OF SUPPLY THROUGH 2098 UNDER RCP 4.5 WITHOUT ASR

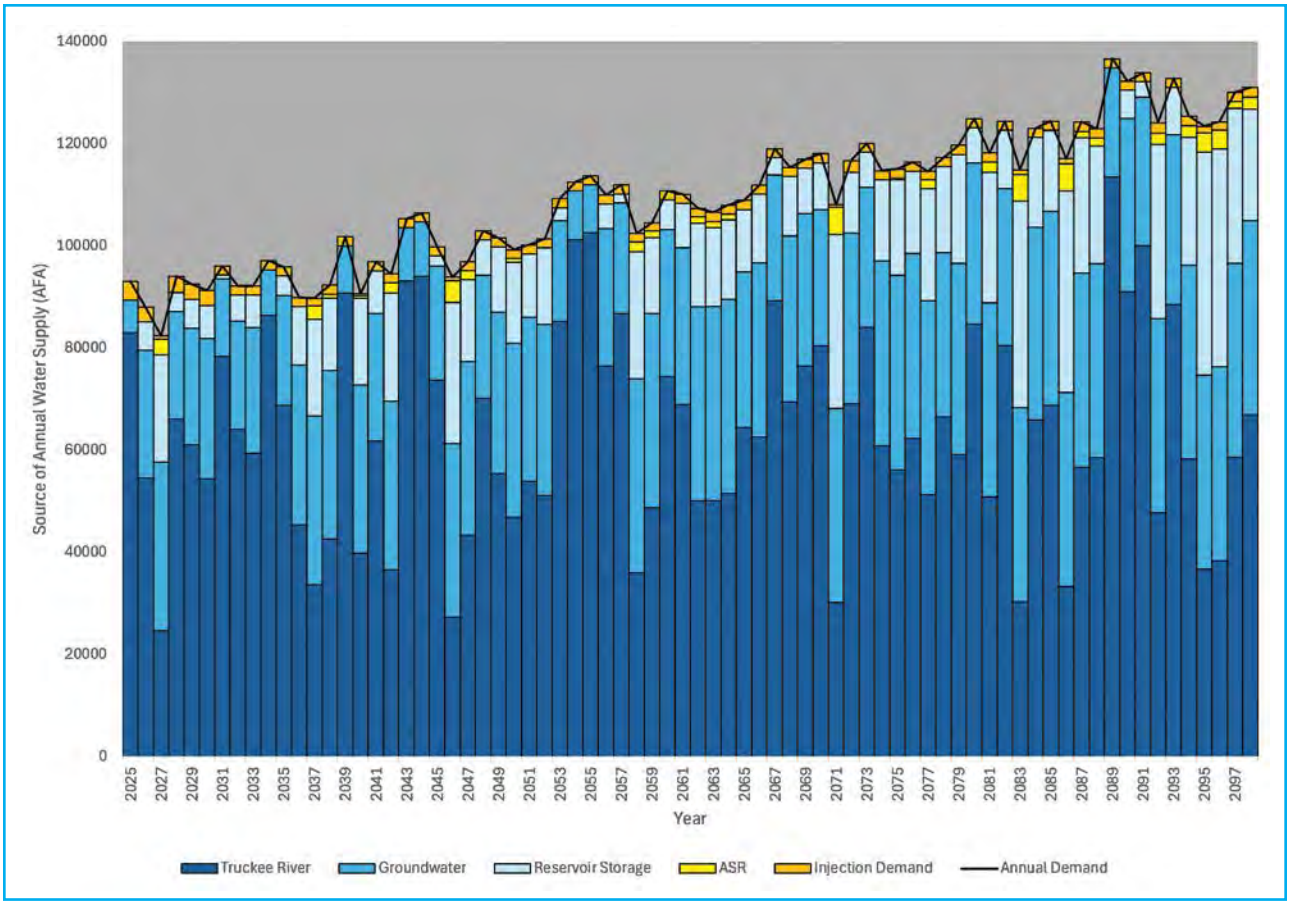


FIGURE 3–8: TMWA PROJECTED ANNUAL SOURCES OF SUPPLY THROUGH 2098 UNDER RCP 4.5 WITH ASR

5,600 AF. Additional shortages were also noted in 2095 (600 AF) and 2098 (1,000 AF). TMWA's projected annual sources of supply under RCP 4.5 without ASR are depicted in Figure 3-7.

With the application of ASR, the three shortages observed under RCP 4.5 without ASR were eliminated. ASR was also utilized earlier in the model simulation to preserve additional water available in upstream reservoir storage (based on model prioritization). TMWA projected annual sources of supply under RCP 4.5 with ASR supplies are depicted in Figure 3-8.

VERY HIGH EMISSIONS SCENARIO

Under the very high emissions scenario (RCP 8.5), where carbon emissions are projected to increase through the end of the century, results indicate there were no water supply shortages in any of the eight GCMs until the year 2069 (2,100 AF). Additional shortages were also noted in 2070 (3,700 AF), 2085 (31,300 AF), 2088 (26,900 AF), 2089 (4,200 AF), 2091 (9,000 AF), and 2095-2098 (ranging from 9,000 AF to 37,100 AF). TMWA's projected annual sources of supply under RCP 8.5 without ASR are depicted in Figure 3-9. It is important to note the RCP 8.5 represents a scenario where there are no additional strategies adopted to mitigate global carbon emissions. This is considered highly unlikely by many climate scientists, as it would contradict current trends in the energy sector; however it is included in this plan as a conservative scenario of how an extreme climate future could impact water resources.

With the application of ASR, the shortages observed under RCP 8.5 in 2069, 2070, and 2091 were eliminated (Figure 3-10). The shortages that

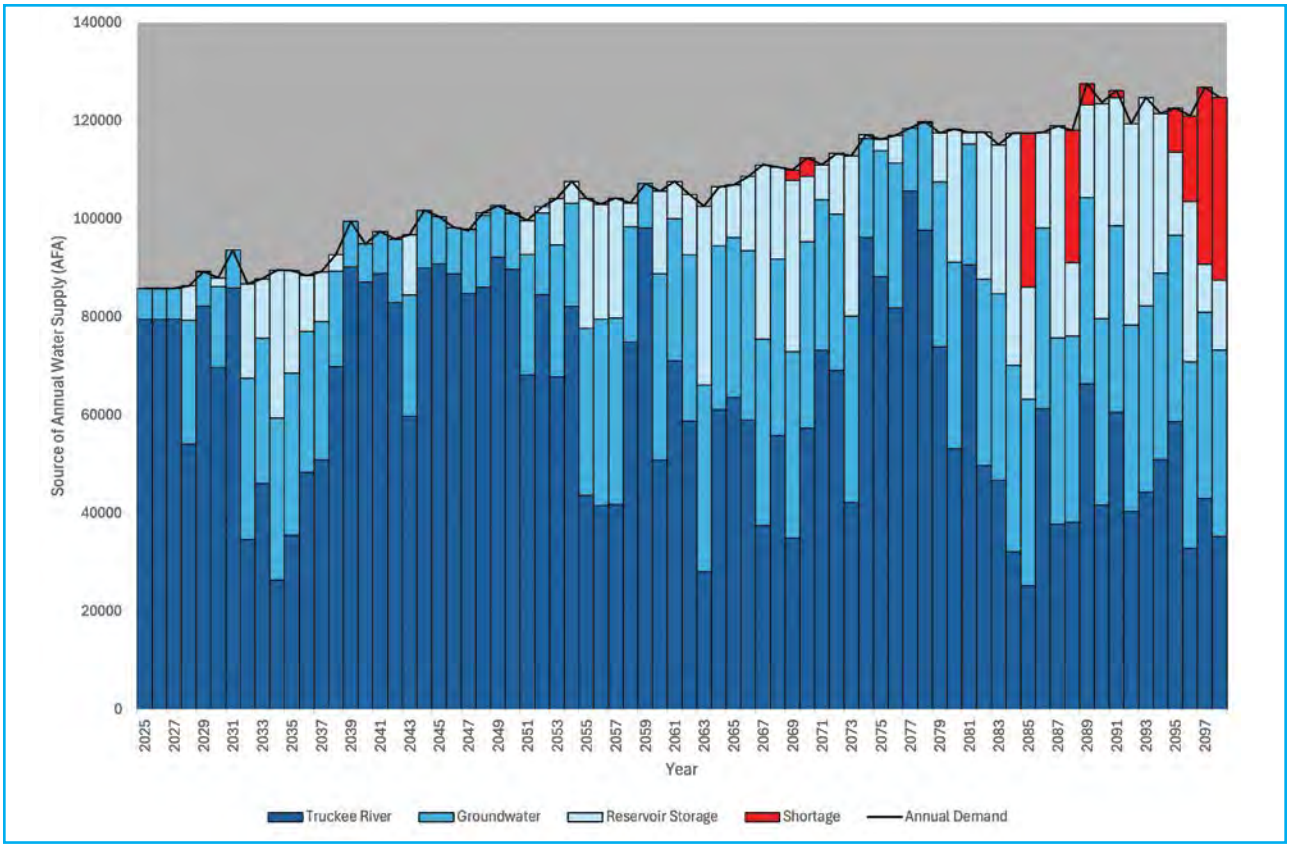


FIGURE 3–9: TMWA PROJECTED ANNUAL SOURCES OF SUPPLY THROUGH 2098 UNDER RCP 8.5 WITHOUT ASR

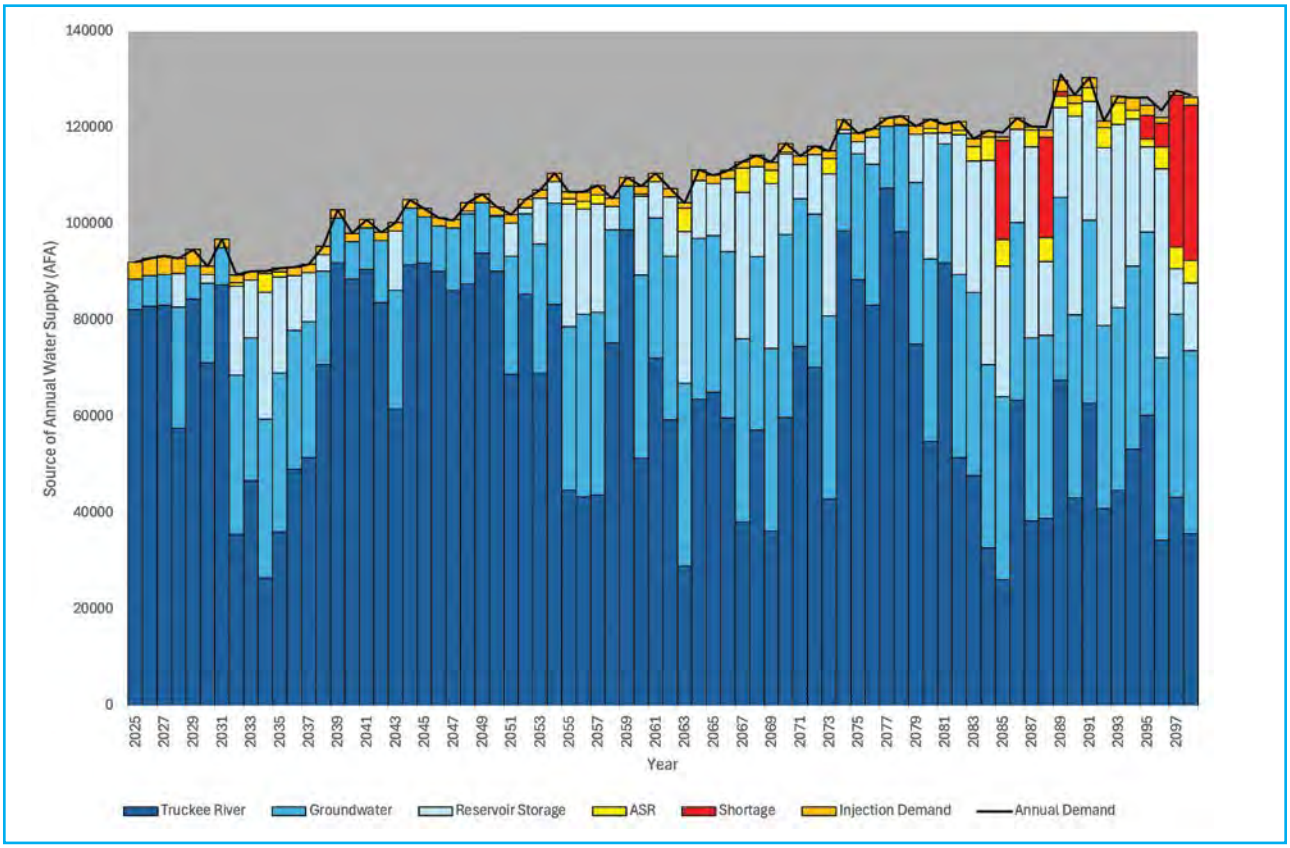


FIGURE 3–10: TMWA PROJECTED ANNUAL SOURCES OF SUPPLY THORUGH 2098 UNDER RCP 8.5 WITH ASR

were still observed were noticeably reduced by ASR in 2085 (20,600 AF), 2088 (20,800 AF), 2089 (900 AF), and 2095-2098 (4,900-32,000 AF).

One of the main constraints on accessing groundwater supplies stored under ASR is well capacity (during summer peaking). A potential mitigation strategy could be to install new wells strictly limited to recharging and recovering groundwater stored via ASR. This would allow TMWA to extract additional groundwater during periods of higher demand. It is important to note this would require new wells, amended water right permitting, and additional infrastructure. Furthermore, mitigating these shortages isn't necessary until 2085, even under the very high emissions scenario.

SUMMARY

Throughout the rest of the century, regional temperatures are expected to rise well beyond 3°F, a warming trend that has already been observed since the 1920s. Increased temperatures could reduce snow accumulation and shift the timing of annual runoff. This variability in runoff timing is incorporated into the climate modeling results presented herein.

While uncertainty remains regarding future precipitation patterns, model projections suggest an overall increase in annual precipitation across the region. However, the timing, form, and magnitude of precipitation could change significantly by the end of the century. There is broad consensus among climate models that precipitation variability will increase under continued climate change.

The purpose of the 2045 WRP modeling was to build on previous scenario-based climate modeling by focusing efforts on mitigating shortages through the application of ASR. Modeling results indicate that TMWA's water supply portfolio is highly resilient, as multiple sources of supply can be used to meet demands well into the future. Even without ASR, the climate change modeling simulations did not result in any shortages until 2088 under the RCP 4.5 (moderate emissions) and 2069 under RCP 8.5 (very high emissions). The shortages projected with the RCP 4.5, and to some extent the RCP 8.5, were eliminated with the application of ASR, which supports TMWA's ongoing planning efforts to optimize recharge operations, including advanced purified water facilities.

TMWA has experienced historical periods of extensive drought which required use of drought storage to meet customer demand during peak demand months. With TROA in place, TMWA's ability to meet customer demand through an intense, prolonged drought has been significantly enhanced. Even with increased drought frequency under anticipated climate change, modeling results indicate that upstream drought reserve storage and the application of ASR adds significant water supply resiliency, allowing TMWA to reliably meet the demands of its customers well into the future.

There are many factors that could change in terms of supply and demand that may not be accurately captured in a model projecting future hydrologic conditions (available runoff and upstream reservoir storage) 75 years into the future. Modeling results for both the RCP 4.5 and RCP 8.5 represent a wide range of potential future outcomes in the Truckee River basin (i.e., moderate to more extreme temperature increases). It is also important to note that conservative assumptions were used regarding model input and TMWA's future resource assumptions (e.g., using the RCP 8.5, groundwater pumping capacity, development of additional existing groundwater rights, water treatment plant diversion capacity, infrastructure and system intertie improvements, new surface water right acquisitions, etc.). As such, TMWA will

continue to monitor, collect, and apply the most current climate change research. Insights from this ongoing effort will be used to guide water resource management decisions to ensure the sustainability of the region's drinking water for future generations.

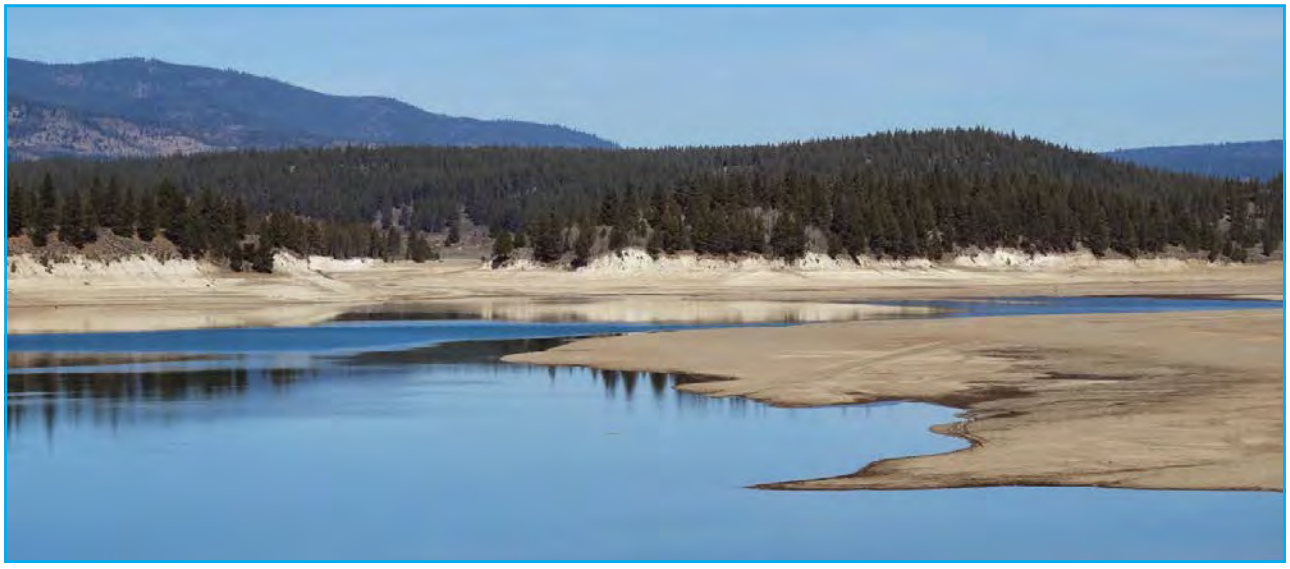
Adaptive Management

To address droughts and weather variability, TMWA uses a wide range of strategies to manage its water resources. One of the most significant adaptations that will ultimately improve the future water supply outlook for the Truckee River basin is the reoperation of federally-owned upstream storage reservoirs for wintertime flood control.

Operations have been based on the "1985 Water Control Manual" (WCM), as provided by the U.S. Army Corps of Engineers (USACE). The WCM provides rules and operating guidelines for the management of Prosser, Stampede, and Boca Reservoirs, and requires minimum flood space requirements in each reservoir and prohibits the capture of springtime runoff prior to April.

