Administrative Draft – May 12, 2026

2025 Urban Water Management Plan

THE CITY OF BENICIA CALIFORNIA

Prepared By:

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This 2025 Urban Water Management Plan was prepared under the direction of a California licensed civil engineer.

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EXECUTIVE SUMMARY
LAYPERSON'S DESCRIPTION

After the devastating drought in the late 1970s, the California Legislature declared California's water supplies a limited resource, subject to ever-increasing demands and that the long-term, reliable supply of water is essential to protect California's businesses, communities, agricultural production, and environmental interests. The Legislature also recognized a need to strengthen local and regional drought planning and increase statewide resilience to drought and climate change. Thus, in 1983, the California Legislature created the Urban Water Management Planning Act (UWMPA).[1] The UWMPA requires urban water suppliers serving over 3,000 customers or supplying at least 3,000 acre-feet of water annually to prepare and adopt an urban water management plan every five years,[2] and demonstrate water supply reliability in a normal year, single dry year, and droughts lasting at least five years over a twenty-year planning horizon.[3] The UWMPA also requires each urban water supplier to prepare a drought risk assessment and water shortage contingency plan.[4] And last, beginning in July 2022, each urban water supplier must prepare an annual water supply and demand assessment.[5] The California Legislature asserts that aggregating all of these legal requirements at the urban water supplier level will improve local, regional, and statewide water planning and water resilience.

At a practical level, the Urban Water Management Plan (UWMP) is the legal and technical water management foundation for urban water suppliers throughout California. A well-constructed UWMP provides the supplier's elected officials, management, staff, and customers with an understanding of past, current, and future water conditions and management. The UWMP integrates local and regional land use planning, regional water supply, infrastructure, and demand management projects as well as providing for statewide challenges that may manifest through climate change and evolving regulations. Thoughtful urban water management planning provides an opportunity for the supplier to integrate supplies and demands in a balanced and methodical planning platform that addresses short- and long-term planning conditions. In brief, the UWMP gathers, characterizes, and

[1] California Water Code (CWC) §10610 *et seq*. (Chapter 1 added by Stats. 1983, Ch. 1009, Sec. 1).

[2] CWC §10610 *et seq*.

[3] CWC §§10631-10635

[4] CWC §§10632

[5] CWC §§10632.1

synthesizes water-related information from numerous sources into a plan with local, regional, and statewide practical utility.

ES-1 CITY OF BENICIA

The City of Benicia is located along the northern shoreline of the Carquinez Strait in Solano County, where the Sacramento–San Joaquin Delta meets San Francisco Bay. Incorporated in 1851, Benicia is one of the oldest cities in the Bay Area and has a long history of developing and managing water supplies to meet the needs of its residents, businesses, and industries. Early water supplies were derived from Sulphur Springs Creek and Lake Herman, and these local sources continue to play a role in the City's water system today. The City's water service area is shown in Figure ES-1.

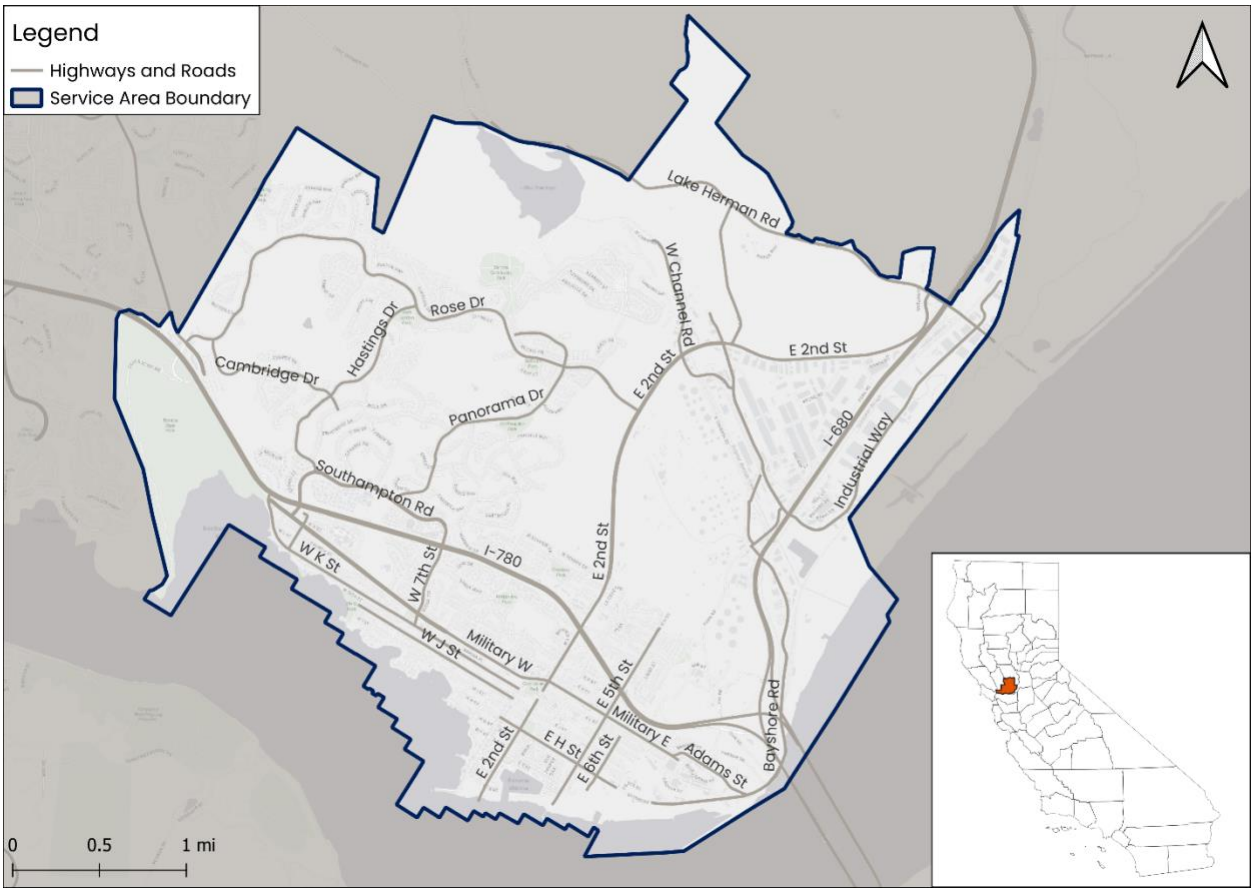


FIGURE ES-1: WATER SERVICE AREA

Benicia owns and operates its water treatment plant, raw water conveyance system, potable distribution system, and wastewater treatment facilities through its Public Works Department. The City provides potable water service to approximately 9,700 residential, commercial, institutional, and irrigation connections. In addition, Benicia delivers untreated raw water to

the Valero Benicia Refinery under a long-standing agreement that has historically represented a substantial portion of the City's total water demand.