Stakeholders throughout the Truckee River basin have recognized the importance of modifying the flood control guidelines to adapt to future climate change for both flood control and water supply. Accordingly, revised rules for filling, storage, and the release of water based on forecast-informed reservoir operations (FIRO) were developed by the stakeholders of the Truckee River system (US Bureau of Reclamation, State of California, State of Nevada, Pyramid Lake Paiute Tribe, and TMWA) since TMWA's last WRP. Proposed adjustments to downstream flow thresholds for the Truckee River at the USGS Reno gage were also developed based on historical hydrology and projected future hydrologic scenarios under climate change.

These proposed revisions are based on extensive hydrologic modeling and provide much needed flexibility during the wintertime based on FIRO to better manage the Truckee River system. Operational deviations have been granted by the USACE recently to operate the system during the winter months according to FIRO until USACE approves the suggested updates to the WCM. These changes will be instrumental in helping the region adapt to the potential effects of climate change, such as preparing for water operations based on earlier runoff and more precipitation falling as rain instead of snow.



BOCA RESERVOIR DURING DROUGHT SITUATIONS

Development and Growth in the Region

The Truckee Meadows region has continued to experience population growth and increased economic development over the past five years. TMWA estimates future population growth and water demand annually to ensure there are sufficient water resources to meet increasing demand.

During the customer survey process, concerns are consistently expressed about the adequacy of water for new growth. While water rights are required for new developments to be approved, ultimately Reno, Sparks, and Washoe County determine the amount and type of growth within each of their respective jurisdictions. TMWA enters the process to ensure appropriate and sustainable water rights are dedicated and costs for new water supply, treatment, and delivery infrastructure are covered by developers.

TMWA holds all water rights dedicated to serving existing businesses or residences in its service territory. For any new development, water rights must be dedicated to TMWA, or the developer must purchase a will-serve commitment from TMWA's inventory of uncommitted water rights. In most cases in which a developer purchases and dedicates water rights, those rights were decreed agricultural rights that are converted to municipal use.

As directed by TROA, TMWA collects an extra 11% of water rights on top of the water demand for each development and that amount is dedicated to upstream drought storage. The amount of Truckee River water available for use was determined by a 1944 court decree and cannot change. Any water rights that are not used in any given year because of water conservation by residential customers cannot be rededicated for growth. The water is retained in upstream reservoirs as drought storage or flows downstream to other Truckee River water rights holders. See Ch. 2 for additional information about TMWA's water rights.

Water demand does not necessarily increase at the same rate as population growth. Due to increased efficiency and ongoing water conservation measures, TMWA's water demand has decreased or stabilized over the last 20 years, even with a growing population in Washoe County (Figure 3-11). The decrease in per-capita

Are Protections in Place To Ensure That Growth Will Not Exceed Water Supply?

1. Set by court decree in 1944, new water rights from the Truckee River cannot be created. Existing rights can be bought and sold and are converted from agricultural to municipal use.
2. New development is served only if enough water rights are dedicated to meet the estimated water demand of the project. Dedicated rights are controlled by TMWA to divert, treat, and distribute water to new projects.
3. Water rights from outside sources can also be dedicated to TMWA. An example is groundwater from the Fish Springs Importation Project, which will serve future growth projected in the North Valleys.

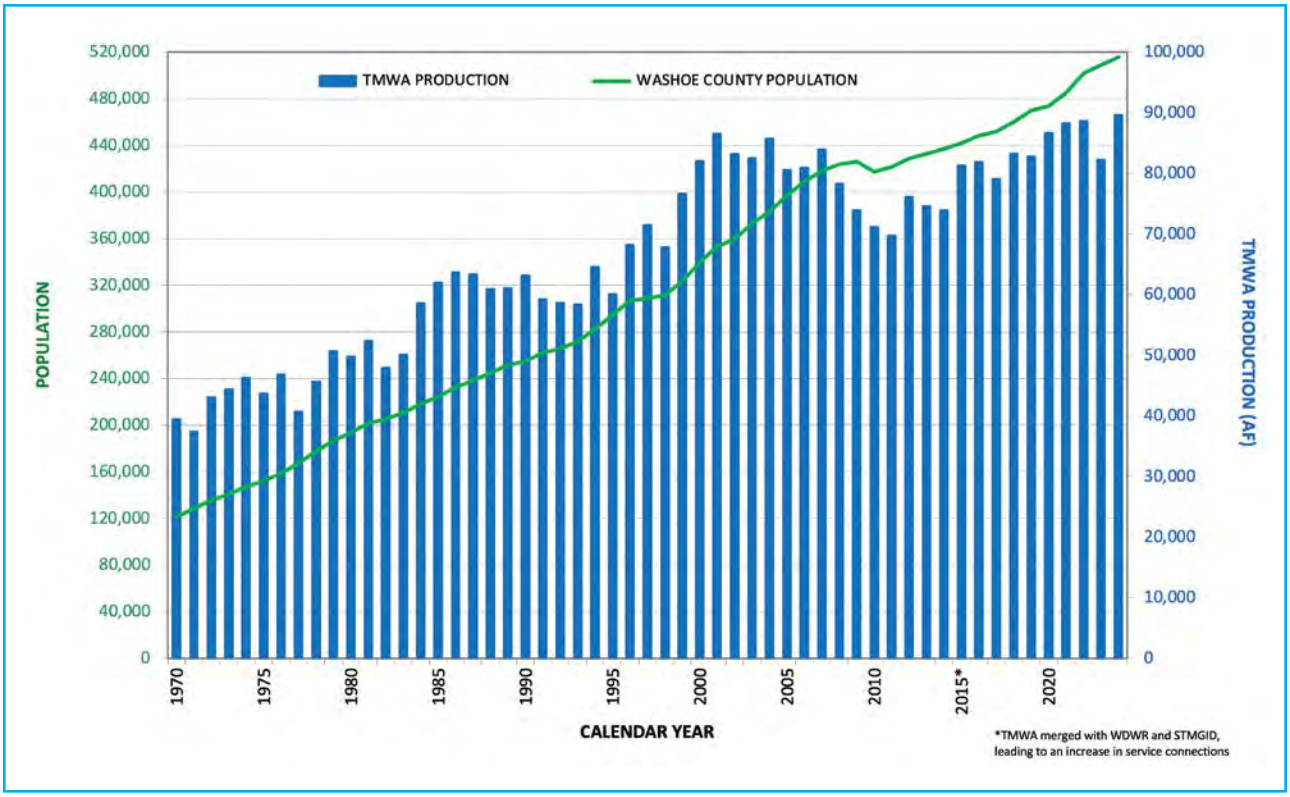


FIGURE 3–11: WASHOE COUNTY POPULATION VERSUS TMWA ANNUAL WATER PRODUCTION

water use is due largely to TMWA's metering of most services within the system, a tiered rate structure that incentivizes efficient water use, a conservation program that helps customers detect leaks and correct inefficient water use practices, and the transition to a three day per week outdoor watering schedule. Additionally, water use has decreased as older appliances and fixtures are replaced with newer models that are required to be more water efficient.

Washoe County Question #3

In a county-wide general election on November 4, 2008, voters approved Washoe County Ballot Question #3 (WC-3). WC-3 required the Truckee Meadows Regional Plan be amended to reflect and include a policy or policies requiring that local government land use plans be based upon and in balance with identified and sustainable resources available within Washoe County.

In January 2010, the Truckee Meadows Regional Planning Governing Board adopted amendments to the Regional Plan in response to WC-3. These amendments require the Northern Nevada Water Planning Commission (NNWPC) and WRWC to compare the draft Consensus Forecast population to the population that can be supported by the estimated sustainable water resources identified in the "Comprehensive Regional Water Management Plan" (RWMP), which is completed by the WRWC and NNWPC.

The comparison consists of four parts: the 20-year population projection for Washoe County provided in the draft Consensus Forecast, the sustainable water resources estimate in the adopted RWMP, a 20-year water demand projection based on the Consensus Forecast provided by TMWA, and a comparison of the

water demand projection with the sustainable water resources estimate set forth in the RWMP.

If the NNWPC and WRWC find that the Consensus Forecast population can be supported by the sustainable water resources in the RWMP, the WRWC submits the draft population forecast to Reno, Sparks, Washoe County, and TMRPA, with the finding that the forecasted population can be supported.

The 2024-2044 Consensus Forecast projects the total population in Washoe County will be 616,041 in 2044. The 2021-2040 RWMP provides an estimate of potentially available, sustainable water resources of approximately 192,988 AFA (and 143,800 AFA without additional water importation). The estimated water demand to serve the projected 2044 population is 113,873 AF. This forecast differs from TMWA's forecast because it is a projection for all of Washoe County, whereas TMWA's forecast only covers its service area. The projected 2044 population is significantly less than the population that can be supported by the sustainable water resources identified in the RWMP. For more information, see the WRWC RWMP at **www.wrwc.us/rwmp**.

Water System Resiliency

In addition to climate conditions, there are events beyond TMWA's control that could affect supply reliability, such as chemical spills, earthquakes, or wildfires. While there is a risk to source water during these events, TMWA has enough production well capacity and system storage to meet reduced customer demand during a water quality emergency; and additional actions are available to TMWA in the event of extended off-river emergencies. An earthquake in 2008 tested TMWA's emergency response plan with a loss in water supply and demonstrated TMWA's ability to respond by providing alternative water supplies.

The water quality of the Truckee River is normally excellent. Surface water is of exceptional quality because flows originate from Sierra Nevada snowpack runoff. Turbidity (the concentration of particulate matter in water-levels) is generally very low. However, water in the Truckee River can have higher turbidity at times due to storm runoff and algae growth associated with low flows and warm temperatures in summer. To ensure safe, reliable water is always provided to its customers, TMWA utilizes a water quality assurance program comprised of the following components:

Source Water Protection: TMWA has an integrated and coordinated source water protection program designed to protect or improve the quality of TMWA's surface water and groundwater supplies. TMWA, in conjunction with NDEP, completed an Integrated Source Water Protection Plan for Washoe County that provides management strategies to protect groundwater and surface water. Further information is provided in Ch. 6.

Potable Water Treatment: TMWA's modern treatment facilities for its raw surface water and groundwater supplies complies with all federal and state drinking water regulations. Also, TMWA uses a highly skilled staff of scientists, engineers, and operators who continually monitor water quality in the distribution system. Additional information is available at **tmwa.com/your-water/water-quality-facts**.

Cross Connection Control: TMWA has an extensive backflow prevention and cross-connection control program. The purpose of the program is to prevent backflow of pollutants or contaminants from customer plumbing systems into TMWA's distribution system.

Summary

Climate change and drought are the most significant variables with the potential to change the availability of water supplies. Studies indicate that climate change will likely alter the timing and form of precipitation, but to what extent is still uncertain. By stress-testing the system under various climate change scenarios, TMWA can plan for future variability in supply and demand.

The Truckee River basin has a long history of droughts dating back to at least the early 1500s according to tree-ring data. The most severe drought in recorded history lasted eight years (1987-1994). With this historic perspective and experience from more recent decades, TMWA responds to droughts with a combination of natural river flows, release of drought reserves, groundwater pumping, and extraction of banked groundwater stored through ASR. Addressing future climate conditions will require similar strategies; however, the region is extremely fortunate to have TROA, which provides for additional municipal storage under drought conditions and increased operational flexibility. With TROA and TMWA's conjunctive use of its diverse water resources portfolio, TMWA is confident in its ability to meet the region's growing water demand well into the future.

C4

Conservation Strategies

CHAPTER OVERVIEW

Northern Nevada experiences cycles of wet and dry periods, making water conservation essential. To help mitigate unpredictability, conservation strategies help build resiliency in TMWA's water supply portfolio. Responsible water use is an essential component of TMWA's water management strategy. This chapter describes TMWA's ongoing water conservation program and evaluates the effectiveness of each water saving provision, as required by the state of Nevada. It also addresses the contingency actions TMWA can take when droughts occur.

CHAPTER AT-A-GLANCE

Highlights of Chapter 4 include:

1. How TWMA prevents water loss in its system
2. An overview of TMWA's conservation programs to manage demand
3. The effectiveness of conservation efforts
4. Drought response strategies

Conservation helps TMWA reliably supply water to its customers, even during prolonged periods of drought. This chapter serves as TMWA's water conservation plan, in accordance with Nevada Revised Statute (NRS) 540.141, and highlights the importance of regional water conservation efforts that encourage customers to modify their water use habits.

A range of conservation strategies have been developed to add resiliency to TMWA's water supply portfolio. With customer participation, TMWA has been able to apply these strategies to reduce water loss and better manage regional water resources. Responsible water use is promoted year-round through a variety of water saving programs. TMWA's ongoing water conservation initiatives identified in this plan are designed to promote water resource sustainability. Additionally, TMWA is empowering customers to conserve water and decrease water waste through the installation of advanced metering infrastructure (AMI) across its system to provide real-time water use data to customers.

This chapter also describes TMWA's drought contingency plan. To effectively respond to drought conditions, TMWA relies on its conjunctive management of surface water and groundwater resources, increased drought storage through the Truckee River Operating Agreement (TROA), and enhanced conservation efforts, as needed. These provide operational flexibility, increase system redundancy, and help create a drought resilient water supply for customers under various climatic and hydrologic conditions.

Managing Water Loss

A key component of effective water supply management is tracking and managing water loss within the delivery system. TMWA manages water distribution system flows, pressures, and storage levels through an automated control system, known as supervisory control and data acquisition (SCADA). TMWA's distribution system is essentially fully metered, and large meters are calibrated to ensure accuracy. AMI, the newest metering technology that allows for two-way communication between customer meters and utilities, will be installed on all water meters by the end of 2025.

Additionally, a water balance study is conducted annually to measure the amount of water delivered to customers. Tracking losses within the delivery system and keeping these below recommended industry standard thresholds is a key component of managing water loss. In 2024, water loss was calculated at 9.4%, which is consistent with trends seen over the last several years and below the American Water Works

TMWA WATER MAIN REPLACEMENT

Association (AWWA) industry loss benchmark of 10%. Keeping water loss below the AWWA threshold is a supply-side management tool that helps ensure TMWA is efficiently managing its water resources. NRS 540.141 requires that a water loss audit be conducted in accordance with AWWA methodology. Appendix B includes the water balance summary for TMWA's system for 2024.

CAPITAL IMPROVEMENT PLAN PROJECTS

Updated annually, TMWA's "Capital Improvement Plan" (CIP) identifies projects that are essential to reducing water loss within the delivery system over a five-year planning period. Water main replacement projects help prevent leaks and maintain high quality service. Through prioritizing projects that expand the efficiency of TMWA's existing water system, the CIP further improves TMWA's ability to sustainably manage water.[1]

Managing Water Demand

Promotion of smart water use in both drought and non-drought years is important to extend the availability of this vital resource in the Truckee Meadows. TMWA focuses on outdoor watering practices from April through mid-October. During the hot summertime months, customer demand can be three-to-four times higher than wintertime use. Therefore, TMWA conservation efforts are seasonally relevant and targeted to address customers' outdoor usage patterns. These programs also reduce peak-day demand on the system, potentially delaying or even eliminating the need for infrastructure improvements like new water sources, treatment facilities, or larger pipes. Demand management strategies, among other factors, have led to the overall decline in per capita water use.

The standard metric used to measure water usage is gallons per capita per day (GPCD). TMWA's GPCD is calculated by dividing the total amount

[3]*For more information on the most current CIP, visit* ***https://tmwa.com/financial-information****.*

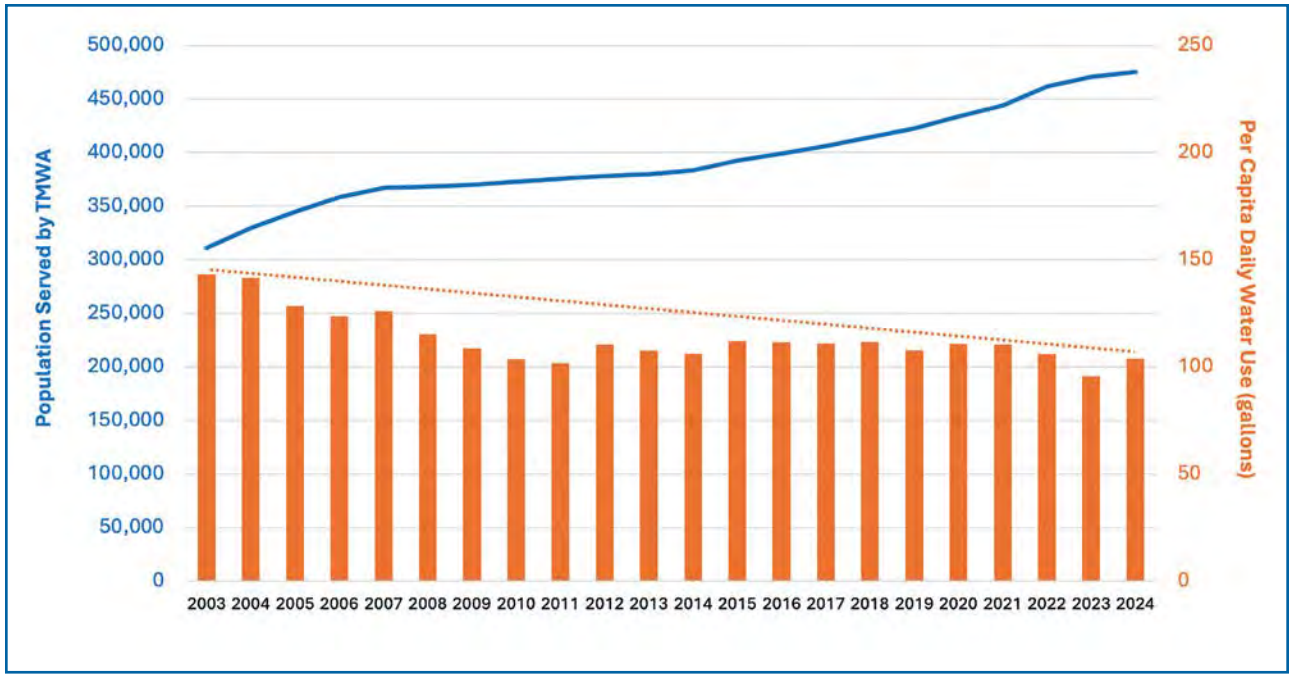


FIGURE 4–1: POPULATION SERVED BY TMWA AND RESIDENTIAL PER CAPITA DAILY WATER USE (DOTTED ORANGE LINE SHOWS DOWNWARD TREND OVER LAST TWO DECADES)

of surface water diverted and groundwater pumped to meet customer demand minus effluent returned to the river by the number of customers served each year [GPCD = ((water diverted + pumped) - effluent returned) ÷ (annual service area population)]. Proven effective over the years, TMWA's conservation policies, among other factors, have resulted in per-capita water usage declines of almost 30% over the last 20 plus years (Figure 4-1).

Ongoing Water Conservation Practices

The sections below describe TMWA's ongoing conservation practices that target customer behavior and help educate the public about the importance of smart water use.

ADVANCED METERING INFRASTRUCTURE (AMI)

TMWA's entire system, including its approximately 138,000 active water service connections, is essentially fully equipped with water meters. Water meters encourage water conservation because customers know how much water they use and can adjust their use accordingly, thus saving money on water bills.

Starting in 2021, TMWA began converting all water meters in its system to advanced meters, a project that will be completed in 2025. AMI will enable TMWA staff and customers to get real-time updates to better manage water usage. Water system leaks will be much easier to identify with AMI, and customers can receive leak alert notifications for irregular water use patterns. AMI is another demand-side management tool that will help customers track water consumption, detect leaks, adopt water-saving habits, and save money on their water bills.

TMWA will continue to explore the capabilities of AMI technology and will use real-time data to help inform the implementation of its other

conservation strategies.

WATER PRICING STRUCTURE

TMWA has an inverted, tiered-rate billing structure in which customers are charged increasingly higher rates based on the amount of water used. This billing structure incentivizes responsible water use by providing a "price signal" to customers whose usage crosses into a higher tier and encourages efficient use of water. The first tier reflects average indoor use. The second and third tiers are higher rates, respectively, for any monthly usage over-and-above the first tier. TMWA's water rates are available at https://tmwa.com/tmwa-customer-service/water-rates/.

WATER EFFICIENCY CODES (RULE 2)

TMWA has general conditions that all customers must follow. TMWA Water Rule 2.E. is specific to the enforcement of water waste. As a condition of service, customers must use water in an efficient manner that avoids waste. In this case, waste refers to any excessive use of water. This includes leaks that customers have been notified of but have failed to repair, washing vehicles without self-closing nozzles, and disregarding TMWA's assigned day watering schedule, among others.

If water waste is observed at a property, the customer will receive a notice. The first violation has no penalty. A second violation may result in a $25 fee, and repeated violations within the same year could lead to a $75 charge per incident, though this is rare.

ASSIGNED DAY WATERING

A key component of TMWA's demand-side management program is assigned day watering, which has been in place for over 30 years. This rule requires that customers follow an assigned, three-day-a-week irrigation schedule for lawns based on their street address (Figure 4-2). Assigned-day watering helps prevent waste and reduces peak-day demand.

Customers with even addresses may water Tuesday, Thursday, and Saturday and those with odd addresses may water Wednesday, Friday, and Sunday. No watering is allowed on Mondays to allow the system to adequately recover. Additionally, lawn irrigation is not permitted between 12 p.m. and 6 p.m. from Memorial Day through Labor Day. Drip systems and hand watering are allowed anytime, as long as no waste occurs. Variances to these rules may be granted for newly seeded lawns or planted sod, lawns in

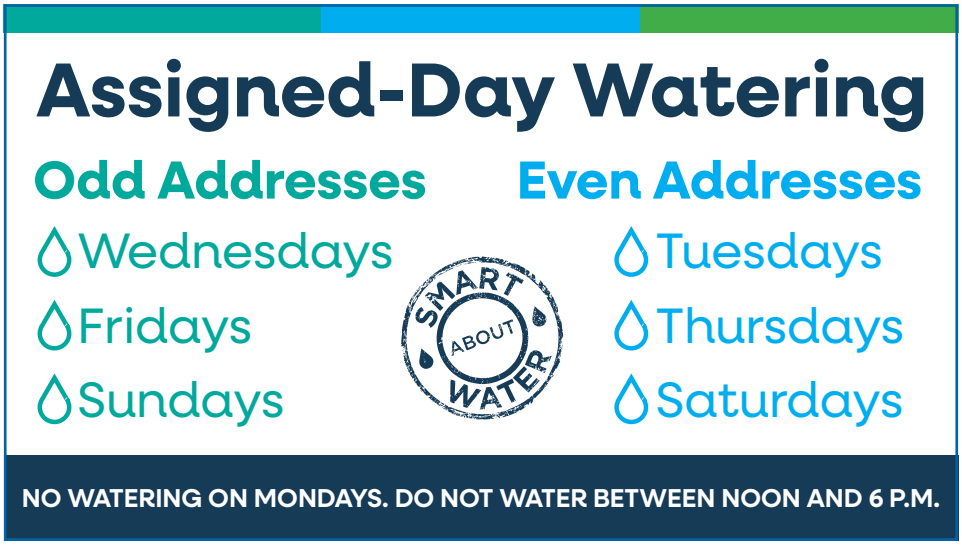


FIGURE 4–2: ASSIGNED DAY WATERING SCHEDULE IN NON-DROUGHT YEARS

public parks, playgrounds, athletic fields, and common areas.

WATER CONSERVATION CONSULTANT PROGRAM

To help promote the water-efficiency codes outlined in Rule 2, TMWA hires additional staff during the outdoor watering season to aid in the conservation of water. These water conservation consultants drive around TMWA's service territory looking for water waste and are trained to assist customers in following TMWA's water use rules. They respond to reports of water waste and watering on the wrong day and time and will issue notices of violation when necessary. Their primary duty is to educate customers about responsible water use and provide information about TMWA's water-efficiency codes. They can also help customers identify any sources of leaks or water waste. Over the last ten years (2015-2024), TMWA staff has had over 54,000 customer contacts regarding water waste and conservation, averaging over 5,400 customer contacts each year.

WATER USAGE REVIEW PROGRAM

The Water Usage Review (WUR) program helps customers identify sources that contribute to high water consumption levels. When a WUR is requested, TMWA staff review water usage patterns, visit customer premises to check meter accuracy, and detect potential leaks in the customer's system. If a leak is detected, staff help customers identify its location and provide information on fixing the leak. When completed, staff provide an overview of leaks detected, review customer watering habits, make recommendations on how to reduce water use, and teach customers how to monitor for future leaks. Over the last ten years (2015-2024), TMWA staff have performed almost 18,000 water usage reviews, averaging about 1,800 each year. Recognizing the importance and success of the program, the Western Regional Water Commission (WRWC) annually provides approximately $100,000 to TMWA to support the WUR program.

WATER WATCHER VEHICLE

PUBLIC OUTREACH AND COMMUNITY EDUCATION PROGRAM

TMWA has numerous educational initiatives to help customers learn about the benefits of water conservation while providing tools, tips, and techniques to foster smart water use.

These educational initiatives include:

- Free workshops on irrigation system startup and proper wintertime shutdown procedures.
- A native landscape planting guide designed specifically for the Truckee Meadows, which encourages the use of plants native to the region's high desert climate (available online at **tmwa.com/landscape**).
- Sponsoring development of educational materials on water-efficient landscaping design and irrigation practices with partners like the University of Nevada Cooperative Extension.
- A formal lesson plan on water conservation, targeting middle and high school students, developed in conjunction with the Washoe County School District and Desert Research Institute.
- Partnerships with other organizations that

Landscaping in the Truckee Meadows

TMWA offers a comprehensive landscaping guide to the trees, plants, and shrubs that thrive in the Truckee Meadows region. The guide, which is offered electronically and in print, is tailored to help customers create water-efficient landscaping that makes sense in the Truckee Meadows. Users can select vegetation based on a variety of attributes including color, light requirements, wildlife attraction, drought tolerance, and fire resistance. The goal of the guide is to take the guesswork out of creating a beautiful, vibrant, and water-efficient yard that is compatible with the region's high-desert climate. Visit **tmwa.com/landscape** for more information.

provide water resource, water quality, and watershed protection activities to students.

- Participation in public presentations and events (e.g., speaking engagements, special events, and other community activities).
- Xeriscape, tree care, and smart-watering-tips information provided at all events.
- A TMWA YouTube channel containing how-to videos on fixing leaks and conducting water audits at home.

TMWA's website provides online resources regarding the programs listed above.

Year-round outreach strives to promote useful and seasonally relevant information and programs to all customers. These communication channels include:

- Direct communication to customers via bill inserts and e-newsletters.
- TV, radio, newspaper, and local magazine advertisements.
- Social media engagement including Facebook, Twitter, LinkedIn, and Instagram.

EFFLUENT REUSE IN THE TRUCKEE MEADOWS

Effluent reuse is a key component of regional water conservation strategies. While TMWA does not provide reclaimed water directly, it actively works with regional partners to use reclaimed water in efficient and innovative ways. Larger amounts of reclaimed water are being used each year within TMWA's service territory. Reusing effluent conserves potable water and provides a reliable, drought-resistant water source.
As described in Ch. 2, reclaimed water offsets approximately 10% of the region's potable water demand in 2024 (8,853 acre-feet). If effluent had not been used for the irrigation of parks, medians, and golf courses, TMWA's demand would have been that much higher.

Effectiveness Of TMWA's Conservation Practices

As required by NRS 540.121, this section evaluates the effectiveness and quantifies the gallons of water saved annually by each conservation

practice. Except for effluent reuse within TMWA's service territory, which conserved 8,853 acre-feet of water in 2024 based on metered sales, estimating the amount of water saved by each of TMWA's ongoing conservation strategies is nearly impossible. There are many variables that factor into how much water a customer uses, especially the weather. TMWA's overall customer demand can vary 10% or more on an annual basis due to weather in the spring, summer, and fall periods. As most of TMWA's water conservation policies and practices have been in place for decades, it is virtually impossible to determine how much water has been saved from each practice.

Decline in water use per person over time is a good measure of the effectiveness of TMWA's water conservation policies and practices. TMWA's GPCD shows that water consumption has gone down substantially over the last 20 years. By this measure, TMWA's ongoing water conservation rules and practices helped customer demand decline from 143 GPCD in 2003 to 104 GPCD in 2024. To put it another way, TMWA's demand last year would have been noticeably higher if TMWA's conservation strategies had not been in effect over the last 20 years.

TMWA acknowledges that there are other factors that have contributed to the decline of demand over the years, most notably new home construction in the region typically has high efficiency plumbing fixtures, smaller lot sizes, and less turf.

Drought Contingency Plan

As described in Ch. 2 and 3, the historical hydrology of the Truckee River system shows that TMWA's water supplies are typically not impacted until the third year of a drought. This is due to the network of upstream storage reservoirs that were designed to store water during wet years for use during drier years. In normal years, if there is enough water in upstream reservoirs, Truckee River flows (also known as Floriston Rates) can be maintained all year and all water right holders are able to divert their full entitlement of water. When Floriston Rates (the required rate of flow at the California-Nevada state line) are sufficient, TMWA does not need to use its drought reserves to meet customer demand.

When a drought occurs and Floriston Rates cannot be met, TMWA must rely more heavily on groundwater and upstream releases of drought reserves, and conservation efforts increase as needed. In instances where conditions are severe enough that drought reserves must be released, TMWA may implement enhanced conservation measures to minimize the use of drought reserves, including temporary, voluntary reductions or calls for mandatory conservation if deemed necessary.

This approach was effective during the drought of 2012–2016. During 2015, when Floriston Rates dropped in June, TMWA was able to temporarily

TRUCKEE RIVER—FALL 2014 (TOP) AND WINTER 2017 (BOTTOM)

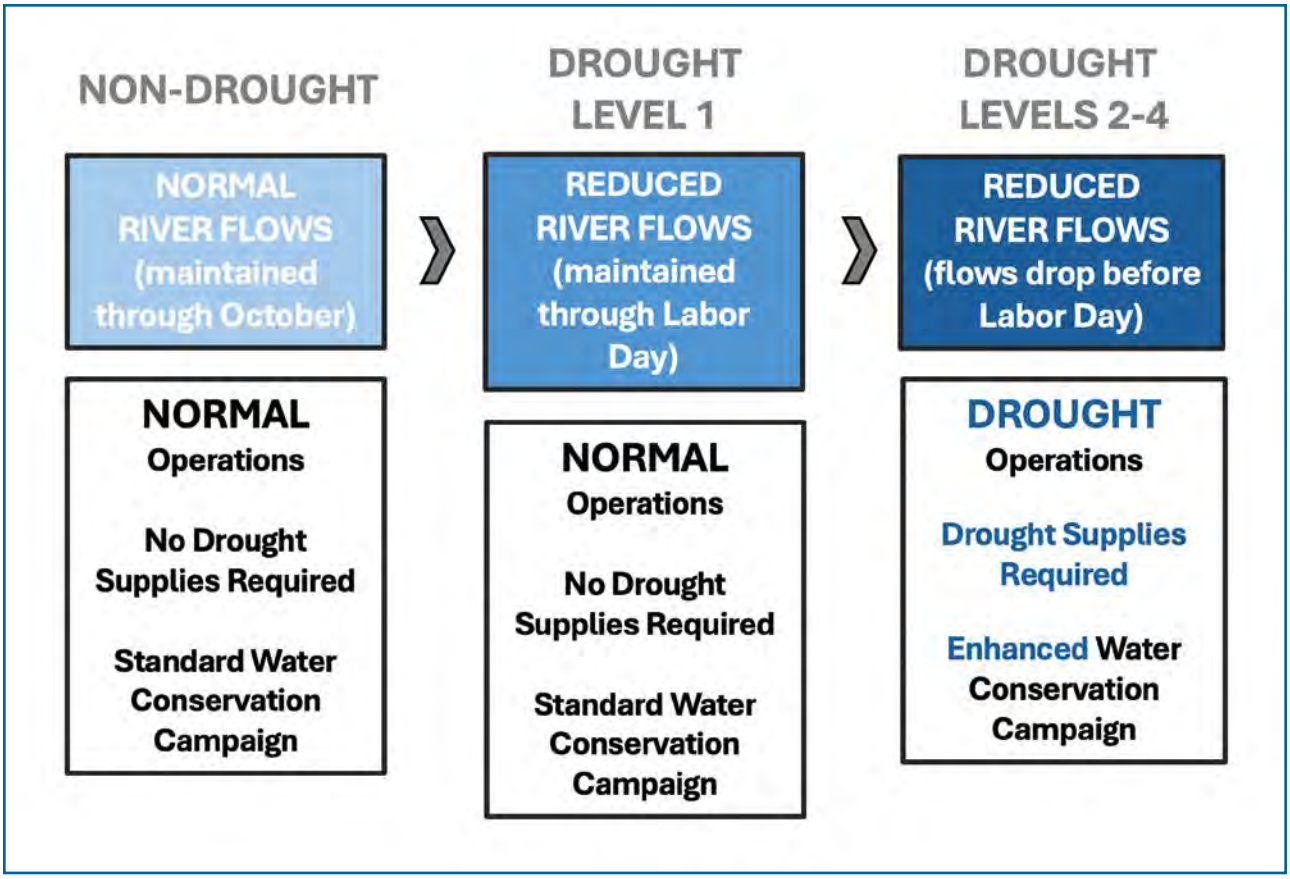


FIGURE 4–3: TMWA DROUGHT SEVERITY RESPONSE FLOWCHART

reduce customer usage by 9–16%, on average over the peak demand months. Enhanced conservation efforts are used to heighten awareness regarding drought conditions and highlight the importance of responsible water use.

Section 12.A.2(e) of the Truckee River Operating Agreement requires TMWA to have a water conservation plan in place designed to produce water savings each year equal to or better than a plan requiring water savings of ten percent or more during the ensuing year, based on the April 1 seasonal Truckee River runoff forecast that a drought situation exists. TMWA's water conservation plan has satisfied this requirement since TROA was implemented in 2015.

TMWA'S DROUGHT LEVEL DESIGNATION

TMWA's drought response is based on TROA, which defines a drought situation based on Lake Tahoe's elevation and on the loss of Floriston Rates. When a drought exists under TROA and Floriston Rates are projected to fall short prior to October 31st in any given year, TMWA responds accordingly. TMWA has designed four sub-categories based on the severity of a drought. These drought severity levels are centered around when TMWA's upstream drought storage is projected to be needed to meet customer demand later in the year.

If the projected release of upstream storage is in June, July, and August, drought severity is designated as level 4, 3, or 2 (respectively), with 4 being the most severe. If upstream storage is not expected to be needed until after Labor Day, TMWA's drought severity designation is a level 1. When the drought severity is a level 2, 3, or 4, TMWA implements enhanced conservation. When the drought severity is a level 1, enhanced

CONSERVATION INITIATIVE	DROUGHT SITUATION LEVEL OF SEVERITY	
	LEVEL 1	LEVEL 2 - 4
Communication and Outreach Campaign	Standard campaign	Enhanced campaign
Water Efficiency Codes (between Memorial Day and Labor Day)	Time-of-day: No lawn watering from 12 p.m. to 6 p.m.	Time-of-day: No lawn watering from 11 a.m. to 7 p.m.
Water Watcher Programs	Standard staffing level	Increase staffing level
Water Usage Review Program	Standard staffing level	Standard staffing level
Temporary Cutback (voluntary or mandatory)*	No cutback request	Temporary cutbacks may be requested
Water Pricing Structure**	Standard pricing structure	Drought rates or increased fines may be implemented

* The nature and exact amount of curtailment requested (voluntary or mandatory) are determined based on projected demand levels, drought storage availability, and estimated surface and groundwater available.

** While historically this measure has never been used in the Truckee Meadows, increasing the price of water during a drought has been an effective measure used by other water purveyors.

TABLE 4–1: CONSERVATION ACTIONS BASED ON DROUGHT SITUATION SEVERITY

conservation is not required, and standard conservation practices are used. Figure 4-3 provides a flowchart of the triggers required for each of TMWA's drought severity levels.

DEMAND MANAGEMENT DURING DROUGHTS

In addition to releasing upstream drought storage and increasing groundwater pumping, TMWA implements enhanced conservation initiatives to better manage demand over the course of a drought, with the goal of minimizing the use of upstream drought reserves.

TMWA's level of response depends on the total amount of drought reserves available and the amount required to meet projected demand during the summer and early fall months. To minimize the use of drought reserves, TMWA enhances existing conservation initiatives when drought severity is at a level 2, 3, or 4. The drought contingency plan has built-in flexibility to allow TMWA to adapt to the unique conditions of each drought. As needed, TMWA can issue additional restrictions and temporary cutback requests of outdoor water use during the summer months.

TMWA begins increasing conservation efforts at least a month before any drought reserves are needed to meet customer demand. Table 4-1 shows different initiatives used for TMWA's standard and enhanced conservation efforts. Enhanced conservation begins with TMWA ramping up its education and outreach efforts, particularly during the months when outdoor watering occurs (typically May through mid-October). TMWA increases media advertising to promote awareness of drought conditions and any additional watering restrictions needed. TMWA utilizes expanded media coverage to highlight

its programs and online resources that help customers conserve water. Table tents asking that water only be served by request are provided to local restaurants. Mirror stickers encouraging customers to use water efficiently are placed in public restrooms. TMWA also sends letters to homeowners' associations (HOAs), requesting they not penalize residents who let their lawns turn brown during the drought.