While local watershed supplies remain important, the City's primary source of water is imported surface water from the Sacramento River Watershed, delivered through the State Water Project (SWP) and regional conveyance facilities. The City also imports water from the Solano Project (SP) via the Putah South Canal and raw water conveyance facilities. The City manages a diverse water supply portfolio that includes SWP Table A supplies, carryover storage, a settlement agreement with the California Department of Water Resources, agreements with neighboring agencies for Solano Project water, and local surface water rights associated with Sulphur Springs Creek and Lake Herman. This diversified portfolio allows Benicia to balance cost, water quality, and reliability across a wide range of hydrologic conditions.

ES-2 Benicia's Water Supply Reliability

A central finding of the 2025 UWMP is that the City of Benicia's water supply portfolio is capable of meeting projected water demands through 2050 under normal conditions, a single dry year, and a drought lasting five consecutive years, provided that the City continues active and coordinated water supply management.

Under normal conditions, Benicia relies primarily on imported supplies delivered through the State Water Project and the Solano Project, supplemented by local watershed supplies and strategic use of storage. During dry and critically dry years, the City shifts its supply mix to preserve long-term reliability by maximizing carryover storage, coordinating closely with the Solano County Water Agency (SCWA), and managing monthly deliveries to reflect regulatory and conveyance constraints.

The UWMP evaluates water supply reliability using conservative planning assumptions that reflect historical droughts, regulatory limitations in the Sacramento–San Joaquin Delta, and projected impacts of climate change on snowpack, runoff timing, and reservoir operations. While the City has access to significant annual water entitlements, some supplies, particularly those dependent on Delta conditions, may be constrained during certain months in dry years. As a result, proactive water management, regional coordination, and conservation remain critical components of Benicia's long-term strategy.

Although the City's analysis demonstrates sufficient supplies to meet demands over the planning horizon, the UWMP recognizes that extraordinary conditions—such as State-declared drought emergencies, regulatory curtailments, infrastructure failures, or seismic events—could require temporary reductions in water use. To address these risks, the City maintains an updated Water Shortage Contingency Plan that establishes clear shortage stages, response

actions, and communication protocols to protect public health and essential services during water supply emergencies.

Overall, the 2025 UWMP confirms that Benicia's diversified supply portfolio, combined with continued demand management, infrastructure investment, and regional coordination, positions the City to reliably serve its community under a wide range of future conditions.

CHAPTER 1
INTRODUCTION

The City of Benicia (City or Benicia) is located on the northern shore of the Carquinez Strait in Solano County, connecting San Pablo Bay with the Sacramento–San Joaquin Bay-Delta Estuary system. Benicia is one of the oldest cities in the San Francisco Bay Area, incorporated in 1851, with municipal water service dating back to the late 19th century. Early residents secured water rights to Paddy Creek and Sulphur Springs Creek in the 1880s, and Sulphur Springs Creek remains an important water source for the City today. The Benicia Water Company, predecessor to the City's municipal system, developed the original reservoirs, pipelines, and wells that laid the foundation for Benicia's modern water infrastructure. Today, the City's water treatment plant, conveyance system, and wastewater treatment plant are owned and operated by the City's Public Works Department.

Historically, Benicia played a significant role as a shipbuilding center during World War I and supported waterfront industries such as canning and tanneries. The City also hosted a U.S. Army Armory and continues to serve as an industrial hub, with an active industrial park in the northeast portion of the City that includes the Valero oil refinery. At the same time, Benicia maintains its small-town character, with a vibrant downtown, diverse residential neighborhoods, and a unified school district.

Land use in Benicia is guided by sustainable development principles that emphasize compact growth, efficient use of land, reduced traffic, preservation of farmland, open space, and wetlands, and minimizing infrastructure costs. These planning strategies are intended to avoid the costs of urban sprawl and protect Benicia's quality of life while supporting long-term economic stability and environmental stewardship.

Ensuring a reliable and sufficient water supply remains a critical component of the City's ability to meet the needs of its residents and its commercial, institutional, and industrial (CII) customers. The 2025 Urban Water Management Plan (UWMP) builds on prior planning efforts and incorporates updated local, regional, and statewide information. This Plan provides a comprehensive framework to guide water resource management decisions, ensuring that Benicia can adapt to evolving conditions, meet regulatory requirements, and plan for future growth in a sustainable and resilient manner.

1.1. BACKGROUND AND PURPOSE

The Urban Water Management Planning Act (UWMPA) was enacted by the California Legislature in 1983 to address the growing need for comprehensive water supply planning

across the state's urban areas. Codified in California Water Code sections 10610-10656, the UWMPA requires urban water suppliers serving more than 3,000 customers or delivering more than 3,000 acre-feet annually to prepare and adopt comprehensive water management plans every five years. The City has prepared this 2025 UWMP to comply with the UWMPA requirements and addresses the City's water management planning efforts to assure adequate water supplies to meet forecast demands over the next 25 years.

As required by the UWMPA, this 2025 UWMP specifically assesses the availability of the City's supplies to meet forecast water uses during normal, single-dry, and five consecutive drought years through 2050. Verification that future demands will not exceed supplies and assuring the availability of supplies in dry-year conditions are critical outcomes of this plan. The 2025 UWMP is an update to the City's 2020 UWMP and presents new data and analysis as required by the California Department of Water Resources (DWR) and California Water Code. There were no changes to the Water Code regarding UWMP reporting requirements for the 2025 cycle; however, in many instances this UWMP provides enhancements beyond the statutory requirements to maximize the utility of the updated plan. This comprehensive water planning document describes existing and future supply reliability, forecasts future water uses, presents demand management progress, and identifies local and regional cooperative efforts to meet projected water use.

The UWMP is designed to be a valuable water management and planning tool to guide and inform the City's managers, customers, and the State of California about the City's water management practices. It reflects the City's planning assumptions and goals and should be used in combination with other planning resources and documents over the UWMP planning horizon, representing the City of Benicia's continued commitment to responsible water stewardship and proactive strategies that protect both water reliability and community prosperity.

1.2. Basis for Plan Preparation

The City operates a Public Water System as described in California Health and Safety Code 116275. The City qualifies as a Retail Urban Water Supplier as described in Water Code Section 10617, providing water for municipal purposes to more than 3,000 customers or 3,000 acre-feet of water per year. This qualification requires the preparation of an Urban Water Management Plan every five years.

The City's Public Water System details are listed in **Table** 1-1.

TABLE 1-1: PUBLIC WATER SYSTEM INFORMATION

Public Water System Number	Public Water System Name	Number of Municipal Connections 2025[6]
CA4810001	City of Benicia	~9,700

The State Legislature passed numerous new requirements for the 2020 UWMP cycle which continue to apply to this 2025 UWMP. Since there have been no additional statutory changes to UWMP requirements between 2020 and 2025, this plan incorporates the same comprehensive framework established for 2020 UWMPs. Major requirements implemented in 2020 and continued in this 2025 UWMP are listed below along with references to the corresponding sections where they are addressed in this document.