TMWA also increases its water-efficiency requirements during drought severity levels 2, 3, and 4. Time-of-day restrictions are expanded to prohibit watering between 11 a.m. and 7 p.m. from Memorial Day through Labor Day. Depending on the severity of the drought and how many years a drought has been in effect, TMWA can request that customers reduce their outdoor water consumption by a targeted amount during the months when reserves are needed. The cutback amount depends on the quantity of drought reserves TMWA has accumulated and the projected level of demand during peak-use months.

Demand Management And Emergency Supply Conditions

Natural disasters and other unforeseen events can interrupt TMWA's available water supplies; these include floods, wildfires, earthquakes, equipment failure, or distribution leaks. Sometimes the events are localized within the distribution system and sometimes the whole community can be affected. During such events, TMWA's goal is to minimize customer disruptions. During emergencies, the community may be required to comply with increased conservation measures, such as mandatory temporary cutbacks or significant outdoor watering restrictions (e.g., no outside watering or once per week during summer months). Additionally, commercial properties may be asked to reduce laundry, use paper plates in restaurants, and to not use potable water for non-potable purposes.

Increased conservation by TMWA customers during emergencies is just one element of the successful management of emergency water supply interruptions. TMWA staff train and practice responding to various emergency situations. This has shown success during past emergencies in which water supply interruptions have been mitigated as quickly and efficiently as possible. TMWA's goal is to undertake actions to avoid any water supply interruptions for TMWA customers.

Summary

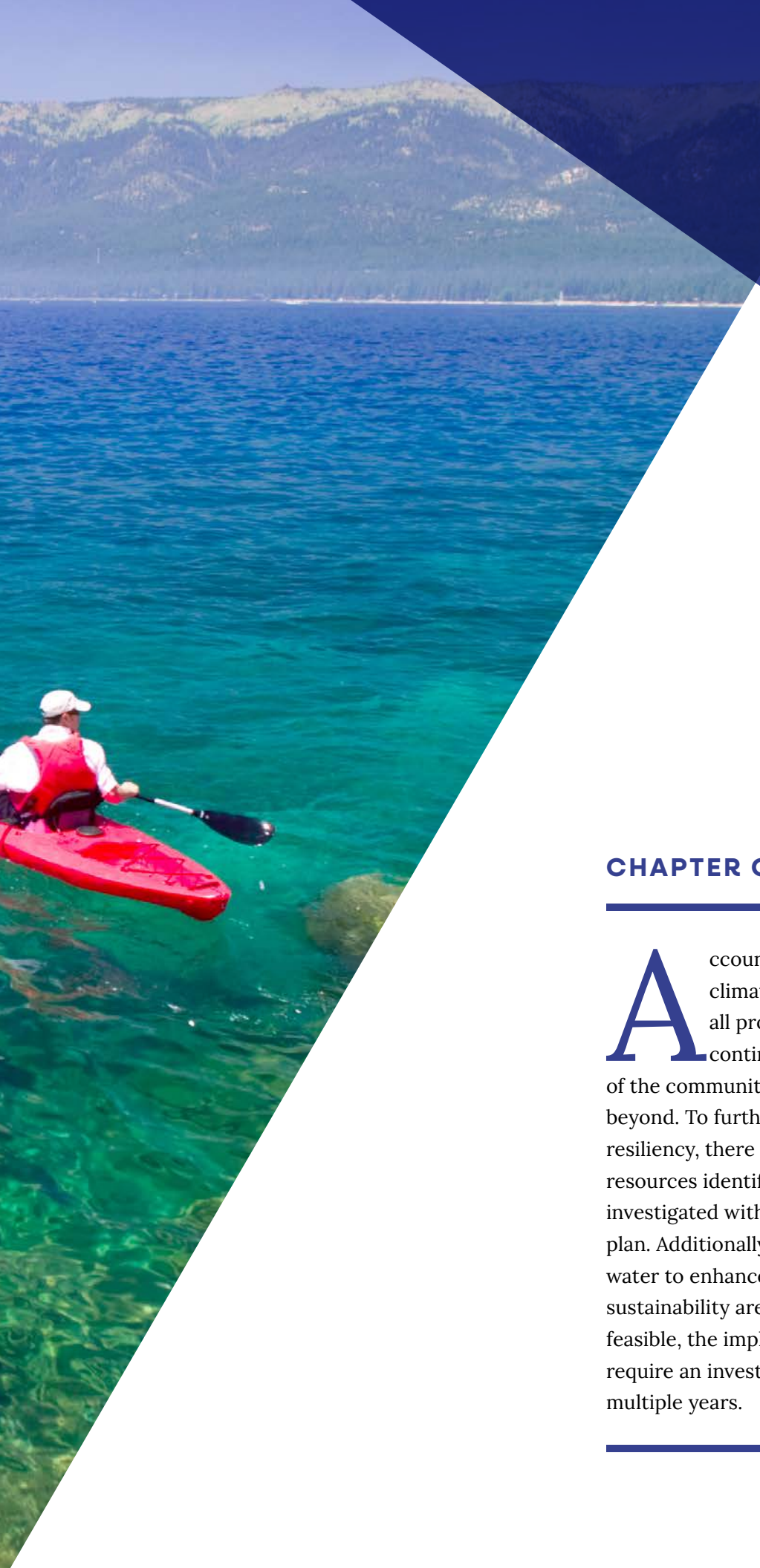
TMWA's conservation plan includes actions on the distribution (supply) side to reduce water loss and demand management programs to manage customer usage. Such initiatives include a robust capital improvement program, an extensive education and outreach effort, tier-based water rates structure, water efficiency codes and enforcement, and other practices tailored to efficient and smart water use. To enhance existing conservation programs, AMI will provide real-time water use data across the system, allowing TMWA and its customers to manage water better and reduce water waste.

TMWA has reliably provided water to the community through severe droughts due to sound water management and conservation practices. The drought contingency plan allows TMWA to assess the potential implications of droughts and respond accordingly. The ability to enact enhanced conservation measures allows TMWA to flexibly address each unique drought.

The conservation strategies outlined in this chapter have proven effective over the past several decades, with a reduction in GPCD of approximately 30% over the last 20 years. TMWA will continue to research new and innovative ways, including using data gathered through its advanced meters, to further water conservation in the Truckee Meadows.

C5

Future Water Resources



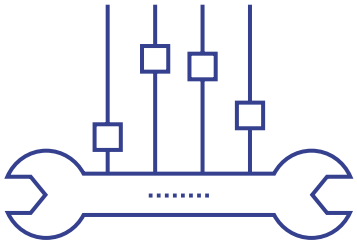
CHAPTER OVERVIEW

Accounting for continued growth and climate impact on the water supply, all projections confirm TMWA will continue to meet the water needs of the community for the next 20 years and beyond. To further bolster TMWA's water supply resiliency, there are several small-volume water resources identified in this chapter that will be investigated within the 20-year timeframe of this plan. Additionally, technologies to purify reclaimed water to enhance water resource resiliency and sustainability are currently being developed. If feasible, the implementation of these projects require an investment of time and funds over multiple years.

CHAPTER AT-A-GLANCE

Highlights of Chapter 5 include:

1. Overview of future groundwater development
2. Aquifer storage and recovery expansion
3. Exploration of additional surface water resources
4. Implementation of advanced purified water
5. Potential water banking projects



TMWA has a diverse water resource portfolio to sufficiently meet the projected needs of the Truckee Meadows over the 20-year planning horizon. Currently, and for the foreseeable future, TMWA will rely on the conversion of Truckee River water rights from agriculture to municipal use and imported Fish Springs Ranch groundwater to meet projected growth. The merger and integration of the Washoe County Department of Water Resources (WDWR) and South Truckee Meadows General Improvement District (STMGID) water systems brought additional groundwater and creek resources and facilities to TMWA. Future water resource projects and management strategies will be pursued and implemented as needed to further increase drought reserves and to continue to meet the region's water needs into the future.

While the water resources and projects outlined

TABLE 5–1: ESTIMATED YIELD OR CAPACITY OF FUTURE WATER RESOURCE PROJECTS

RESOURCE/PROJECT	RANGE OF YIELD OR CAPACITY	ESTIMATED TIMELINE
Treatment of Existing Groundwater Resources		
Spanish Springs Valley Nitrate Treatment Facility	3-4 MGD	2030-2035
Sparks Groundwater Treatment Facility	11.9 MGD	Beyond 2045 planning period
Longley Lane Groundwater Treatment Facility	4-6 MGD	Beyond 2045 planning period
South Truckee Meadows Groundwater Treatment Facility	4-6 MGD	Beyond 2045 planning period
Additional Groundwater Capacity		
New/Replacement Well Development	As needed	Ongoing
ASR Expansion	3,000-5,500 AFA	3-5 year planning period
Additional Fish Springs Ranch Water	Up to 5,000 AFA	Beyond 2045 planning period
Creek Water Resources	**Varies**	**Ongoing**
Marlette Lake Water System – Wholesale Service	**Varies**	**Feasibility being investigated**
Reclaimed Water		
Expanded Irrigation	Varies	Ongoing
Advanced Purified Water	Varies	Ongoing
Water Banking	**Varies**	**Feasibility being investigated**

in this chapter would provide relatively small quantities of water to the region, they are collectively important to expand the community's future water supply portfolio. The 2040 WRP is a high-level planning document and is not intended to be used for specific project details (i.e., detailed costs estimates, facility layouts, precise yield values). However, more detailed information for specific projects will be developed in the future, which if proven feasible and necessary will be incorporated into TMWA's Capital Improvement Plan and Water Facilities Plan.

For future projects under consideration, Table 5-1 summarizes the estimated ranges for the yields and capacity for each project currently being considered. A description of each resource or project, including a summary of the benefits and implementation challenges, is presented in the next section.

Treatment Of Existing Groundwater Resources

TMWA's production wells provide peaking capacity to ensure reliable service during the typical irrigation season and provide critical drought capacity in dry years. In areas where there are groundwater quality issues, TMWA is exploring opportunities for small-scale treatment plants to continue utilizing these important resources.

SPANISH SPRINGS VALLEY NITRATE TREATMENT FACILITY

Due to the high density of septic systems, watering of residential turf, and impacts from livestock in the Desert Springs area of Spanish Springs, some of TMWA's municipal wells have elevated levels of nitrate. To ensure that these wells can continue to be used for water supply, TMWA completed a one-year pilot study to assess the effectiveness of using two-stage, fixed-bed (FXB) biological treatment for nitrate removal from Desert Springs Well 3 groundwater. Biological treatment is not presently an approved technology in Nevada for nitrate removal. The pilot study demonstrated that the biological treatment system consistently reduced nitrate from groundwater. With additional chemical treatment, naturally occurring arsenic can also be removed. Based on the pilot study, a conceptual design was created for a full-scale treatment facility with a capacity of 3–4 million gallons per day (MGD) to treat water from Desert Springs Wells 1, 2, 3, and 4. TMWA is evaluating various options in Spanish Springs to meet existing and future customer demand.

TABLE 5–2: BENEFITS AND CHALLENGES OF NITRATE TREATMENT

OBJECTIVE	BENEFITS	CHALLENGES
Implementation	• Allows continued use of TMWA's wells by mitigating water quality issues due to nitrates • Will help maintain existing groundwater capacity in northern Spanish Springs • Maintains beneficial use of TMWA's groundwater rights	• Coordination with City of Sparks on proposed WTP site • Requires the construction of pipelines across Pyramid Highway to the proposed treatment plant site • Requires permits for operating a new treatment facility
Cost	• A treatment facility may be used to help mitigate a regional water quality issue.	• High cost to existing customers

SPARKS GROUNDWATER TREATMENT FACILITY

TMWA has four production wells and two additional test well sites in Sparks that have not been used due to water quality issues, including elevated levels of arsenic, iron, and manganese. These wells are not currently equipped but may be needed in the future to provide additional peaking capacity to serve future growth and to enhance TMWA's ability to provide reliable service during drought or emergency conditions. Water from these wells will be treated in the proposed Sparks Groundwater Treatment Facility (GWTF), located along East I Street and East Prater Way.

The Sparks GWTF will be designed with magnesium dioxide pressure filters to remove arsenic, iron, and manganese to meet federal and state drinking water quality standards. If needed, additional treatment facilities for PFAS reduction would be installed. The Sparks GWTF is not currently scheduled to be constructed within the WRP 20-year planning horizon. As contemplated, it would be built in two phases. Phase 1 will produce up to 7.6 MGD, and Phase 2 will add another 4.3 MGD of treated water production capacity.

TABLE 5–3: BENEFITS AND CHALLENGES OF THE SPARKS GROUNDWATER TREATMENT FACILITY

OBJECTIVE	BENEFITS	CHALLENGES
Implementation	• Provides opportunities to use existing wells with arsenic, iron, and manganese water quality issues • Provides new off-river resource • Increases drought supply and peaking capacity	• Requires extensive phased construction of well buildings and treatment facility over several years
Cost	• A treatment facility may be used to allow use of poor quality groundwater	• High cost to build, operate, and maintain a new treatment facility

LONGLEY LANE GROUNDWATER TREATMENT FACILITY

With an existing capacity of approximately 4 MGD, the Longley Lane WTP was owned and operated by WDWR prior to the merger with TMWA. TMWA currently does not use this facility for water treatment; however, it is used as a booster pump station serving the Hidden Valley area.

In the future, TMWA plans to retrofit the Longley Lane treatment facility with magnesium dioxide pressure filters to remove arsenic, iron, and manganese from existing and future wells. Additional treatment facilities for PFAS reduction would be installed if needed. The facility would treat water from Hidden Valley Wells 1 and 3, and a new future well. Hidden Valley Well 4 would likely be abandoned because the water quality from this well is under the influence of surface water and would require specialized treatment. The combined capacity of Hidden Valley Wells 1 and 3 plus the new well is expected to be approximately 4 MGD. These supply and treatment facilities will be needed in the future to provide additional peaking capacity to serve growth and enhance TMWA's ability to provide reliable service during drought or emergency conditions affecting the Truckee River.

TABLE 5–4: BENEFITS AND CHALLENGES OF THE LONGLEY LANE WATER TREATMENT FACILITY

OBJECTIVE	BENEFITS	CHALLENGES
Implementation	• Allows continued use of TMWA's wells by mitigating water quality issues • Increases drought supply, reliability, and peaking capacity	• Requires retrofitting an existing treatment facility using adsorption clarifiers and filtration rather than membranes
Cost	• Improves conjunctive use and operational flexibility and lowers operating costs • Construction can be phased as needed	• Relatively high cost to existing customers

SOUTH TRUCKEE MEADOWS GROUNDWATER TREATMENT FACILITY

Double Diamond Wells 1, 3, and 5 were owned by WDWR prior to the merger with TMWA. Of the three wells, only Well 1 was equipped for operation due to naturally occurring arsenic in Wells 3 and 5. TMWA has since made improvements to Well 3, which is currently blended with treated surface water and operated during peak summertime demand. TMWA is also investigating the feasibility of blending at Well 5. In the future, when needed for peaking capacity, drought protection, and reliability, TMWA plans to replace Well 1 with a higher capacity well and route all three to an arsenic groundwater treatment facility. TMWA acquired a 10-acre site off Double R Blvd. during the merger with WDWR that is permitted for a treatment facility. The ultimate capacity is expected to be 4–6 MGD.

TABLE 5–5: BENEFITS AND CHALLENGES OF THE SOUTH TRUCKEE MEADOWS WATER TREATMENT FACILITY

OBJECTIVE	BENEFITS	CHALLENGES
Implementation	• Allows expanded use of TMWA's wells that have water quality issues • Increases drought supply and peaking capacity	• Requires construction of pipelines to the treatment plant site • Requires permits for operating a new treatment facility
Cost	• Improves conjunctive use and operational flexibility • Construction can be phased as needed	• High cost for construction

Additional Groundwater Capacity

Although conjunctive use allows TMWA to minimize groundwater pumping when there is sufficient surface water available in the Truckee River, TMWA must still rely on the ability to maximize groundwater production for summer peaking and during times of drought. TMWA's current groundwater operating capacity is approximately 70-80 MGD via 86 active production wells. Based on future demand estimates and climate impacts, TMWA's current groundwater capacity is sufficient to meet demands for the foreseeable future (when combined with surface water resources).

However, there are some opportunities within TMWA's current service area where new replacement wells could be developed (under existing groundwater right permits), and TMWA is constantly analyzing opportunities to expand its groundwater resources. This section outlines projects TMWA could implement to expand groundwater capacity in its service area, including new wells and ASR expansion.

NEW PRODUCTION WELLS

TMWA replaces existing wells when efficiency declines or a well's physical condition necessitates new well construction. When replaced, the new well is often drilled in proximity to, or on the same parcel as, the existing well. New wells are constructed with superior design and construction materials, which often results in a higher well capacity for future pumping. This capacity increase allows TMWA to operate with additional water supply flexibility when groundwater is required.

In areas where there are no existing wells, exploratory drilling programs are implemented to characterize groundwater capacity and quality. If the exploratory program results are favorable, the site may eventually be developed into a full-scale production well site. It is important to note, new well drilling programs are complementary to existing groundwater rights that TMWA currently manages. Similar to some of TMWA's current and planned groundwater resources, development of new groundwater sites will likely require treatment of naturally occurring constituents.

AQUIFER STORAGE AND RECOVERY (ASR) EXPANSION

TMWA has been expanding its existing ASR program by equipping additional wells for recharge in the acquired WDWR and STMGID water systems. Over the last several years, wells in Spanish Springs, South Truckee Meadows, and Pleasant Valley have been retrofitted to increase ASR capacity.

In addition to active recharge, TMWA rests groundwater wells whenever possible to help restore declining groundwater levels and support natural recovery of the aquifer. After 2015, TMWA expanded surface water infrastructure to areas previously reliant solely on groundwater, including the Mt. Rose Fan, certain areas in the South Truckee Meadows, Spanish Springs, and Lemmon Valley. By expanding delivery of surface water in these areas, it helps bolster groundwater levels and strengthens TMWA's conjunctive management of water resources. For planning

TABLE 5–6: BENEFITS AND CHALLENGES OF NEW WELL DEVELOPMENT

OBJECTIVE	BENEFITS	CHALLENGES
Implementation	• Provides added off-river water resources • Increases drought supply and peaking capacity • Is a resource that the public readily accepts	• Need to maintain existing well capacity in wells with production and/or water quality challenges • Lack of good locations for new wells due to water quality constraints
Cost	• Costs to drill and equip new wells can be incorporated into TMWA's capital improvement budget when needed	• New wells are relatively expensive to drill and equip • Wells drilled in areas with low water quality may require expensive treatment systems

TABLE 5–7: BENEFITS AND CHALLENGES OF ASR EXPANSION

OBJECTIVE	BENEFITS	CHALLENGES
Implementation	• Provides opportunity to use available surface water in winter months when demand is low • Aligns with TMWA's strategy of conjunctive use of water resources	• Requires complex state permits and drilling of new monitoring well sites • Only able to recharge a relatively small amount of water in comparison to demand • Operational constraints that limit recharge duration
Cost	• Costs to equip existing wells for ASR can be incorporated into TMWA's capital improvement budget	• Costs may increase at certain locations due to potential treatment requirements

purposes, TMWA developed ASR targets ranging from approximately 3,000 AFA (current capacity) to 5,500 AFA (three-to-five-year planning period). ASR continues to play an important role in TMWA's conjunctive management of water resources. As such, TMWA will continue to assess the need to expand the ASR programs with future demand increases and climate impacts.

ADDITIONAL FISH SPRINGS RANCH WATER

TMWA's current use of water from the Fish Springs Ranch is discussed in Ch. 2. As Stead, Lemmon Valley, and Cold Springs continue to develop, Fish Springs Ranch water will be the primary supply for these areas. As of December 2024, TMWA has committed 647 AF of the 8,000 AFA of Fish Springs Ranch water to development. Currently, TMWA is permitted to use 8,000 AFA, but there is the potential to increase the water supply in the future by up to an additional 5,000 AFA. This would be subject to favorable water level and water quality monitoring, additional groundwater modeling analysis, and securing all necessary permits.

As a condition of the existing water rights filed with the State Engineer, TMWA has a monitoring plan to track hydrogeological impacts on the southeast side of Honey Lake Valley. The annual monitoring report includes groundwater pumping, groundwater levels, groundwater chemistry, and surface water and spring flow measurements. To predict possible impacts of increased groundwater withdrawal, a groundwater flow model for Honey Lake Valley is maintained. This model will help TMWA analyze

TABLE 5–8: BENEFITS AND CHALLENGES OF ADDITIONAL FISH SPRINGS RANCH WATER

OBJECTIVE	BENEFITS	CHALLENGES
Implementation	• Expands utilization of existing infrastructure • Increases drought supply and peaking capacity, especially for the North Valleys	• Requires environmental permitting to use additional 5,000 AFA • Need to prove ability to pump up to the additional 5,000 AFA from the basin without impacting water quantity and/or water quality
Cost	• Limited infrastructure will need to be constructed	• Operating cost is relatively high

the possibility of future water quality concerns, such as the potential to draw in water high in total dissolved solids (TDS) from beneath the playa to the north. In addition to monitoring, multiple permitting approvals will be required prior to TMWA accessing the additional Fish Springs Ranch water.

Creek Water Resources

Creeks throughout the South Truckee Meadows represent a valuable resource that TMWA can use to increase off-river reliability of its water supply. TMWA holds 3,060 AF of Whites Creek water rights, and diverts much of this to the Mt. Rose WTP to decrease reliance on groundwater pumping in that area. Mt. Rose WTP provides treated water for ASR and allows for passive recharge of aquifers in South Reno by allowing production wells to rest when Whites Creek water is available to serve customers. Whites Creek water can also be used through a creek exchange permit. Creek exchange allows TMWA to measure the quantity of Whites Creek water left instream and to exchange that water for Truckee River water. In addition to Whites Creek, TMWA holds water rights on Thomas and Galena Creeks. TMWA is currently investigating the feasibility of using additional creek resources through creek exchange permits. In 2024, TMWA filed exchange water right permits for leased water from Galena Creek to be used for either municipal or return flow purposes.

Marlette Lake Water System—Wholesale Service

In late 2018, the Nevada Department of Administration approached TMWA to determine TMWA's interest in purchasing wholesale water supplies from the Marlette Lake Water System, which includes Marlette Lake, Hobart Reservoir, and the "East Slope" facilities. The water system currently provides water from Hobart Reservoir and its East Slope Facilities to Carson City and Virginia City. The water system includes water rights totaling approximately 11,500 AF, only a portion of which are currently used by the state for water service deliveries.

Since late 2018, TMWA staff has conducted due diligence and held several discussions with the Nevada Department of Administration and staff from the State Engineer and Federal Water Master's offices. Based on TMWA's due diligence, purchasing available wholesale water from Marlette Lake Water System under a

TABLE 5–9: BENEFITS AND CHALLENGES OF CREEK WATER RESOURCES

OBJECTIVE	BENEFITS	CHALLENGES
Implementation	• Provides new off-river resources • State allows permits for creek exchange for Truckee River water • Decreases reliance on groundwater in regions with declining water levels	• Lacks infrastructure to use many creek resources • Creek flows may be affected by changing climate and hydrologic conditions • Not reliable during severe droughts
Cost	• Creek exchange is a low-cost option	• New water treatment plants or other infrastructure needed to use creek resources directly are expensive

TABLE 5–10: BENEFITS AND CHALLENGES OF THE MARLETTE LAKE WATER SYSTEM WHOLESALE SERVICE

OBJECTIVE	BENEFITS	CHALLENGES
Implementation	• Provides new water resources • Marlette Lake water could be delivered through the Truckee River • Maximizes the beneficial use of the state's available water resources among Virginia City, Carson City, and TMWA	• Requires development of a complex, cooperative agreement among numerous parties • Flows may be impacted under changing climate and hydrologic conditions . • Not reliable during severe drought conditions • Involves water rights and permitting considerations
Cost	• Wholesale service from Marlette Lake to TMWA requires few infrastructure improvements	• Unclear whether Marlette Lake Water System improvements required at this time

long-term contract could prove beneficial for TMWA customers and the greater Reno, Sparks, and Washoe County community. For instance, possible uses of the water include return flow augmentation for the Truckee Meadows Water Reclamation Facility (TMWRF) and drought storage augmentation.

In 2020, TMWA, Carson City, and Virginia City implemented a Memorandum of Understanding to establish a structure to meet the needs of the three parties. TMWA, the Department of Administration, Carson City, and Virginia City have also initiated discussions to conduct analyses and investigate necessary authorizations for the long-term use of a portion of the water available from Marlette Lake Water System. The goal is to develop the following:

1. Provide agreeable terms and conditions for establishing a long-term operating agreement that maximizes the beneficial use of the state's available water resources from the Marlette Lake Water System among TMWA, Carson City, and Virginia City.
2. Provide an agreed-upon delivery schedule, special conditions of service, and pre–determined adjustments to the quantity of water available for sale each water year to address variable hydrologic conditions.
3. Provide predictable revenue sources to the state and reduce the per-acre-foot charge to each water user by fully allocating the available water resources.

The water service agreement would also address future rate setting procedures, memorializing the Nevada Department of Wildlife's operating restrictions on Marlette Lake for the benefit of fisheries, water rights permitting requirements, and other general terms and conditions.

Reclaimed Water

Reclaimed water provides both local and regional benefits. Reclaimed water use provides a sound method of effluent management with beneficial use through irrigation and other applications. The main local benefit of reclaimed water is that it conserves potable water and provides a reliable, drought-resistant water source, even in times of restriction and conservation. Additionally, using reclaimed water provides a more predictable way to ensure compliance with discharge limitations when compared with river discharge but likewise competes with water rights needed to maintain

instream flows. Dedicated Truckee River water that does not return to TMWRF as wastewater, generally requires additional water rights to be dedicated to provide for depletion of that return flow to the watershed.

TMWRF currently supplies approximately 4,400 AFA of reclaimed water to numerous sites in Sparks, including Wildcreek Golf Course, Reed High School, Shadow Mountain Sports Complex, Golden Eagle Regional Park, and numerous other parks and streetscapes; and in Reno, this includes the University of Nevada, Reno (UNR) Farms property and Mira Loma Park. In 2024, 489 AF of reclaimed water was also supplied to TRIGID for industrial purposes. Reclaimed water is treated to high water quality standards that meet both the discharge limits to the Truckee River and the standards required for reclaimed water use.

The Reno-Stead Water Reclamation Facility (RSWRF) currently has an annual average flow of 2.1 MGD. RSWRF is currently permitted to receive up to 2.5 MGD. With recent upgrades, the actual treatment capacity of the facility is 4.0 MGD. During the winter and when reclaimed water flows are greater than irrigation demand, excess reclaimed water is discharged into a natural drainage channel that flows to Swan Lake. This is the primary disposal site for RSWRF, which is permitted to discharge up to 2,072 acre feet a year to Swan Lake.

Under present operations, RSWRF provides an average of 0.5 MGD, or about 24% of its total flow to reclaimed water customers for irrigation of the Sierra Sage Golf Course, the North Valleys Sports Complex, Mayors Park, The Lakes Apartments, O'Brien Middle School, and a truck fill station at the facility.

Starting in 2019, a "flow shave" has been operated up to 0.5 MGD which pumps screened, raw sewage to TMWRF for treatment to reduce the discharge to Swan Lake due to high lake levels. In the future, when lake levels drop, this practice of flow shaving will likely transition to serve as capacity augmentation for RSWRF, until such time as additional effluent management practices are implemented and the discharge permit is modified to allow utilization of the full treatment capacity, making the flow shave unnecessary for normal operations.

South Truckee Meadows Water Reclamation Facility (STMWRF) is one of the few water

TABLE 5–11: BENEFITS AND CHALLENGES OF RECLAIMED WATER

OBJECTIVE	BENEFITS	CHALLENGES
Implementation	• Reliable under changing climate and hydrologic conditions • Allows reuse of water for uses when potable water is not needed (e .g ., irrigation) • TMWA has been actively involved in partnerships to expand reclaimed water use in the region • Offsets wastewater flows to the Truckee River • There is strong public acceptance of reclaimed water for non-potable uses	• TMWA does not have the ability to supply reclaimed water • Infrastructure to use reclaimed water is only in place in certain areas • Water right return flow requirements must be satisfied
Cost	• Reclaimed water rates are typically less than potable water rates	• Reclaimed water distribution systems are expensive

reclamation facilities in the United States that operates a zero-discharge system with 100% reuse. STMWRF reclaimed water meets or exceeds the State of Nevada's Category A designation, which permits unrestricted use of reclaimed water. Reclaimed water from STMWRF is used for irrigating parks, schools, golf courses, commercial landscapes, and thoroughfare median landscapes. Specific reuse areas include the South Meadows Industrial Park, Double Diamond and Damonte Ranch residential areas, the Arrow Creek and Wolf Run Golf Courses, the South Valley Regional Park, and Manogue High School, among others.

Although TMWA does not supply reclaimed water, TMWA recognizes the value of using this resource to meet non-potable demand and collaborates with partner agencies to implement regional strategies for its use. As described in Ch. 2, TMWRF will be providing up to 4,000 AFA to TRIGID, primarily for cooling systems for large companies in the industrial park. TMWA has been a key player in creating operational strategies for this large-scale reclaimed water project.

There are future opportunities for TMWA and the region to innovatively use reclaimed water. TMWA strives to use all regional water resources as efficiently as possible. Therefore, TMWA will continue to collaborate with regional partners and pursue projects such as advanced purified water, water banking, and other reclaimed water opportunities, as described in the next several sections.

Advanced Purified Water (OneWater Nevada)

As discussed in Ch. 2, TMWA and the City of Reno are constructing an indirect potable reuse facility to use "Category A+" reclaimed water, or advanced purified water, for groundwater augmentation. Although new to the Truckee Meadows, advanced purified water has been used to replenish underground aquifers and surface water reservoirs throughout the United States for over 40 years.

DIRECT POTABLE REUSE

Beyond indirect potable reuse and groundwater augmentation, stewardship of the Truckee River and the river environment have sparked interest in innovative concepts such as direct potable reuse (DPR). DPR involves treating effluent to extremely high standards and then introducing it directly into the drinking water system. This technology has the potential to bolster water resilience, reduce reliance on the Truckee River and water importation projects, and provide a sustainable, drought-resistant local water source. By pairing state-of-the-art treatment processes—like membrane filtration, ultraviolet disinfection, ozonation, and biological active carbon filtration—with rigorous monitoring and regulatory oversight, water agencies in northern Nevada are evaluating the merits and feasibility of DPR. DPR could help augment existing water supplies while simultaneously reducing effluent discharges to the Truckee River to help improve river water quality.

Implementing advanced purified water in northern Nevada would require thorough planning, community engagement, and significant investment in infrastructure. Public outreach is a key factor; addressing concerns about the reliability and safety of advanced purified water is crucial. Ongoing collaboration among local government agencies, water utilities, and research institutions through the OneWater Nevada initiative can produce information to evaluate feasibility, demonstrate efficacy and build public trust. With continued public outreach, emphasizing transparent communication, scientific rigor, and showcasing successful

TABLE 5–12: BENEFITS AND CHALLENGES OF DIRECT POTABLE REUSE

OBJECTIVE	BENEFITS	CHALLENGES
Implementation	• Maintains local control of the water resource • Drought-proof and sustainable resource • Nevada has adopted regulations that allow use of Category A+ water for groundwater augmentation • Potential to offset development of other water resources that could benefit the environment • Public outreach efforts are underway • Can provide an environmentally sound effluent management strategy	• Nevada regulations for DPR must be enacted • Requires costly construction of advanced treatment facilities • Large-scale advanced purified water projects are a long-term goal • Requires education of staff, elected officials, regulators, and the public • Public acceptance for using advanced purified water for potable uses
Cost	• Potential to generate revenue from sale of will-serve commitments	• New advanced treatment facilities and other infrastructure required will be expensive

advanced purified water case studies from other regions, northern Nevada can position itself as a leader in advanced water management solutions while securing a safe, stable water supply for future generations.

Water Banking Projects

TMWA continues to investigate the feasibility of water banking in area aquifers. Aquifer storage of surplus surface water in times of plenty can preserve water for future uses and increase the region's drought resiliency. One such project investigated during the past several years is Palomino Farms.

PALOMINO FARMS

OneWater Nevada's Palomino Farms Sustainable Water Resource Feasibility Study is part of a regional effort to optimize and expand available water resources. The purpose of the study was to explore the coordinated use of surface water, groundwater, and recycled water. The addition of recycled water expands upon the resources used for conjunctive use, which is an important strategy to help meet the region's future water supply needs.

More specifically, the study focused on determining the viability of bringing water to the Palomino Farms and Warm Springs areas as part of a long-term sustainable water management plan. The hope is that the aquifer can eventually be utilized to build up large quantities of water for drought protection and to help meet demand during the peak summer-use season in the Spanish Springs area. Additional benefits for residential well owners and agricultural users in the area would be improvement of groundwater levels and potential improvement to water quality.

High quality "purple pipe" reclaimed water would be piped to Palomino Farms for use in agricultural irrigation. This would dramatically reduce the need for groundwater pumping by the agricultural wells currently supplying this area. Potable

water from TMWA would also be sent through a separate pipeline to Palomino Farms in the winter, when water is more plentiful, and recharged into the Palomino Valley aquifer via injection wells. Through this process, TMWA would recharge the aquifer storing significant amounts of water for later use. More water would remain in storage than withdrawn when needed to support peak summer use or provide drought reserves for Spanish Springs.

There are multiple potential benefits of this project. Firstly, a potable water pipeline running between Sparks and Palomino Farms would provide TMWA greater flexibility and resilience in improving water supply and potentially water quality in the coming years. Secondly, the water storage and delivery infrastructure improvements being contemplated by the Study would also complement the potential later addition of advanced purified water to the overall water supply. Although feasible, there remain several significant challenges in implementing the project. The Palomino Farms property is held in private ownership, and the long time frame and funding needed to implement such a large scale water project may not be compatible with the owner's interests.

Other Conceptual Resources

The following descriptions are of privately prepared water supply projects that are conceptual in nature and are promoted by external project proponents as possible regional water resources. These projects have not been vetted for feasibility by TMWA, permitted, or constructed. Identification of a conceptual project shall not be construed as an indication of TMWA support or opposition of any project nor an indication of project viability. The list is not exhaustive and is intended to merely identify some potential projects for informational purposes. TMWA will continue to monitor project progress.

IWS BASIN, LLC (FORMERLY INTERMOUNTAIN WATER SUPPLY, LTD.), DRY VALLEY, BEDELL FLAT, NEWCOMB LAKE VALLEY

This project seeks to import approximately 3,500 AFA of groundwater to Lemmon Valley from three relatively undeveloped hydrographic basins approximately 20–30 miles north of Reno. In 2018, the State Engineer canceled IWS's water right permits because it failed to show reasonable diligence in placing the water to beneficial

TABLE 5–13: BENEFITS AND CHALLENGES OF WATER BANKING PROJECTS

OBJECTIVE	BENEFITS	CHALLENGES
Implementation	• Feasibility studies at multiple sites have been completed • Ability to store large quantities water underground for future use • Diversifies the water supply and reduces reliance on Truckee River resources • Potential to provide drought backup	• Water banking projects are a long-term goal, and must be evaluated in conjunction with groundwater augmentation and advanced purified water • Additional substantial feasibility testing and permitting is required before making any commitment to proceed
Cost	• Potential to generate revenue from the sale of future will-serve commitments	• High cost due to substantial infrastructure requirements

use. As of this writing, the status of IWS Basin's water right permits is uncertain and subject to legal proceedings. IWS Basin has other pending applications to appropriate water in these basins; however, they are protested by other parties and have not been acted on by the State Engineer.

A few different parties have pending applications in the basin, so the State Engineer undertook a re-evaluation of the perennial yield in 2022. Order 1331 set the perennial yield at 1,100AFA. The order was immediately appealed by IWS, who both claimed that the perennial yield was between 2,000-3,000AF. The district court for Washoe County upheld the State Engineer's order on 11/12/2024. The decision is being appealed.

LOWER SMOKE CREEK

The Lower Smoke Creek project is located just north of Pyramid Lake in the Smoke Creek Desert groundwater basin. Much of the water in the basin is held by the Jaksick family through various entities, including Bright-Holland Co. and Jackrabbit Properties LLC. Jackrabbit and Bright Holland executed a water development agreement with LSC Development, which intends to develop a water importation project. The first phase is intended to capture the water in the southern portion of the basin and pipe it to Winnemucca Ranch and other planned developments consistent with the relevant water resource plans. The second phase would extend the pipeline to transport water from the northern portion of the basin. Washoe County also has pending applications to develop any excess groundwater resources in the Smoke Creek Desert for a similar municipal water importation project.

The Smoke Creek Desert basin has a perennial yield, substantiated by the USGS, of 16,000 AFA, and is currently being adjudicated. The adjudication was initiated in 2009. With existing monitoring information, including USGS gages in place since 1986, the abovementioned water rights could support approximately 10,500 to 14,000 AFA of municipal water, subject to State Engineer approvals and additional hydrogeological monitoring. The aforementioned adjudication proceeding may severely limit, or preclude entirely, the future development of groundwater resources in Smoke Creek Desert basin depending on the water rights ultimately recognized in the resulting decree. All pending applications for municipal use have been placed on hold by the State Engineer for the duration of the adjudication proceedings. It is not uncommon for adjudication proceedings in Nevada to span multiple decades.