Five Consecutive Dry-Year Water Service Reliability Assessment: The Legislature modified the dry-year water reliability planning from a "multiyear" time period to a "drought lasting five consecutive water years" designation. This statutory change requires the City to analyze the reliability of its water supplies to meet its water use over an extended drought period. This requirement is addressed in Chapter 3—Water Supply Characterization, Chapter 4—Water Use, and Chapter 5—Water Service Reliability Assessment.

Drought Risk Assessment (DRA): Due to the severity of recent California droughts and the variability associated with climate change predictions, the California Legislature created a DRA requirement for UWMPs. The DRA requires assessment over a five-year period from 2026 to 2030 that examines water supplies, water uses, and the resulting water supply reliability for five consecutive dry years. The DRA is addressed in Chapter 5—Water Service Reliability Assessment and Chapter 6—Water Shortage Contingency Plans.

Seismic Risk: Evaluating seismic risk to water system infrastructure and facilities and having a mitigation plan is now required by the Water Code. Incorporating the water system into regional or county hazard mitigation planning is an important aspect of this statute. Seismic risk is addressed in Chapter 6.

Water Shortage Contingency Plan: The Legislature modified the UWMPA to require a Water Shortage Contingency Plan (WSCP) with specific elements. The WSCP is a document that provides the City with an action plan for a drought or catastrophic water supply shortage. This WSCP updates the 2020 version based on an assessment of response action and protocol effectiveness during the 2020-2025 implementation period. The WSCP is presented in Chapter 6 of this UWMP.

[6] The City supplies Valero Refining Company raw water. These raw water connections are not included in the municipal connection count.

Groundwater Supplies Coordination: UWMPs are required to be consistent with Groundwater Sustainability Plans following the 2014 Legislature enactment of the Sustainable Groundwater Management Act (SGMA). The City does not utilize groundwater supplies, but this requirement is met in Chapter 3—Water Supply Characterization.

Lay Description: A synopsis of the fundamental determinations of the UWMP is a statutory requirement. This section is intended for new staff, new governing members, customers, and the media, and ensures a consistent representation of the City's detailed analysis.

1.3. COORDINATION AND OUTREACH

The City has complied with the UWMPA by engaging in coordination with local and regional agencies to ensure a consistent, transparent, and regionally integrated approach to water resource planning. Coordination and communication among agencies play a critical role in promoting reliability, resilience, and sustainability of the region's water supplies. In accordance with California Water Code Section 10620(d)(3), the City coordinated the preparation of this UWMP with other appropriate agencies within and adjacent to its service area, including water suppliers sharing common sources, water management agencies, and relevant public entities.

The City continues to participate in region-wide water planning through the Solano County Water Agency (SCWA), whose members include the Cities of Benicia, Dixon, Fairfield, Rio Vista, Suisun City, and Vacaville; the Solano Irrigation District; Maine Prairie Water District; and Reclamation District 2068. The City also coordinates with Travis Air Force Base, Vallejo Flood and Wastewater District, and the City of American Canyon. The SCWA has developed and implemented an Integrated Regional Water Management Plan (IRWMP) and a Strategic Plan, which provide a collaborative framework for long-term water resource planning and project implementation in the region. The City of Benicia is an active participant in these ongoing efforts.

Benicia is also an affiliate member of the Bay Area Clean Water Agencies (BACWA), a consortium of local agencies that operate publicly owned treatment works (POTWs) discharging to the San Francisco Bay Estuary. BACWA's members collectively serve more than seven million people across the nine-county Bay Area, managing both domestic and industrial wastewater treatment and discharge to protect regional water quality.

In compliance with Water Code Section 10621(b), the City provided notification to all affected cities and counties at least 60 days prior to the public hearing on this UWMP update. Additionally, the District conducted outreach to community stakeholders and encouraged the involvement of diverse social, cultural, and economic elements within the service area, as required under Water Code Section 10642. These efforts reflect the City's ongoing commitment to public transparency and engagement in water resource planning. A

summary of these notifications is provided in **Table** 1-2, and copies of the notification letters are included in **Appendix A**.

TABLE 1-2: PUBLIC AND AGENCY COORDINATION

Coordinating Agencies	Sent Notice of Preparation / 60-Day Notice	Provided Notice Public Hearing
City of Dixon	X	X
City of Fairfield	X	X
City of Rio Vista	X	X
City of Suisun	X	X
City of Vacaville	X	X
City of Vallejo	X	X
Solano County Water Agency	X	X
Solano Irrigation District	X	X
Valero Benicia Refinery	X	X
Solano County Planning Commission	X	X
Reclamation District 2068	X	X
Maine Prairie Water District	X	X
Rural North Vacaville Water District	X	X
Suisun-Solano Water Authority	X	X
Department of Water Resources	X	X
State Water Resources Control Board	X	X
Solano LAFCo	X	X
General Public	X	X

1.4. WATER SUPPLIER INFORMATION EXCHANGE

In accordance with Water Code Section 10631(h), wholesale and retail water suppliers must exchange information regarding projected water supply and demand in order to facilitate consistent planning assumptions. Since the City receives a portion of its supply from a wholesale agency, this exchange of data and projections is performed as part of regional coordination and SCWA's planning process.

1.4.1. STATUTORY REQUIREMENTS FOR NOTICE

In compliance with Water Code Section 10621(b), the City notified entities in **Table** 1-2 in late October and early November, 2025 regarding its intent to update and adopt this 2025 UWMP. The notification was provided more than 60 days prior to the scheduled public hearing, fulfilling statutory requirements. Furthermore, consistent with Water Code Section 10642, the City encouraged public participation by providing notice of the hearing date, time, location, and methods for accessing the draft UWMP. Notifications were published in local newspapers

and sent directly to interested stakeholders to promote inclusive community involvement in the plan's development.

1.5. Public Hearing, Adoption, and Submittal

In compliance with Water Code Section 10642, the City held a publicly noticed hearing on June 2, 2026 to review and consider adoption of the 2025 UWMP and associated WSCP. The hearing provided an opportunity for community members, partner agencies, and regional stakeholders to comment on the proposed Plan. Following public input, the City Council formally adopted the 2025 UWMP and WSCP by resolution.

Consistent with Water Code Section 10644(a), the adopted Plan was submitted within 30 days to the California State Library, and the County of Solano. The City does not supply water outside of its service area. In addition, the City electronically submitted the Plan and all required data tables to the DWR prior to the regulatory deadline of July 1, 2026, thereby completing all statutory submittal requirements.

1.6. Document Organization

This 2025 UWMP is organized as follows:

Executive Summary provides an overview of the purpose and findings of this 2025 UWMP.

Chapter 1 establishes the basis for the UWMP, describes the outreach activities and introduces the document organization.

Chapter 2 provides a description of the City's service area, demographic characteristics and climate, and describes the future population the City anticipates needing to serve.

Chapter 3 describes the current and future water supplies and the availability of the supplies through 2045.

Chapter 4 details the customer uses, including the past and future estimated uses, and describes District's past and on-going demand management measures.

Chapter 5 presents the City's water system service reliability into the future, including an assessment of reliability if a drought occurred over the next five consecutive years.

Chapter 6 is the City's stand-alone water shortage contingency plan, incorporated as a chapter in this UWMP, but also available to be shared and utilized separate from the UWMP

NOTE TO DWR:

The City of Benicia has prepared this Urban Water Management Plan (UWMP) primarily as a water resources planning tool to effectively manage water supply, reliability and demand. This UWMP also satisfies all the requirements of the Urban Water Management Planning Act (UWMPA).

The body of the document provides narratives, analysis and data that DWR requests in its 2025 UWMP Guidebook, including enhancements wherever possible, acknowledging there have been no statutory changes to the Water Code regarding UWMPs since 2020.

Unless otherwise noted, annual reporting is on a calendar year basis and units for volumetric values are reported in acre-feet.

To facilitate review by DWR for compliance with the UWMPA, data from the body of the document has been transferred into required DWR submittal tables consistent with the organization of the tables in Appendix E of the 2025 UWMP Guidebook. These tables are separately uploaded to DWR's web portal. This UWMP has been reviewed for adequacy according to the UWMP Checklist as contained in Appendix F in the 2025

CHAPTER 2
WATER SERVICE AND SYSTEM DESCRIPTION

The City of Benicia is approximately 35 miles northeast of San Francisco and 57 miles southwest of Sacramento. Located in northeastern San Francisco Bay, the City sits on a gentle slope leading down to the north shore of the Carquinez Strait (Strait) which forms the outlet of the Sacramento-San Joaquin River Delta (Delta). Benicia is located in Solano County and connects the San Francisco Bay to the west with the Delta to the east. The City's water service area contains its own surface drainage watersheds which drain runoff to waterways in and adjacent to the City. Two surface drainage basins are located within the City's water service boundaries, Sulphur Springs Creek in the west and Paddy Creek in the east. The Sulphur Springs watershed is approximately 18 square miles with six square miles in the higher elevation and northern part of the area outside of the City's planning area and within the neighboring City of Vallejo's sphere of influence. This watershed also includes Lake Herman, a key element of the City's water delivery and management system. Paddy Creek drains three square miles before flowing into the lower reach of Sulphur Springs Creek, below the Lake Herman outlet. While administratively and geographically part of Solano County, Benicia is closely linked to Contra Costa County across the Strait.

The City of Benicia's water delivery and management system is responsible for serving a large residential population, commercial and retail connections and significant industrial and manufacturing customers. Notably, the City has been serving untreated water to Valero Refining Company – California (Valero), a major petrochemical industrial facility, since 2000 when Valero acquired the refinery from Exxon Company, U.S.A. (Exxon) The raw water agreement between the City and the refinery was originally with Humble Oil and Refining Company (Humble Oil) and dates back to 1967. The agreement was assigned to Exxon in 1988.

Benicia provides both water and wastewater services to its community. The water service area is contiguous with the City boundaries (**Figure** 2-1), encompassing about 14.15 square miles.

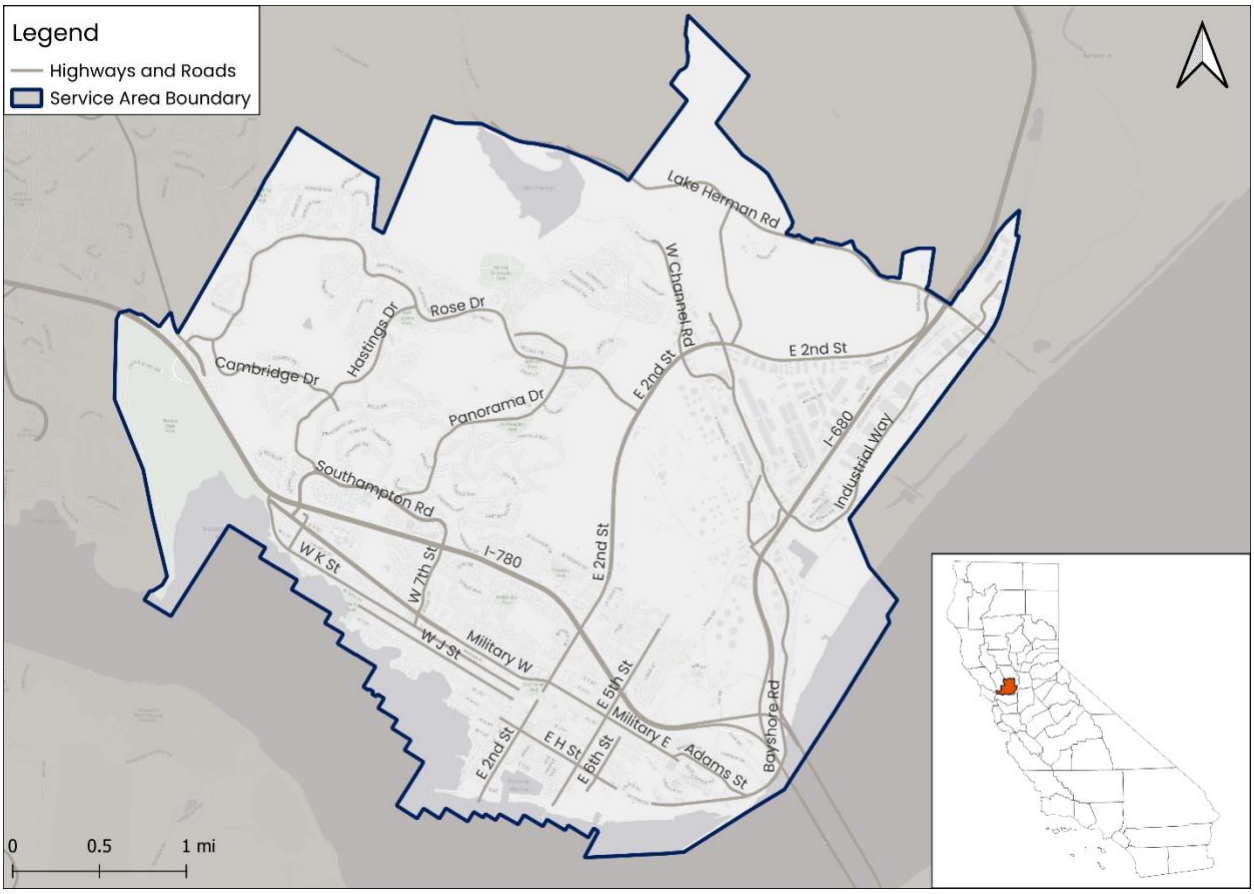


FIGURE 2-1: WATER SERVICE AREA

The City provides water service to approximately 9,800 residential, commercial, irrigation, and institutional/governmental service connections. Much of the development is low-density, single-family housing and retail related commercial use. **Table** 2-1 shows the number of service connections by customer class for 2020 through 2025, representing the mix of customer types and in total customer connections since the 2020 UWMP.