SIERRA VALLEY

Since the late 1800s, a diversion ditch has carried up to 60 cubic feet per second of water for agricultural use from the Little Truckee River above Stampede Reservoir out of the Truckee Basin to Sierra Valley, California, in the Feather River Basin. The Little Truckee River diversions are inversely proportional to the Sierra Valley natural runoff, meaning that the lower the available flows in the native Sierra Valley streams, the higher the diversions from the Little Truckee River. Thus, these rights have a higher drought yield than a normal year yield, but the ability to store these rights would be required.

Summary

While the region has adequate water resources to meet future demand, TMWA is constantly analyzing options to further expand its water supply portfolio. TMWA is committed to researching innovative ways to increase water resource resiliency, especially drought-resistant and off-river resources. There are opportunities for TMWA to expand its groundwater resources and retrofit its existing infrastructure to increase its ability to pump groundwater when needed. Additionally, TMWA is furthering its utilization of creek water resources, especially in the South Truckee Meadows. TMWA is collaborating with many regional partners through OneWater Nevada to explore innovative ways to use advanced purified water and the possibility of creating water banks for additional drought storage. TMWA has an extensive water resource portfolio that has been further bolstered by the implementation of TROA; however, TMWA will continue to identify and develop safe and sustainable local water supplies to ensure that a reliable, high-quality product is delivered to customers into the future.

C6

Protecting the Watershed and Environment

CHAPTER OVERVIEW

TMWA and its customers are reliant on high quality sources of groundwater and surface water. Protecting these sources of supply is critical to ensuring a resilient, sustainable water supply for the Truckee Meadows community. With its range of partnerships and a focus on renewable energy generation, TMWA works to be a responsible steward of the environment.

CHAPTER AT-A-GLANCE

Highlights of Chapter 6 include:

1. Support of watershed projects through the Truckee River Fund
2. Collaborative efforts to help manage upstream forests to decrease wildfire risk
3. Stewardship efforts in the urban corridor
4. Strategies to protect water resources from new contaminants
5. Long-term energy sustainability through hydroelectric power

TMWA works with many organizations and agencies throughout the Truckee River watershed to protect and improve the community's sources of drinking water. Since TMWA does not own most of the land around its groundwater and surface water supplies, multiple partnerships and collaborative projects are essential to help maintain the region's water supply sources. In recognition of these efforts, TMWA received national recognition with the American Water Works Association's Exemplary Source Water Protection Award in 2022.

TMWA also uses sustainable business practices to minimize environmental impact, including using hydropower and solar energy to offset most of its power costs and reduce greenhouse gas emissions. In addition to TMWA's three existing hydroelectric plants, TMWA is constructing a fourth hydroelectric facility to generate power from excess pipe capacity at Chalk Bluff WTP.

Watershed Restoration And Protection Initiatives

SUPPORTING WATERSHED PROJECTS WITH THE TRUCKEE RIVER FUND

Since the Truckee Meadows relies on the Truckee River and upstream reservoirs for most of its water supply, TMWA established the Truckee River Fund (TRF) in 2004 to facilitate regional source water protection. The TRF utilizes an Advisory Committee of nine appointed members that equally represent Washoe County, the City of Reno, and the City of Sparks.

The TRF is used to support projects that protect and enhance the water quality or resources of the Truckee River or its watershed, which also benefits TMWA's customers and the community. The projects funded by the TRF normally address areas of the watershed that are multi–jurisdictional in nature, which makes a watershed improvement project difficult, if not impossible, to implement solely through one entity or agency. In addition, TRF provides TMWA a vehicle for responding to funding requests from outside groups and organizations involved in promoting and improving the health of the Truckee River system and watershed. The TRF has been highly successful in leveraging matching funds for the projects it supports. This allows TMWA to help local organizations and agencies complete projects at a lower cost and support projects outside of its jurisdictional boundaries, without additional impacts on customer rates.

Through 2024, TRF has approved and funded over 220 projects. Since its inception, TRF has approved distribution of nearly $17 million to qualifying projects. Partner organizations

provided additional funding of over $26.5 million in cash and in-kind services. Examples include riparian cleanup, river restoration, forest management, watershed education, aquatic invasive species inspections and removal efforts, and many other activities. Projects completed or underway are listed at **truckeeriverfund.org**.

MITIGATING LARGE WILDFIRES IN THE FORESTED HEADWATERS

Large wildfires in the heavily forested headwaters of the Truckee River watershed can potentially have major impacts on downstream communities. Although fire can be good for forest health, unnaturally large fires can result in high levels of

Truckee River Fund Project Spotlights

SIERRA NEVADA JOURNEYS – WATERSHED EDUCATION INITIATIVE

Sierra Nevada Journeys has been a recipient of TRF funding since 2011 for support of the Watershed Education Initiative for students in kindergarten through 8th grade. This program includes school-based and field-based components to teach students about the Truckee River watershed, point and non-point source pollution, invasive species, sources and impacts of erosion, water conservation, and stewardship.

CITY OF RENO – LAKE PARK WATERSHED PROJECT

This innovative project was a collaboration between City of Reno, One Truckee River, Friends of Lake Park, and Truckee Meadows Parks Foundation. To address the water quality issues in the pond at Lake Park, floating vegetated wetlands were placed to remove excess nutrients and native plants were installed to reduce erosion.

TRUCKEE RIVER WATERSHED COUNCIL – LOWER HOKE MEADOW RESTORATION

The Truckee River Watershed Council restored a wet meadow habitat by reconnecting an incised stream channel to its floodplain. The Lower Hoke Meadow area is upstream of Stampede Reservoir, and the project helps reduce erosion, increase resiliency against wildfire, improve water quality, and enhance wildlife habitat.

HISTORIC STREAM CHANNEL RECONNECTED THROUGH RESTORATION IN LOWER HOKE MEADOW (SOURCE: TRWC)

FIGURE 6–1: MIDDLE TRUCKEE RIVER WATERSHED FOREST PARTNERSHIP PROJECT STATUS AND LOCATIONS (2025)

sediment, ash, and debris in waterways. Among many devastating impacts to communities, wildfires can degrade source water quality, decrease water storage capacity, and increase the cost of water treatment.

To begin to address the prevention of large fires in the headwaters, TMWA entered a formal partnership in 2022 with the US Forest Service – Tahoe National Forest, Truckee River Watershed Council, National Forest Foundation, and The Nature Conservancy to form the Middle Truckee River Watershed Forest Partnership (MTRWFP). A catastrophic fire in the Middle Truckee River watershed could drastically affect TMWA's sources of water supply. This subwatershed is approximately 330,000 acres with more than 260,000 acres managed by the Tahoe National Forest.

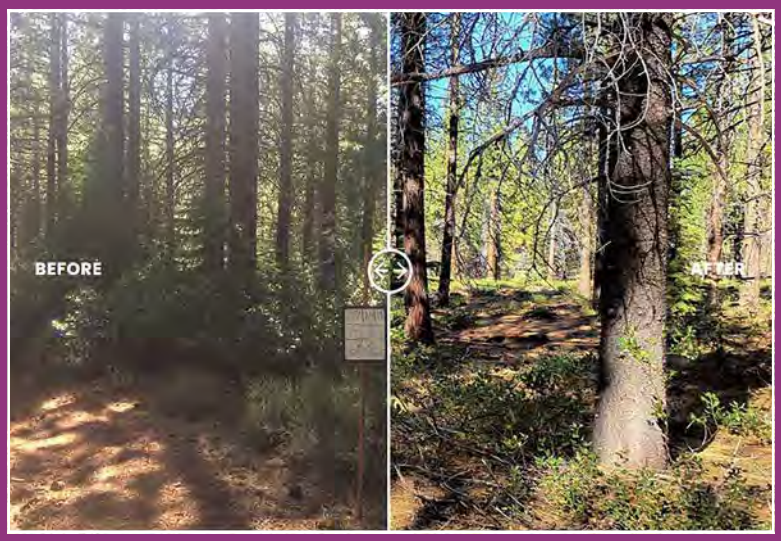
The partnership goals include improving and restoring forest health and resilience, reducing the risk of high-severity wildfires, protecting communities from wildfires, protecting and securing water supplies and infrastructure, and augmenting resources gaps to increase the pace and scale of implementation. The MTRWFP aims to complete forest thinning and fuels reduction work on approximately 60,000 acres of US Forest Service land by 2033 (Figure 6-1). More information about the partnership and its 10-year vegetation management plan is available on truckeeforests.org.

COLLABORATING WITH ONE TRUCKEE RIVER IN THE URBAN COORIDOR

TMWA has been an active participant in implementing the One Truckee River Management Plan since the plan's inception in 2017. The goal of the effort is to manage, protect, and provide stewardship of the Truckee River across all

PORTLAND LOO INSTALLED AT BRODHEAD PARK IN 2020

Ladybug Project



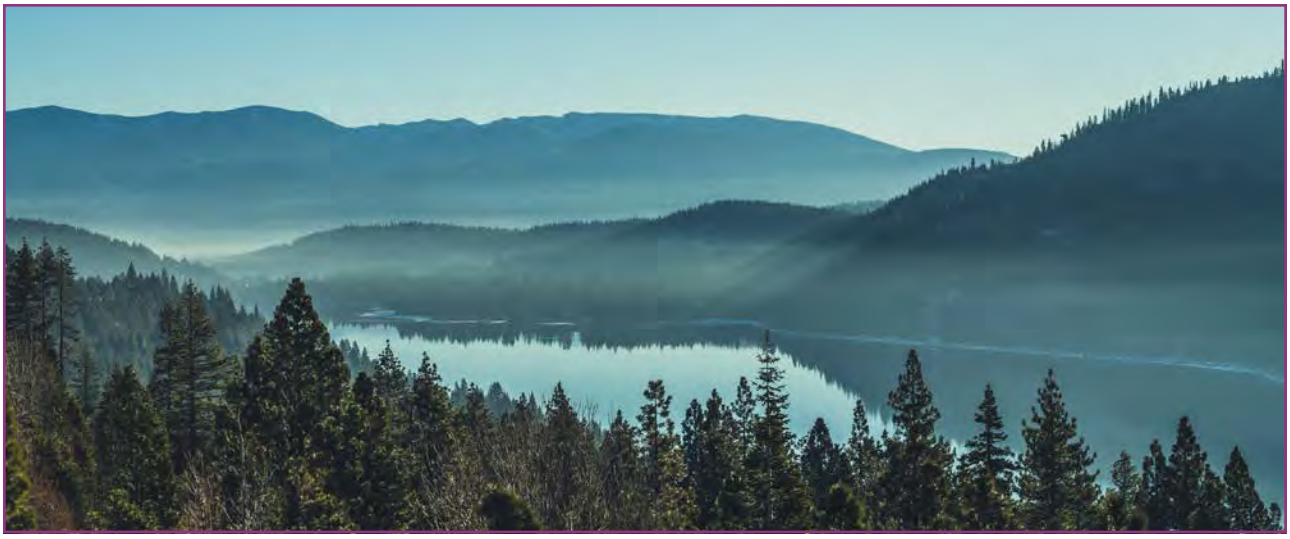
As a pilot project for the Middle Truckee River Watershed Forest Partnership, TMWA helped fund a forest thinning and fuels reduction effort on the northeast corner of Stampede Reservoir. This project, the Ladybug Forest Health and Fuels Reduction Project, is managed by the National Forest Foundation and will treat 2,500 acres of forest once fully implemented. Treatments include tree and shrub mastication, commercial tree removal, and prescribed burning. Additional funding has been provided by other groups, including The Nature Conservancy, Google, US Forest Service, California Wildlife Conservation Board, and more. The photo provides an example of forest thinning work being completed at the Ladybug Project and other sites across the Middle Truckee River watershed.

jurisdictional boundaries. Focus areas include water quality, connectivity to community resources, health and wellness opportunities, and habitat protection and restoration. More information about One Truckee River (OTR) can be found at **onetruckeeriver.org**.

A high priority action item in the OTR Management Plan is the installation of public restrooms along the river corridor. Through this partnership, TMWA and OTR have installed three public restrooms in the downtown Reno area at Brodhead Park (2020), John Champion Park (2023), and Reno City Plaza (2024). These restrooms help maintain and improve surface water quality upstream of TMWA's Glendale Water Treatment Plant (WTP) intake by providing all river users access to sanitation facilities. OTR maintains the restrooms through a partnership with the non-profit Reno Initiative for Shelter and Equality which employs a formerly unhoused individual to clean the restrooms.

PARTNERING FOR STEWARDSHIP AT DONNER LAKE

As one of TMWA's primary storage reservoirs, Donner Lake is both a critical water resource and an important recreation area and tourist destination. During 2020, visitation to the Donner Lake area drastically increased, and with growing numbers of visitors came additional issues such as higher boat traffic, increased erosion, and more litter. To address these issues, multiple stakeholders came together, through facilitation by the Truckee River Watershed Council, to form the Donner Interagency Partnership for Stewardship (DIPS). The partnership created a stewardship plan to identify various issues around the lake and provide recommended actions. DIPS partners complete an annual "State of Donner Lake Report" to monitor water quality and ecological conditions in the lake.



DONNER LAKE

PROTECTING WATER SOURCES FROM NEW CONTAMINANTS

TMWA and many partners developed an Integrated Source Water Protection Plan (ISWPP) for the Truckee Meadows in 2016. The ISWPP identifies Source Water Protection Areas (SWPAs) for drinking water sources. An interdisciplinary team of scientists and stakeholders identified SWPAs and the susceptibility of those areas to contamination or pollution. SWPAs take into consideration buffer areas around drinking water supplies and the modeling of groundwater systems to determine areas at the most risk for contamination.

A key implementation action has been increased communication between TMWA and regional jurisdictions regarding potential contaminant sources in SWPAs. When identified activities that could impact drinking water supplies are occurring in the SWPAs, TMWA and/or other public water systems are notified. They then work with property owners to help mitigate potential risks to groundwater and surface water quality. The plan includes a map with the SWPAs, watershed descriptions, and water quality improvement projects, available at washoecountycleanwater.org.

Sustainability

Power is one of TMWA's largest expenses due to the energy-intensive treatment and pumping required to distribute water throughout the community. TMWA can offset more than 90% of its power consumption through the use of hydroelectric generation. TMWA owns and operates three run-of-the-river hydroelectric power plants: Fleish, Verdi, and Washoe. These plants were constructed in the early 1900s and continue to play an important role in TMWA's operations. Run-of-the-river hydroelectric plants rely on gravity to move diverted river water through canals to the power generation facilities. After the water passes through the generators, it is returned to the river. TMWA's hydroelectric plants produce an average of 6.7 megawatts, which is enough to power approximately 3,500 households. The hydroelectric plants are a source of clean, renewable energy, generating on average 40 million kWh per year. Every day TMWA runs its three hydroelectric plants at capacity, over 90,500 pounds of CO_2 emissions are effectively eliminated from the atmosphere, equating to roughly 15,000 metric tons a year.

TMWA is also constructing the Orr Ditch hydroelectric facility which will turn excess

water flowing down the Highland Canal into power. Using existing infrastructure and untapped canal capacity, the project will provide renewable energy directly to Chalk Bluff WTP. The Orr Ditch conveys unneeded water from the Highland Canal to the Truckee River using gravity. Directing excess water through two 500 kilowatt hydroelectric turbine generators at Orr Ditch will produce clean, carbon neutral energy with virtually no water loss in the process.

TMWA anticipates continuing to increase efficiency in its processes and optimize its renewable energy generation to offset annual energy expenses and reduce its environmental impact.

TURBINES AT VERDI HYDROELECTRIC PLANT

Summary

TMWA uses a range of approaches to support restoration and protection efforts in the Truckee River watershed to maintain the excellent quality of the region's drinking water supply. TMWA invests in collaborative partnerships throughout the watershed which allows it to support projects it could not otherwise due to jurisdictional limitations, such as land ownership. TMWA will continue to support projects through TRF and will be involved in collaborative watershed management efforts. Additionally, TMWA values its role in being a good environmental steward for the community and will continue to improve efficiency and utilize renewable energy when feasible to minimize impacts on the environment.

C7

Recommended Actions

CHAPTER OVERVIEW

Each WRP includes recommendations for the TMWA Board of Directors to consider. Some become new policies when warranted. Completed recommendations and policy adoptions from the previous 2020–2040 WRP are highlighted in this chapter. Many ongoing recommended actions from that plan have been carried over, with new recommendations added to this 2025–2045 update.

CHAPTER AT-A-GLANCE

Highlights of Chapter 7 include:

1. Key completed actions from the previous five years
2. Background information for each recommended action
3. Recommended actions to address water resource planning, management of current water resources, and future water resources

The 2045 WRP is a planning document that outlines TMWA's water resource management strategy options through 2045. The preceding chapters have explained TMWA's current water management strategies, future impacts from climate conditions and growth, conservation practices, and possible future water resources. Based on the information and findings presented throughout the plan, this chapter includes recommended actions to guide TMWA staff over the next five years and for the TMWA Board to consider and act upon.

Key Completed Actions

This section includes an overview of several key actions that have been completed from the 2040 WRP:

RETURN FLOW SETTLEMENT AGREEMENT AND TRIGID PIPELINE IMPLEMENTATION

A major milestone over the last five years includes successfully re-permitting the secondary water right permits for Reno, Sparks, and Washoe County as well as for effluent re-use projects at the Tahoe Reno Industrial General Improvement District (TRIGID). The main success was a settlement in March 2024 with the Pyramid Lake Paiute Tribe (PLPT) to allow effluent from the Truckee Meadows Water Reclamation Facility (TMWRF), to be pumped to TRIGID for industrial uses. Once the settlement was reached, the PLPT protest was lifted and the return flow make up water was permitted which was the final step in allowing effluent to be delivered to TRIGID from TMWRF. This milestone occurred in the early summer of 2024.

MT. ROSE WATER TREATMENT PLANT

Prior to TMWA's merger with the other regional drinking water utilities in 2015, the Mt. Rose fan area in the south Truckee Meadows was solely reliant on groundwater to meet customer demand. Due to the area's reliance on groundwater, there were significant declines in groundwater levels. With operation of the Mt. Rose Water Treatment Plant (WTP) beginning in 2022, TMWA is now able to treat Whites Creek water to help meet customer demand and to expand its aquifer storage and recovery program to improve groundwater levels. The Mt. Rose WTP, along with TMWA's ability to send treated Truckee River water to the southern boundaries of its service area, are allowing more sustainable management of groundwater levels.

ADVANCED PURIFIED WATER FACILITY AT AMERICAN FLAT PROGRESS

TMWA has continued to work with the City of Reno on designing the Advanced Purified Water Facility at American Flat. Design work is scheduled for completion in August 2025. Construction is anticipated to start in December 2025 and last until September 2028. After construction, the facility will operate in a phased approach to

ensure the treatment technology is sound and trusted by regulators and the public.