TABLE 2-1: CUSTOMER WATER SERVICE CONNECTIONS

Customer Class	2020	2021	2022	2023	2024	2025
Single-Family Residential	8,557	8,514	8,502	8,452	8,498	8,460
Multi-Family Residential	313	317	316	323	325	323
Commercial/Institutional	531	510	507	504	501	505
Industrial	82	72	137	72	72	71
Landscape Irrigation	315	275	273	271	276	275
Other	16	33	27	16	13	14
Total	9,814	9,721	9,762	9,638	9,685	9,648

Benicia's water supply and wastewater services are managed by the City's Public Works Department, which operates the Benicia Water Treatment Plant (WTP), transmission, distribution, and water storage systems, as well as providing all customer-facing activities including billing, conservation messaging, and customer service. The Wastewater Operations Division operates and provides maintenance, repair, and capital improvements of the Wastewater Treatment Plant (WWTP) and collection and discharge systems. Located on Lake Herman Road, the WTP last underwent expansion in 1989.

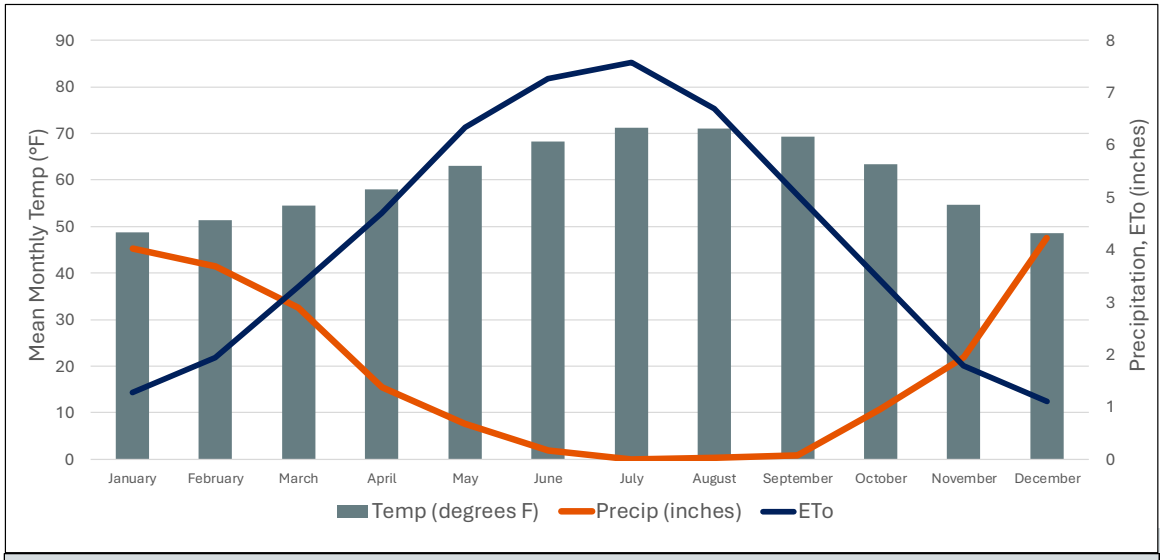
While local freshwater supplies are available from the Sulphur Springs Watershed, imported surface water from the Sacramento River and Putah Creek watersheds constitutes the principal water supply for the City (see Chapter 3).

2.1. SERVICE AREA CLIMATE

Benicia's climate is characterized as a mild, coastal Mediterranean climate with a wet winter and a dry summer. Located in the North Bay region, the City's weather is usually cooler than neighboring inland areas, but warmer than those closer to the Pacific Ocean. Despite its semi-marine environment, summers are characterized as long and hot with the highest average temperatures occurring from July through September. As a result, this seasonal lag means October temperatures are usually warmer than temperatures in May. December through early February is the coldest period. Rainfall primarily occurs between November and March, with an annual average precipitation of nearly 22 inches. The annual mean temperature is 63 degrees Fahrenheit, with summer months regularly reaching average highs in the low 80s, and average winter lows dropping to the upper 30s. Autumns remain comparatively warm, cooling dramatically by late November, when the rainy season typically begins. Spring brings gradual warming by late March with most winter rain ending by late April.

Figure 2-2 presents average historical climate data for the service area, including average monthly temperature, rainfall, and reference evapotranspiration (ETo) from the past 30-

years. As shown in **Figure** 2-2, the warmest months of the year on average are July and August with an average temperature of about 71° Fahrenheit (F), while the coldest months of the year are December and January with average temperatures falling to approximately 49° F. Historically the most rainfall also occurs in December and January with precipitation tapering into the spring and minimal amounts falling in the summer months. Average annual rainfall over the historical period totals just over 20 inches.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temp	48.7	51.4	54.5	58.0	63.0	68.3	71.3	71.2	69.3	63.5	54.7	48.5
Precip	4.03	3.68	2.88	1.37	0.67	0.16	0.00	0.03	0.08	0.96	1.94	4.22
ETo	1.27	1.94	3.30	4.70	6.34	7.27	7.58	6.69	5.04	3.41	1.78	1.10

FIGURE 2-2: AVERAGE CLIMATE CONDITIONS[7]

2.1.1. CLIMATE CHANGE

The California Water Code does not prescribe specific climate change planning and management measures for water suppliers; however, urban water suppliers should consider climate change when evaluating water supply availability and customer water use trends. For example, drier conditions or drought can lead to more residential irrigation and increased water use compared to wetter years. Specifically, increased demand during spring and fall months, where in normal years precipitation is adequate, can stress supplies during seasons that historically had more supply availability and flexibility between sources.

[7] Temperature and rainfall data represents annual averages from 1995-2024 from the PRISM Climate Group https://prism.oregonstate.edu/ Location: Lat: 38.0770 Lon: -122.1341 Elev: 131ft; ETo data is from CIMIS Concord Station 170, April 2001 - December 2024.

Climate change will likely alter precipitation patterns, resulting in consequential externalities like reductions in Sierra Nevada snowpack. Given the City's reliance on imported water, particularly from the Sacramento River, which relies on melting snowpack, effects from climate change on Sierra Nevada snowpack levels and inflows to Northern California reservoirs and the Delta would impact water availability. Specific risks to the City's water supply portfolio are further discussed in Chapter 3. Precipitation has varied widely in recent years as shown in **Figure** 2-3.[8] Rainfall totals have seen negative deviation from the mean from 40% to over 70% in multiple years, with a trend of wide swings in consecutive years over the last two decades.

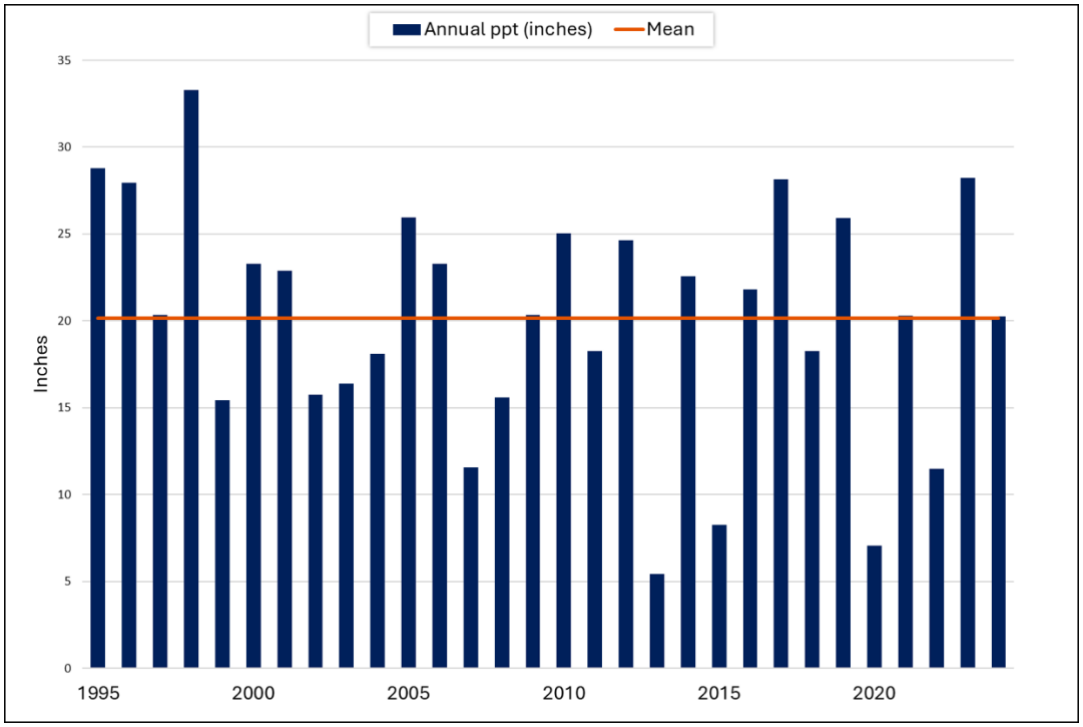


FIGURE 2-3. ANNUAL PRECIPITATION VARIABILITY (1995-2024)

As shown by the trendlines in **Figure** 2-4, there has been a gradual warming in average temperatures over the past 100 years. Rising temperatures impact the region and its water demands at large, especially outdoor water uses, and further exacerbates supply reliability. With existing water supplies facing constraints, additional demand driven by climate change could result in supply shortfalls for many water retailers. **Figure** 2-4 illustrates the general warming trend experienced by the City over the last 100 years.

[8] Rainfall data from PRISM Group, Northwest Alliance for Computational Science & Engineering (NACSE), based at Oregon State University

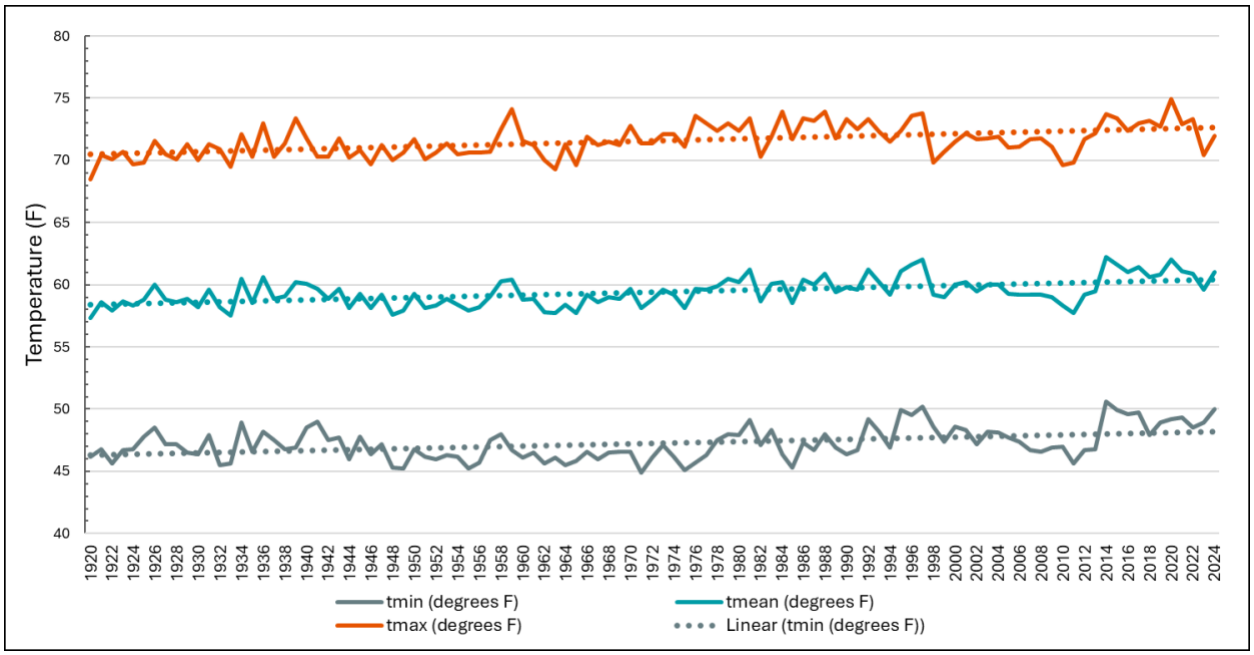


FIGURE 2-4: **HISTORICAL ANNUAL TEMPERATURE (YEARS)**[9]

Accordingly, this UWMP assesses supply availability in dry-year conditions (Chapter 3) and provides a drought risk assessment and long-term reliability projections (Chapter 5). The City's Water Shortage Contingency Plan (WSCP) is also updated in this UWMP as required by the UWMPA.[10] Additional discussion regarding the potential effects of climate change is included in Chapter 3, Chapter 4, and Chapter 5.

2.2. CURRENT AND PROJECTED POPULATION, LAND USE, ECONOMY, AND DEMOGRAPHICS

Service area population and land use projections are critical to developing a useful planning framework, as population dynamics and growth are a primary driver on water use. These projections directly influence planning decisions for system supply, delivery, infrastructure, and demand management. Similarly, understanding the City's economic, social, and demographic trends is requisite for water management and planning. This section of the UWMP addresses these factors to provide a supportable basis for forecasting future water use.

Developing these planning frameworks and growth projections begins with calculating an informed estimate of the City's current service area population, consistent with DWR

[9] Temperature data is from the PRISM Group, Northwest Alliance for Computational Science & Engineering (NACSE), based at Oregon State University. 1920 - 2024 Location: Lat: 38.0770 Lon: -122.1373 Elev: 131ft

[10] CWC Section 10632.2

requirements. There are multiple approaches to developing this estimate; however, because the City's boundaries correspond by 95% or more with the City's water service area, population estimates prepared by the Department of Finance were used.