2025–2045 WRP Recommended Actions

Many ongoing recommended actions have been carried over into this plan from the 2040 WRP, and several new actions and policies have been included. Recommendations in this plan also take into consideration Regional Water Planning Policies and Criteria from the Western Regional Water Commission's "2021-2040 Comprehensive Regional Water Management Plan" to further guide the utility's proposed actions **wrwc.us/resources-and-plans**.

OBJECTIVE 1. WATER RESOURCE PLANNING

RECOMMENDATION 1.1.
TMWA's Water Resource Planning

Background: TMWA's WRP is a planning and management document that spans a 20-year period and is updated every five years. The WRP is a key component of TMWA's integrated planning approach in conjunction with its Water Facility Plan and Capital Improvement Plan. The 2045 WRP is the fifth version of the plan since TMWA's inception in 2001.

Recommendation: Continue monitoring, reviewing, and revising its water resource management strategies at least every five years through TMWA's planning efforts in response to current and future conditions including but not limited to changing conditions in hydrology, climate patterns, economic development, regulatory constraints, and customer demand.

RECOMMENDATION 1.2.
Geographic Scope of TMWA's Planning Area

Background: The Truckee Meadows has been steadily growing over the past five years. Historically, TMWA's planning for water delivery has been focused on areas within and adjacent to its retail service area. As the region continues to grow, TMWA's service area will likely expand, including through the acquisition of smaller water systems in the region. Moving forward, TMWA will continue to expand its service area as needed and in conformance with regional planning efforts.

Recommendation: Continue to analyze the geographic extent of TMWA's water resource planning area subject to the guidelines of TMWA's Joint Powers Authority. Monitor the Washoe County Lands Bill to determine how it could impact TMWA's future service area.

RECOMMENDATION 1.3
TMWA Regional Influence

Background: As the regional drinking water purveyor, TMWA has become more involved in other water resource issues, including watershed protection, effluent management, and advanced purified water. TMWA recognizes that water resources are interconnected, and the challenges faced in other water management sectors, when considered under a "one water" management approach, have the potential to become future opportunities for the region. For example, effluent disposal limitations in the region are being creatively addressed through projects like the American Flat Advanced Purified Water Facility to create a new source of drinking water. It is critical that TMWA continues to be involved in regional initiatives to most efficiently optimize the use of the region's limited water resources.

Recommendation: Continue to be involved in regional water management issues to benefit all area residents, protect water quality, and efficiently use water resources. Expand this involvement as needed when new issues or challenges arise. In the near-term (6-12 months),

begin working with the Truckee Meadows Regional Planning Agency (TMRPA), Economic Development Authority of Western Nevada (EDAWN), and other relevant state and regional agencies to analyze current and potential future policies related to the efficient use of water and other regional resources needed to sustainability serve new large-scale industrial and commercial water users.

RECOMMENDATION 1.4.
Small Private Water System Acquisitions and Collaboration

Background: There are many private or cooperatively-owned small water systems throughout the region. Although TMWA has acquired small water systems, such as the West Reno Water Company in Verdi in 2019, these small private water systems often present a range of financial and technical challenges. Other small water systems have inquired about possible acquisition and/or collaboration in recent years. However, TMWA typically requires systems to be improved to TMWA standards prior to acquisition, as demonstrated by the Verdi Business Park acquisition in December 2014.

Since the last WRP, TMWA has had various inquiries and discussions with a number of small private water systems, especially those contiguous with TMWA. Recently, as of 2025, discussions have occurred with Verdi Meadows Utility Company, Verdi Mutual Utility Company, and Steamboat Springs Water Works. TMWA evaluates the costs and benefits of acquiring these private small water systems and assesses the best path forward for TMWA's customers as well as the private systems.

Also recently, TMWA has participated in collaborative discussions with Great Basin Water Company on issues like the proposed Spanish Springs Valley Nitrate Treatment Facility and a possible wholesale connection to the Stonegate development in Cold Springs.

Recommendation: Encourage local jurisdictions to analyze all conforming regional master plans to determine what growth pressures may be placed on existing small water systems and identify

SUSPENSION BRIDGE OVER THE FLEISH DAM ON THE TRUCKEE RIVER

which water utilities could be integrated into TMWA in the future, especially in growth-prone areas. When approached by small water systems, TMWA will perform its due diligence to assess the resource benefits, financial impacts, and technical challenges of each system prior to considering acquisition. When applicable, other options besides acquisition may be more appropriate to assist small water systems by other means (e.g., providing a wholesale connection).

RECOMMENDATION 1.5.
Wastewater Utility Consolidation

Background: The Northern Nevada Water Planning Commission (NNWPC) and Western Regional Water Commission (WRWC) have been exploring regional wastewater utility planning and effluent management. In October 2024, NNWPC and WRWC agreed to the formation of a working group that includes NNWPC representatives from Reno, Sparks, Washoe County and TMWA, as well as other subject matter experts. The working group is tasked with conducting a feasibility study to evaluate the opportunities and constraints related to the regionalization of wastewater utility planning, effluent management, and water resource efficiencies. The study will also formulate recommendations to the NNWPC and WRWC on a framework for future actions.

Recommendation: Continue to be involved in workshops and working groups related to wastewater utility consolidation, effluent management, and water resource efficiencies.

OBJECTIVE 2. MANAGEMENT OF CURRENT WATER RESOURCES

RECOMMENDATION 2.1.
Conjunctive Use of Water Resources

Background: TMWA uses a combination of surface water and groundwater resources to meet customer demand. Following the merger with WDWR and STMGID, TMWA now provides access to Truckee River water to much of its service area, excluding its satellite systems which are supplied solely by groundwater. Access to these resources has allowed TMWA to conjunctively manage its resources for most of its customers. Under TROA, TMWA can store additional drought reserves to provide adequate supply for existing and new customers through future droughts. Based on the analyses in this WRP, TMWA has sufficient water supplies to meet demand through 2045 in all scenarios tested.

Recommendation: Continue to rely on TMWA's pool of resources to meet current demand, acquire additional water rights to meet future demand, and recognize that TROA provides additional drought-year reserves. Continue to monitor TMWA's ability to meet current and future demand and include factors such as increased future demand, conservation improvement, hydrologic cycles, climate change, and additional water resources. Analyze management strategies under TROA to ensure that the community is receiving the maximum benefits from the agreement. Continue to track return flow requirements and consider these as a future demand upon available water rights. Update the Board when future conditions evolve that require changes to the planning criteria or supply operation.

RECOMMENDATION 2.2.
Groundwater Management

Background: TMWA's 86 production wells, spanning nine hydrographic basins, are an essential component of TMWA's water supply, particularly in the summer months when additional water resources are needed to meet peak demand. The wells are also critical in drought years when Truckee River flows are reduced. Groundwater level declines have historically occurred due to increased pumping

in the south Truckee Meadows, Mount Rose Fan, west Pleasant Valley, and east Lemmon Valley, whereas water levels have remained stable in most other hydrographic basins. TMWA monitors water levels quarterly in all hydrographic basins where TMWA has production wells to track trends in aquifer health. Efficient management of TMWA's wells is important to ensuring continued groundwater level recovery and stabilization throughout the region. There are groundwater quality concerns in several basins due to tetrachloroethylene (PCE), nitrate, arsenic, and emerging contaminants such as PFAS.

Recommendation: Continue to: (1) maintain and rehabilitate TMWA's wells to meet demand while maintaining the sustainability of the aquifers, (2) maintain or improve water levels through passive and active groundwater recharge, and (3) invest in groundwater infrastructure to maintain access to existing resources. Address water quality issues by: (1) working with the Central Truckee Meadows Remediation District to address PCE contamination, and (2) finding solutions in other areas with water quality issues, such as nitrate contamination in Spanish Springs Valley.

RECOMMENDATION 2.3.
Aquifer Storage & Recovery

Background: TMWA's ASR program started in 1993 and is important to maintain water levels in aquifers where TMWA has production wells. ASR augments the existing water supply to proactively improve water levels and increase drought storage. While the ASR program is currently robust, TMWA is continuing to expand the program, especially in areas where water levels have been declining due to historic over pumping. The Mt. Rose Water Treatment Plant (WTP) began operating in 2022, allowing TMWA to divert and treat Whites Creek water for ASR in the winter months on the Mt. Rose Fan, which is helping to improve groundwater levels in that area.

Recommendation: Continue to expand passive and active groundwater recharge to: (1) augment groundwater supplies that provide additional drought and peak-demand capacity; (2) reduce water quality concerns in specific areas; and (3) maintain and improve groundwater levels. Increasing the breadth and scope of all three of these activities throughout the service area will help maintain sustainable groundwater levels and lessen the impact from septic, industrial, and naturally occurring contaminants.

RECOMMENDATION 2.4.
Water Rights Availability

Background: As a result of the merger in 2014 of the WDWR and STMGID water systems formerly operated by Washoe County, TMWA has integrated most of the region into its distribution system, which allows the area to more effectively utilize Truckee River resources. A review of available Truckee River water rights shows sufficient water rights exist to meet TMWA's average water service demand through the 2045 planning period and beyond. However, TMWA needs to proactively acquire Truckee River water rights to be able to serve new development and meet future demand. Demand for Truckee River water rights has increased in response to a competitive development market, difficulty in finding willing sellers of large blocks of water rights, and competition for water rights for environmental and other downstream uses.

Recommendation: Continue to accept the dedication of appropriate Truckee River water rights in the growth prone areas within TMWA's service territory. Recognize Fish Springs Ranch water rights are available to meet future demand in the North Valleys, and possibly other areas in TMWA's service territory if needed. Continue to acquire water rights to meet future water demand and maintain an inventory of water rights for sustainable growth, pursuant to Rule

7. Continue to review the Rule 7 formulas in order to accurately allocate our fixed resources. Continue to prove up beneficial use of TMWA's permitted water rights in order to secure the resource for the future. Continue to pursue strategic water rights purchases where TMWA is uniquely positioned to obtain the maximum benefit through its pooling of resources, upstream storage, and TROA. Pursue prudent and practicable water lease deals that enhance TMWA's portfolio, especially in terms of TMWA's role in the Return Flow Management Agreement.

RECOMMENDATION 2.5.
Water Conservation

Background: TMWA's conservation initiatives include measures to enhance efficient use of water and reduce or eliminate water waste. Specific programs include leak detection and repair, landscape design guidance, assigned-day watering, and water audits. TMWA works with WRWC in developing conservation plans for the region and cooperates with WRWC in implementing its conservation programs. TMWA is implementing an Advanced Meter Infrastructure (AMI) program to more effectively monitor for leaks, excess water use, and outdoor water use violations. AMI also provides TMWA customers with more detailed information regarding water use, so they can make informed decisions about reducing use and water bills.

Recommendation: Continue to implement TMWA's conservation programs to promote smart and efficient use of the community's water resources. Assess additional programs to further TMWA's conservation goals during drought and non-drought years. Cooperate with Reno, Sparks, and Washoe County on any landscape ordinance updates associated with development.

RECOMMENDATION 2.6.
Source Water Contamination

Background: Generally, TMWA has excellent source water quality given that most of its water supply comes from the Truckee River which flows from Lake Tahoe. However, there are concerns about contaminants reaching the Truckee River and its tributaries, such as sedimentation following wildfires, chemical spills from commercial and industrial areas and from the railroad or highway, and litter and waste impacts. Additionally, some of TMWA's groundwater wells have been contaminated by human activity, including historic tetrachloroethylene (PCE) contamination from dry cleaning businesses and nitrate contamination from high-density septic systems.

To help address these issues, TMWA has implemented a robust Source Water Protection Program that has received national recognition. The program includes various education and outreach efforts and partnerships to protect surface water and groundwater resources, including the Truckee River Fund and the Middle Truckee River Watershed Forest Partnership.

Recommendation: Continue to develop TMWA's Source Water Protection Program to preserve and enhance available water supplies and address known and potential threats to water quality. Pursue new partnerships and initiatives as needed to respond to emerging threats and new contaminants.

RECOMMENDATION 2.7.
Emergency Water Supply Standard

Background: There are events outside of TMWA's control that could lead to an emergency condition in which the water supply could be affected over multiple days, such as a chemical spill into the Truckee River, an earthquake, or a wildfire.

TMWA has completed analyses of the impacts of theoretical spill events on the Truckee River, but the likelihood of these events is extremely rare and there have been no historically recorded toxic spills that have rendered the Truckee River unusable. TMWA has dealt with supply outages due to earthquakes, such as the 2008 earthquake that damaged TMWA's Highland Canal, which conveys water from the Truckee River to its Chalk Bluff WTP. TMWA has sufficient well capacity and distribution system storage to meet non irrigation customer demand during a water quality emergency and has an extensive emergency action plan in place in the event of an extended river outage. Current indoor water demand averages 40 million gallons per day (MGD), and TMWA is able to produce approximately 70-80 MGD from its production wells.

Recommendation: Maintain, as a minimum, the ability to meet daily indoor water use with TMWA wells. For river outages lasting up to seven days during the summer, maintain the ability to meet average daily indoor water demand using wells, treated water storage, and enhanced conservation measures.

OBJECTIVE 3. FUTURE WATER DEMAND & RESOURCES

RECOMMENDATION 3.1. Water Demand Forecast

Background: TMWA's 2024 population forecast estimates total TMWA population served will increase by 88,800 people from approximately 475,600 in 2025 to 567,000 in 2045. The population estimates may change over time as the pace of development within the region varies and as the region moves toward greater density of land use. TMWA's forecast results are statistically similar to the State Demographer's near-term projections. Water demand per service within TMWA's service area has been decreasing over time, resulting in slower total demand growth in TMWA's extended forecast. Based on the review of current growth and economic trends in the region, future water demand is anticipated to grow in the Truckee Meadows, but at a slower pace than historically seen. Projected water demand is expected to increase by approximately 17,000 AF from 90,378 AF in 2025 to 107,178 AF in 2045.

Recommendation: Continue to complete future population forecasts, in coordination with other regional planning entities. Accept for planning purposes that TMWA's water demand projections based on these population forecasts are reasonable estimates for use in TMWA's planning areas.

RECOMMENDATION 3.2. Future Climate Change Impacts

Background: TMWA recognizes the importance of addressing the potential impacts of a changing climate, like increased temperatures and more variability in precipitation patterns. Since the adoption of the last WRP, TMWA has been involved in studies with research partners, including UNR, Desert Research Institute (DRI) and Precision Water Resources Engineering (PWRE), to assess the impact of climate change on regional hydrology and water supply. As climate change effects become more pronounced, TMWA will need to adapt to new conditions that may be different from historical hydrologic and demand patterns. Because climate change science is constantly evolving, TMWA recognizes the importance of being involved in ongoing research in the field.

Recommendation: Continue to consider new findings from climate change research for the greater Truckee Meadows region and continue working with UNR, DRI, and other researchers to assess potential climate change effects on TMWA's sources of supply and regional hydrology.

RECOMMENDATION 3.3.
Advanced Purified Water

Background: The Advanced Purified Water Facility at American Flat is a joint effort between TMWA and the City of Reno to help address effluent management constraints, the impacts of weather variability and future climate uncertainties. The 2 MGD groundwater recharge project will use state-of-the-art advanced water purification processes to clean and purify recycled water from the Reno Stead Water Reclamation Facility. It will produce clean, safe, pure water that meets or exceeds state and federal drinking water standards.

Efforts to begin assessing the feasibility of direct potable reuse (DPR), including discussions with regulatory authorities, have started. DPR has the potential to be a more effective approach than indirect potable reuse and could improve water use efficiency, provide operating flexibility during periods of water scarcity, and diversify the region's water supply portfolio.

Recommendation: Remain actively engaged in a leadership role in implementing advanced purified water projects to enhance TMWA's water resource sustainability, drought resiliency, and efficient use of water resources in the region. Continue working with partners to evaluate the feasibility of direct potable reuse.

RECOMMENDATION 3.4.
Future Water Resources

Background: TMWA has adequate water resources to meet expected demand through 2045 and beyond, with current resources. However, given that water resource development projects can take years to analyze, permit, and implement, TMWA will continue to investigate and pursue other resource development projects to meet future water demand beyond the 20-year planning horizon. The selection of a project is typically a function of a project's yield, ease of implementation, sustainability, and financial feasibility. It is possible that as new technology becomes available or as regulatory requirements or public opinions change, new projects may be developed, or projects previously thought infeasible may become feasible. TMWA is actively pursuing projects related to ASR expansion, new well development, water banking, and advanced purified water.

Recommendation: Continue to investigate and evaluate potential future water supply projects consistent with and in addition to TROA to further increase the region's water security and off-river reliability.

Summary

TMWA has adequate water resources to meet future projected demand through 2045 and beyond under a range of hydrologic and climate conditions. However, because the factors influencing both supply and demand are constantly changing, TMWA recognizes the importance of adapting its management strategies to address new challenges. Continuing to maintain and enhance resource redundancy and resilience are also a focus for TMWA through the next planning horizon. The recommended actions outlined in this chapter will help guide TMWA to effectively manage its water resources through the next WRP update, recognizing that these actions may be amended if new challenges or information should arise.

C8

Appendices

APPENDICES

APPENDIX A
Groundwater Status Update

APPENDIX B
2024 Water Balance Summary

Appendix A: Groundwater Status Update

INTRODUCTION

Truckee Meadows Water Authority (TMWA) operates groundwater production wells in nine hydrographic basins including (see Figure A-1):

- Tracy Segment (083)
- Spanish Springs Valley (085)
- Truckee Meadows (087)
- Pleasant Valley (088)
- Washoe Valley (089)
- Truckee Canyon (091)
- Lemmon Valley West and East (092A and 092B)
- Honey Lake Valley (097)

This appendix provides an overview of groundwater aquifers where TMWA operates production wells. It presents a management-level summary of groundwater quantity and quality across all basins. Various data sources are used to assess groundwater conditions and supply, including production data, historical groundwater model simulations, water levels, water quality data, and information on newly developed or rehabilitated wells.

NEW AND REHABILITATED WELLS

TMWA manages an annual well rehabilitation program that actively monitors each production well and prioritizes rehabilitation based on observed declines in production. Drilling a new well to compensate for groundwater production losses is considered a last resort due to the high cost of large-diameter well drilling. However, when replacement wells are necessary, they are constructed using superior casing and screen materials to enhance longevity. Since 2020, a total of 18 wells have been rehabilitated, as shown in Figure A-2.

These include:

2020

- Fish Springs Ranch A
- Fish Springs Ranch B
- Fish Springs Ranch E
- STMGID 12

2021

- Stampmill 2
- STMGID 2
- Silver Knolls

2022

- Boomtown 10
- Lemmon Valley 7
- Poplar 2
- Spring Creek 2

2023

- Truckee Canyon 4
- Boomtown 12
- Boomtown 7

2024

- El Rancho
- Hidden Valley 1
- Lightning W2
- STMGID 5

Spring Creek 10 is the only new well drilled since 2020. Its location is shown in Figure A-3.