2.2.1. Current Population and Historic Trends

As one of the first cities founded in California, Benicia served as a historical waystation for those traveling to and from the Sacramento Valley from San Francisco and Oakland during the Gold Rush. The economic boom following World War II doubled the City's population to 7,000 residents, but the real growth began in the 1960s following the completion of the Benicia-Martinez bridge, enabling Benicia to become a suburb of Oakland and San Francisco. Between 1970 and 1995, the population steadily grew by approximately 1,000 per year, fueled much in part by the completion of the Valero refinery (formerly Exxon) in 1969, which still serves as a major employer and economic driver today. Population growth and housing development patterns reflect build-out constraints established by the City's Urban Growth Boundary (UGB), beyond which no urban development shall be served by City water and/or sewer.[11] This policy aligns with the City's stated goal of focusing growth and preventing urban sprawl while promoting the City's goal of creating a sustainable community.[12] New residential developments within the UGB, including a significant development called Rose Estates, are anticipated to impact future populations; these impacts and their implications for water demand within the City are discussed further in Chapter 4.

The City experienced a 10% increase in population from 1990-2000, and from 2000-2010 growth slowed to under one-half of a percent. From 2010-2019 this trend continued with population increasing just 0.45% with an annual rate of change of just 0.11%. From 2019 to 2024, the population gradually decreased by 3%. The most recent development impact fee study (The EPS Study) was commissioned by the City in 2020.[13] This study estimated the average single family household size as 2.68 people, with 2.08 people average in multi-family households, and 1.5 people estimated in Accessory Dwelling Units. The California Department of Finance recognizes an average occupancy in the City of about 2.38, aligning directly with the average between the City's independent single-family and multi-family findings.[14]

Because the City's water service area overlaps the municipal area by over 95%, California Department of Finance (DOF) population estimates were used to estimate service area population. For 2025, the DOF estimated that the municipal population, and thus the City's water service area population, to be 26,195 people. Historical population dating back to 1990

[11] Policy 2.1.5 City of Benicia General Plan, Updated April 2016

[12] City of Benicia General Plan, 2023-2031 Housing Element, Adopted February 28, 2024 Resolution No. 24-14

[13] Nexus Study for Update of Development Impact Fees, Economic & Planning Systems, Inc. (EPS), November 9, 2020. Sources: Average household size per occupied housing unit in Benicia based on data from the 2018 American Community Survey (5-year estimates) conducted by the U.S. Census Bureau

[14] State of California, Department of Finance, E-5 Population and Housing Estimates for Cities, Counties and the State — January 1, 2021-2025. Sacramento, California, May 2025, for persons-per-household data

is shown in **Table** 2-2, with population and growth rate over the past decade provided in **Table** 2-3.

TABLE 2-2: HISTORICAL POPULATION[15]

1990	1995	2000	2005	2010	2015	2020	2025
24,437	26,298	26,865	26,674	26,997	27,343	27,082	26,195

Over the last decade, the City has experienced modest but notable shifts in population. While the population grew slightly between 2010 and 2020 – from 26,997 to 27,082 – it has since shown signs of decline. This consistent decline is shown in the rate of change in the City's population by year, shown in **Table** 2-3. This trend reflects broader regional dynamics, including housing affordability challenges and shifting migration patterns within the suburbs of the San Francisco Bay Area.

TABLE 2-3: POPULATION GROWTH RATE, 2015—2024[16]

2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
27,343	27,340	27,406	27,302	27,153	27,082	26,934	26,644	26,470	26,347
0.46%	-0.01%	0.24%	-0.38%	-0.55%	-0.26%	-0.55%	-1.08%	-0.65%	-0.46%

2.2.2. PROJECTED POPULATION

To forecast projected service area population as accurately as possible requires consideration of the past growth rate, local economic predictions, and current and projected land uses. The UWMP Act states urban water suppliers "shall coordinate with local or regional land use authorities" regarding land uses that may affect water management planning.[17]

The City's projected population growth is estimated using a methodology that combines historical DOF populations with occupancy rates and future development capacity provided as part of the aforementioned EPS Study, as well as data from the preliminary planning documents for residential developments anticipated throughout the planning horizon. The EPS Study developed in 2020 for future growth projected 90 single-family residences and 740 multi-family residences for completion before the City reaches build-out. Since 2020,

[15] State of California, Department of Finance, E-4 Population Estimates for Cities, Counties, and the State, 1981-1990, 1990-2000, 2000-2010, 2010-2020, 2020-2025. Sacramento, California. For consistency purposes, representative population statistics reflect the most recent values available, as of January 1st or April 1st of each year

[16] State of California, Department of Finance, E-4 Population Estimates for Cities, Counties, and the State, 2010-2020, 2020-2025. Sacramento, California. For consistency purposes, representative population statistics reflect the most recent values available, as of January 1st or April 1st of each year.

[17] 8 CA Water Code Section 10631(a)

however, additional residential developments have been proposed beyond what the EPS Study predicted. Should all developments move forward as proposed, the City will surpass the previously projected number of single-family residences by over 1,500 units, whereas the quantity of multi-family residences projected by the EPS Study would not be reached. Correspondingly, the methodology for the population projections shown in **Table** 2-4 blends the current population estimate from DOF and the existing planning documents for developments within the City while incorporating the remaining projected multi-family residences from the EPS Study to reach build-out conditions. The resulting population and associated growth rate are presented in **Table** 2-4.

TABLE 2-4: POPULATION FORECAST AND GROWTH RATE

Year	2025	2030	2035	2040	2045	2050
Projected Population	26,195	27,292	28,434	29,624	30,864	32,156
Growth Rate		4.19%	4.19%	4.19%	4.19%	4.19%

2.2.3. CURRENT AND PROJECTED LAND USE

The City's land use is shaped by its history, natural geography, and commitment to maintaining a diverse, vibrant community. Covering approximately 15 square miles, Benicia's land use pattern reflects its evolution from a port town to a modern, commuter city within the San Francisco Bay Area. As discussed previously, the City is mostly built out. Residential neighborhoods are the dominant land use, primarily consisting of low- to medium-density single-family units. **Figure** 2-5 presents the City's current land use map.