GROUNDWATER QUANTITY STATUS

Tracy Segment (083)

Total TMWA production within the Tracy Segment (083) has remained relatively stable from 2010 – 2019 at approximately 15 AFA. Production rates increased in 2020 to 50 AFA with further increases to 110 AFA in 2023. Grounwater levels are stable in this region.

Spanish Springs Valley (085)

TMWA groundwater production in Spanish Springs Valley has steadily decreased over the past decade due to conjunctive management, with total groundwater production averaging 550 AFA since 2020. Groundwater levels in the western portion of the valley are rising, while levels on the east side are beginning to stabilize due to increased aquifer storage and recovery activities, as well as greater reliance on surface water in the area.

Truckee Meadows (087)

TMWA's groundwater production in the Truckee Meadows hydrographic basin management area has been declining since 2021, dropping from 10,700 AFA in 2020 to 5,600 AFA in 2023. Groundwater levels are rising throughout the basin, a positive development considering that levels in the southern portion of the valley had been declining rapidly for at least two decades. The reduction in groundwater production has reversed this trend, allowing groundwater levels to continue rebounding.

Pleasant Valley (088)

TMWA's groundwater production in Pleasant Valley has slightly declined since 2020, decreasing from 1,200 AFA in 2020 to 1,100 AFA in 2023. Meanwhile, groundwater levels are rising throughout the basin.

Washoe Valley (089)

TMWA's groundwater production in Washoe Valley has remained relatively stable at approximately 50 AFA since 2018, with groundwater levels currently rising.

Additionally, the Old Washoe 4 well was destroyed in the 2024 Davis Fire. The well house, pump, and instrumentation will be replaced as soon as possible.

Truckee Canyon Segment (091)

TMWA's groundwater production in the Truckee Canyon Segment has been declining since 2020, decreasing from 150 AFA in 2020 to 120 AFA in 2023. Groundwater levels in the area remain stable.

Lemmon Valley (092)

TMWA's groundwater production in the Lemmon Valley hydrographic basin (west and east) has been declining due to increased importation of water from the Fish Springs Ranch well field. Production decreased from 170 AFA in 2020 to 100 AFA in 2023. Ongoing aquifer storage and recovery activities in this basin have contributed to rising groundwater levels.

Honey Lake Valley (092)

Total groundwater production in Honey Lake Valley has been declining since 2019, decreasing from 3,800 AFA in 2019 to 3,400 AFA in 2023. Groundwater levels also began declining in 2019 due to TMWA's increased production from the Fish Springs Ranch wellfield to test system functionality, enhance basin monitoring, and offset groundwater pumping in the North Valleys. Despite the observed decline, aquifer conditions in Basin 97 remain within acceptable thresholds.

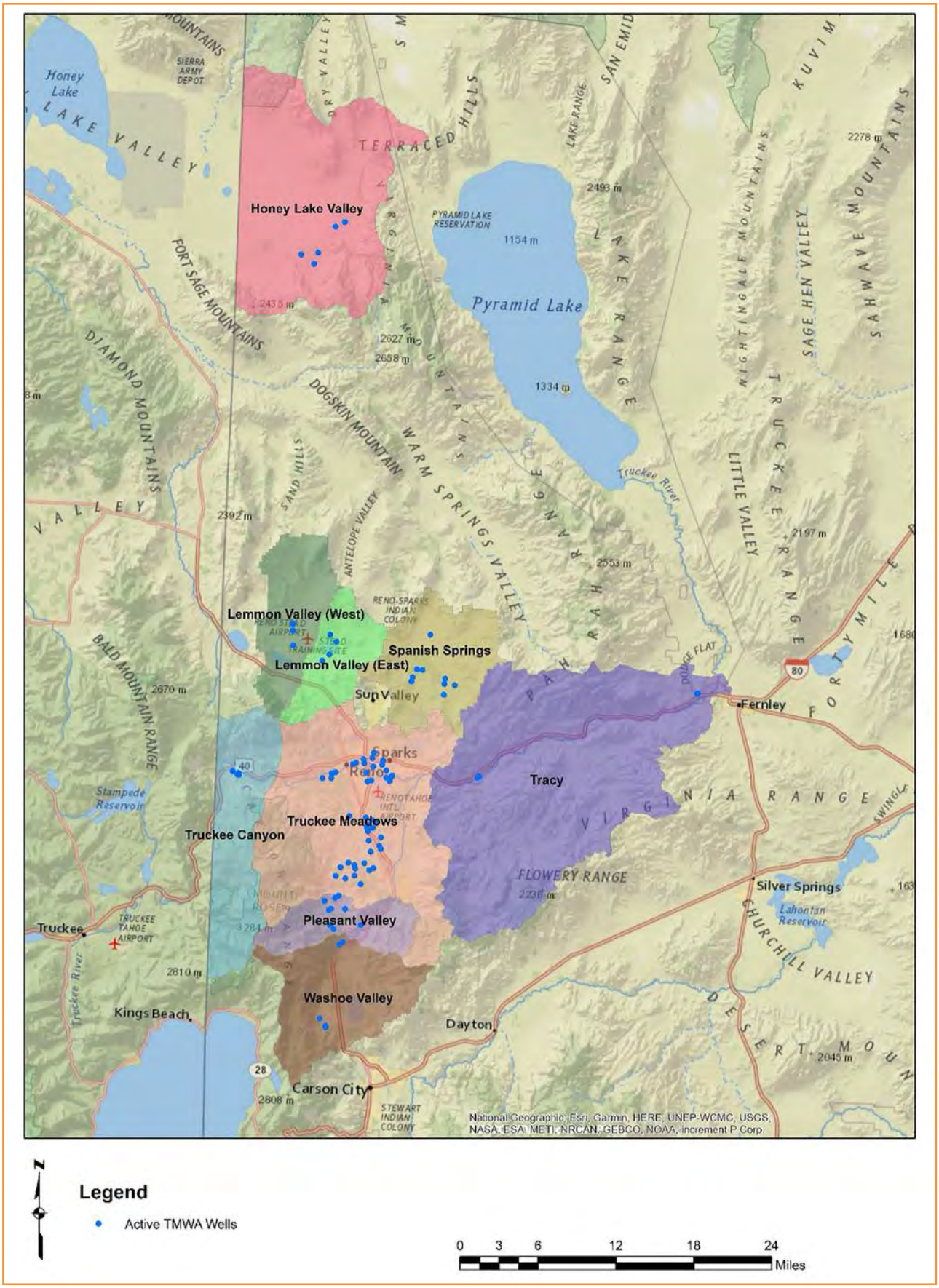


FIGURE A-1: HYDROGRAPHIC BASINS AND TMWA GROUNDWATER PRODUCTION WELLS.

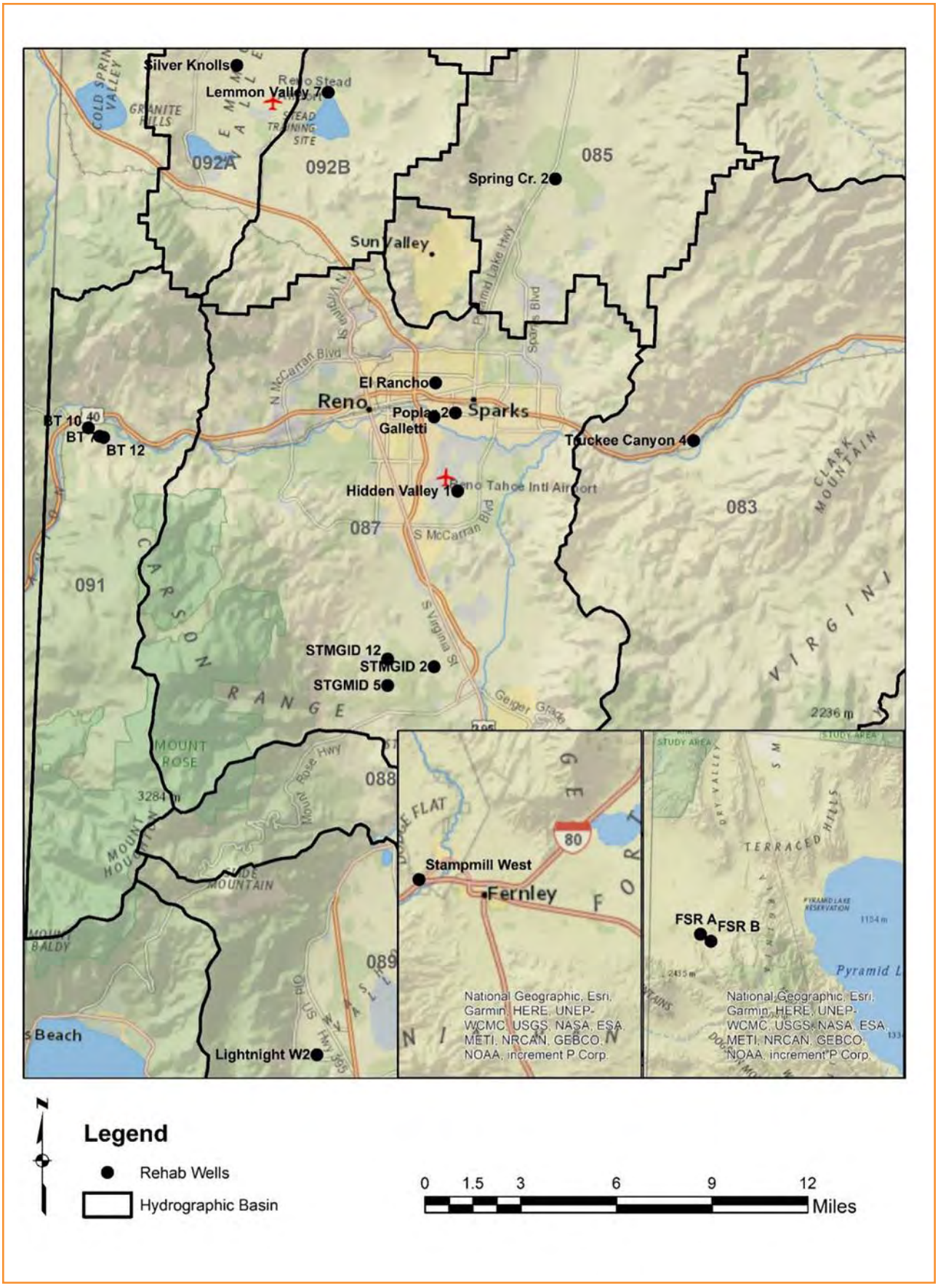


FIGURE A-2: REHABILITATED WELLS SINCE 2020.

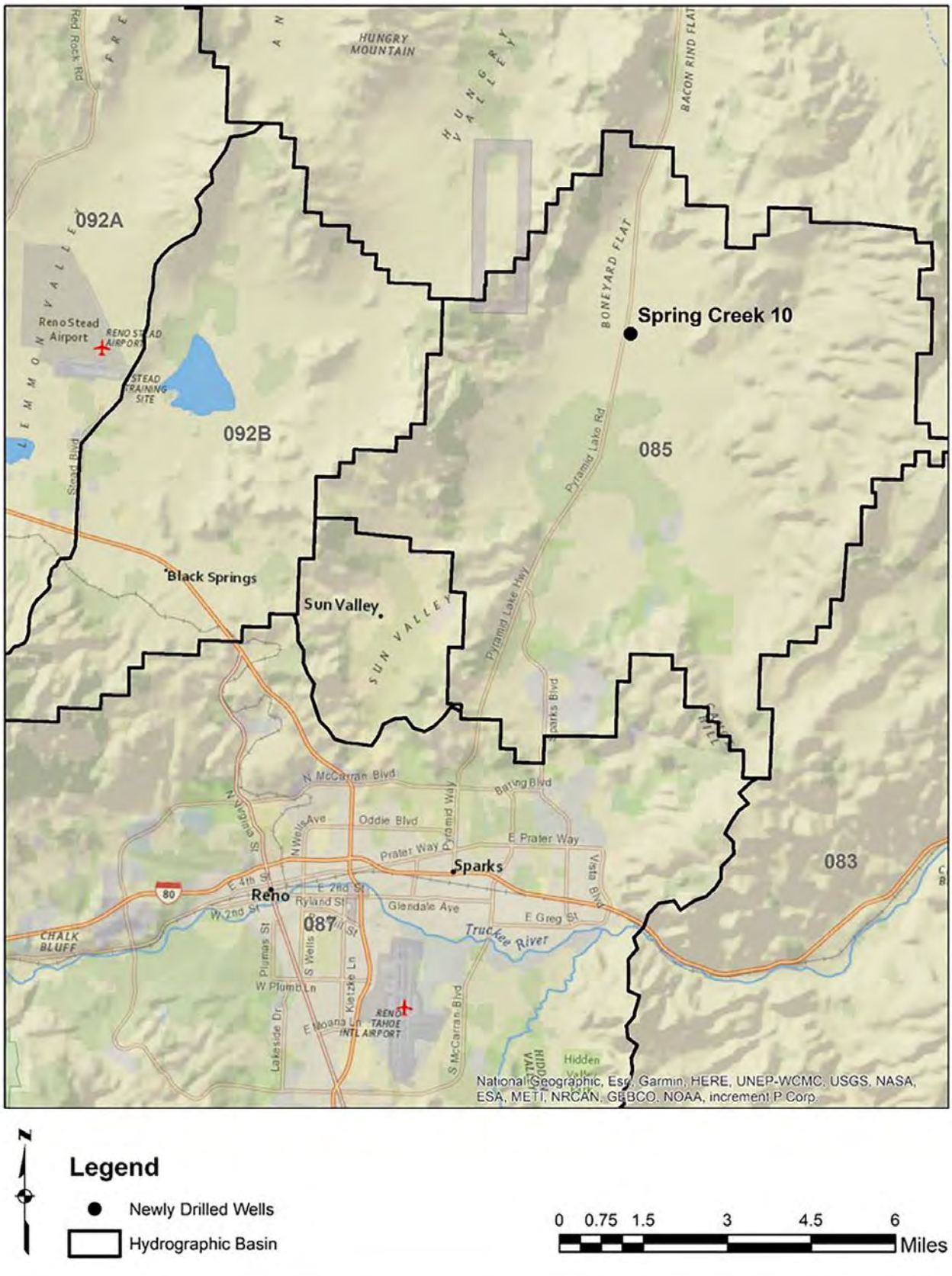
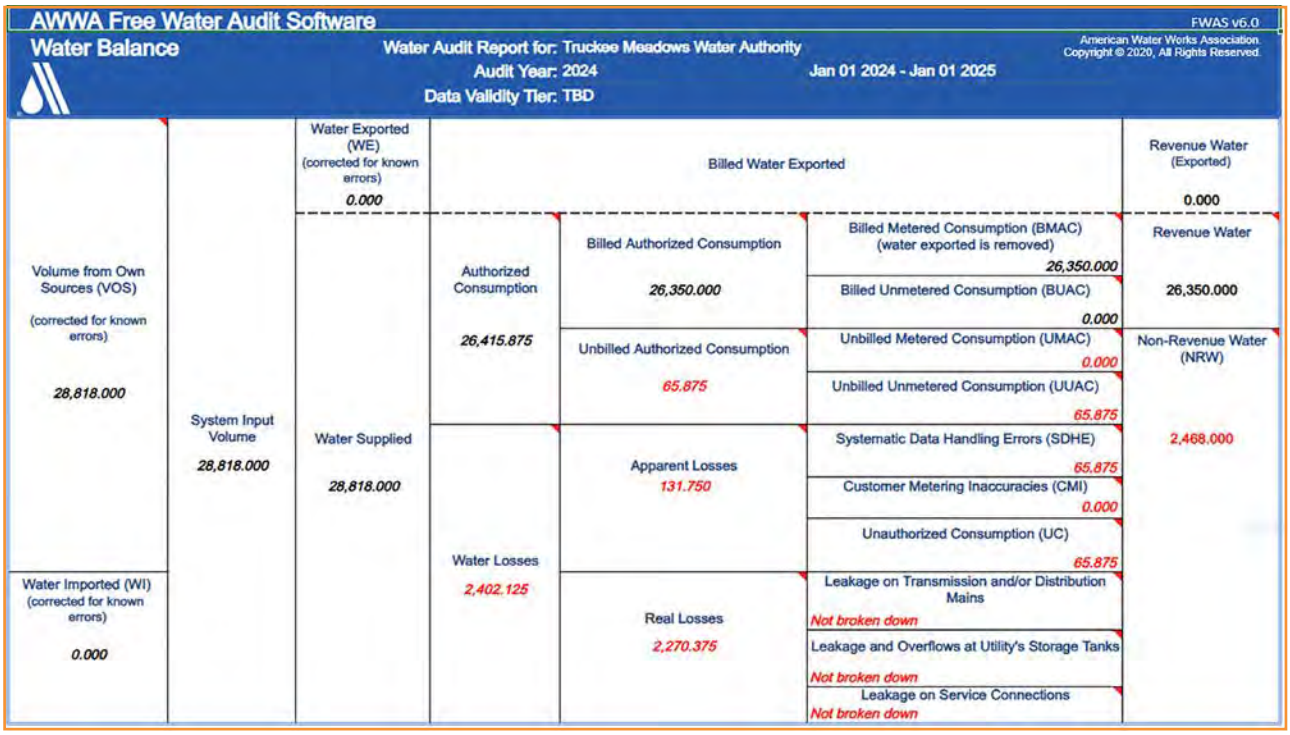


FIGURE A-3: NEW WELLS DRILLED SINCE 2020.

Appendix B: 2024 TMWA Water Balance Summary



AWWA Free Water Audit Software — FWAS v6.0

Water Balance

Water Audit Report for: Truckee Meadows Water Authority

Audit Year: 2024

Data Validity Tier: TBD

Jan 01 2024 - Jan 01 2025

Volume from Own Sources (VOS) (corrected for known errors) 28,818.000	System Input Volume 28,818.000	Water Exported (WE) (corrected for known errors) 0.000	Billed Water Exported			Revenue Water (Exported) 0.000
		Water Supplied 28,818.000	Authorized Consumption 26,415.875	Billed Authorized Consumption 26,350.000	Billed Metered Consumption (BMAC) (water exported is removed) 26,350.000	Revenue Water 26,350.000
					Billed Unmetered Consumption (BUAC) 0.000	
				Unbilled Authorized Consumption 65.875	Unbilled Metered Consumption (UMAC) 0.000	Non-Revenue Water (NRW) 2,468.000
					Unbilled Unmetered Consumption (UUAC) 65.875	
			Water Losses 2,402.125	Apparent Losses 131.750	Systematic Data Handling Errors (SDHE) 65.875	
					Customer Metering Inaccuracies (CMI) 0.000	
					Unauthorized Consumption (UC) 65.875	
Water Imported (WI) (corrected for known errors) 0.000				Real Losses 2,270.375	Leakage on Transmission and/or Distribution Mains Not broken down	
					Leakage and Overflows at Utility's Storage Tanks Not broken down	
					Leakage on Service Connections Not broken down	