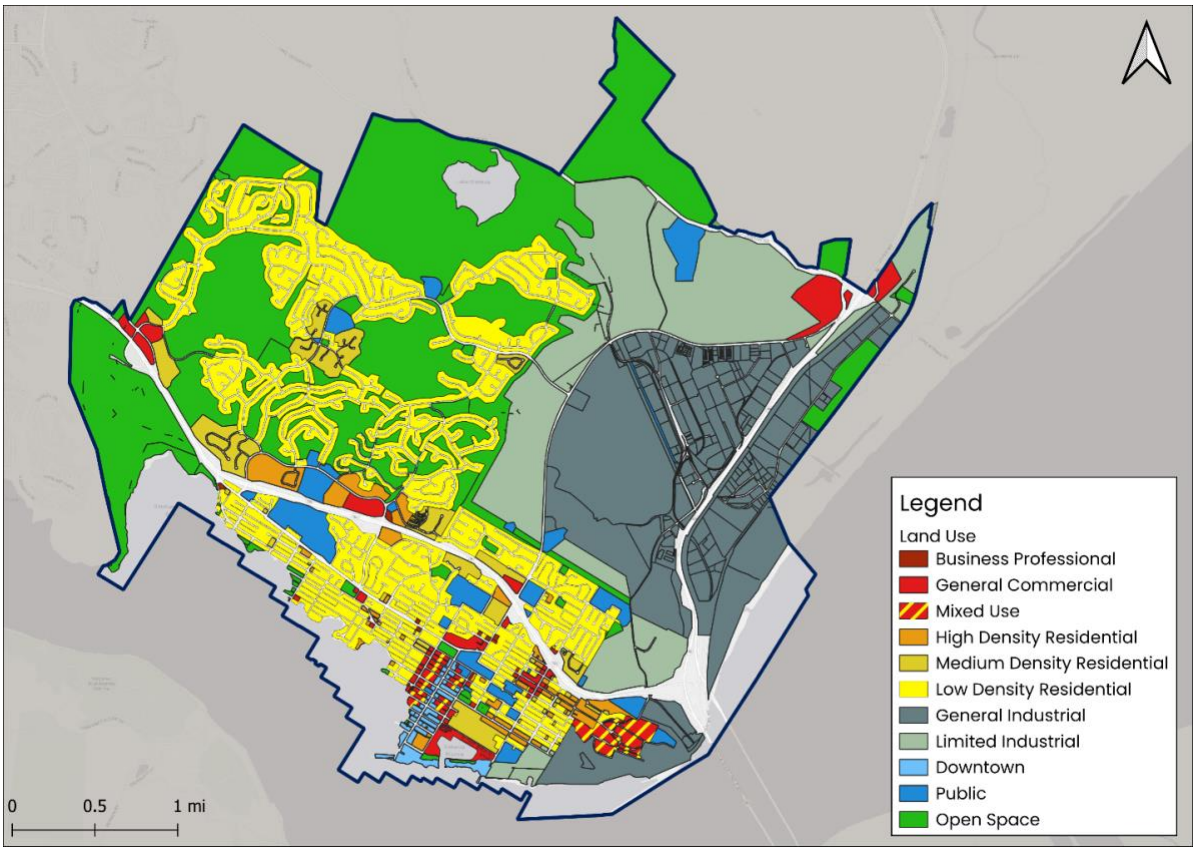


FIGURE 2-5: AGENCY LAND USE MAP

There is limited land available for new large-scale residential or commercial growth due to build-out conditions, topographic constraints, and the City's own Urban Growth Boundary (UGB). Development anticipated within the planning horizon is mostly limited to infill projects or part of the potential growth scheme planned near the northeastern UGB, sometimes referred to as the "North Study Area."

The Rose Estates is a proposed site development for the 527-acre North Study Area property, previously considered in the 2020 UWMP. Although several site development proposals have been considered over the years, Rose Estates is the latest iteration, involving the construction of 1,620 dwelling units and approximately 260,000 square feet of retail/industrial use. Although the status of the Rose Estates proposal is undetermined, the City presumes growth may still occur in this undeveloped area. For the purposes of forecasting water demands in Chapter 4, the land use mix associated with anticipated residential developments, including the Rose Estates Project, are considered as future demands.

In addition to Rose Estates, other anticipated residential developments include:

- The "Eden Senior Housing Development" with nearly 100 rental units and a 19,000 square foot pedestrian promenade open space.

- The approved "Jefferson Ridge" housing development, containing 121 residential units and a 2,000 square foot commercial building.
- The proposed "1451 Park Road" housing development, containing 17 housing units.

Significant non-residential projects on the horizon include:

- A proposed metal-working facility, called "Boilermakers", requiring an expansion to an existing facility from 26,370 to 31,121 square feet, and an addition of a 1,205 square-foot training area.
- A proposed indoor cannabis cultivation facility, requiring minor additions to a 54,602 square-foot building.

Table 2-5 represents the planned mix of new residential and non-residential connections expected by the City between now and 2050. This information is used in Chapter 4 to forecast future water use needs.

TABLE 2-5: SUMMARY OF LAND USE PLANS IN SERVICE AREA WITH FUTURE RESIDENTIAL UNITS[18]

	Residential Units		
	Single-family	Multi-family	Non-Residential (sf)
Rose Estates	1,440	180	261,438
Eden Senior Housing	n/a	97	19,000
Jefferson Ridge	n/a	121	2,000
1451 Park Road	n/a	17	n/a
Boilermakers Facility	n/a	n/a	5,956
Cannabis Cultivation Facility	n/a	n/a	1,342
Infill/Vacant Land within City Limits	n/a	379	n/a

2.2.4. ECONOMIC TRENDS & OTHER SOCIAL AND DEMOGRAPHIC FACTORS

Benicia's economy has evolved over the last few decades, shaped by regional economic influences, shifts in industry, and changing workforce dynamics. Historically, the local economy centered around its established industrial and manufacturing sectors. The City's historic port and Industrial Park provided the economy's industrial base, anchored by the Valero refinery. The presence of the City's industrial and manufacturing sectors has waned as

[18] The specific details of the land use plans presented in this table are derived from information provided by the City or publicly available project application documents and are subject to change. Although the type of residential units wasn't specified in project documents for Jefferson Ridge and Park Road, it is assumed these units will be multi-family residences.

of late as the local economy has gradually diversified while shifting with broader trends in the Bay Area. Since 2015 Benicia has seen steady growth, adding jobs and decreasing the unemployment rate from as high 7.1% in 2015 to 5.6% as recently as June 2025. The unemployment rate spike in 2020 seen in **Figure** 2-6 was due to the Covid-19 pandemic and recovered to pre-pandemic levels in 2022, though since rising over a percentage point.

In recent years, Benicia has undergone a shift away from "heavy industries" toward a more service-oriented and professional services economy. While the Valero Refinery is currently an important economic anchor, the City has benefited from the information technology boom. As a convenient suburb of the greater Bay Area, Benicia's proximity makes it an attractive place to live for those employed by technology companies. However, this economic growth is a contributor to increases in housing costs, income disparity, and pressures on lower- and middle-income residents. Additionally, the Valero Energy Corporation announced in April 2025 its intent to "idle, restructure, or cease refining operations" at its Benicia Refinery by April 2026. While the closure remains undetermined and not final as of the drafting of this UWMP, it is important to consider the impacts of its shuttering as the 170,000-barrel-per-day refinery has operated in the community for over 25 years and employs more than 400 workers. Valero, importantly, represents a meaningful fraction of Benicia's annual $60 million municipal budget and nearly half of the City's gross water use. The closure of the refinery would have significant ripple effects on the local economy; however, over the long-term the closure will create undeveloped real estate opportunities and potential for repurposing land and industrial resources squarely within the City's sphere of influence.

Overall, Benicia's economy remains stable; but like many small municipalities in the Bay Area, it is adapting to broader challenges related to affordability, infrastructure, and economic diversification.

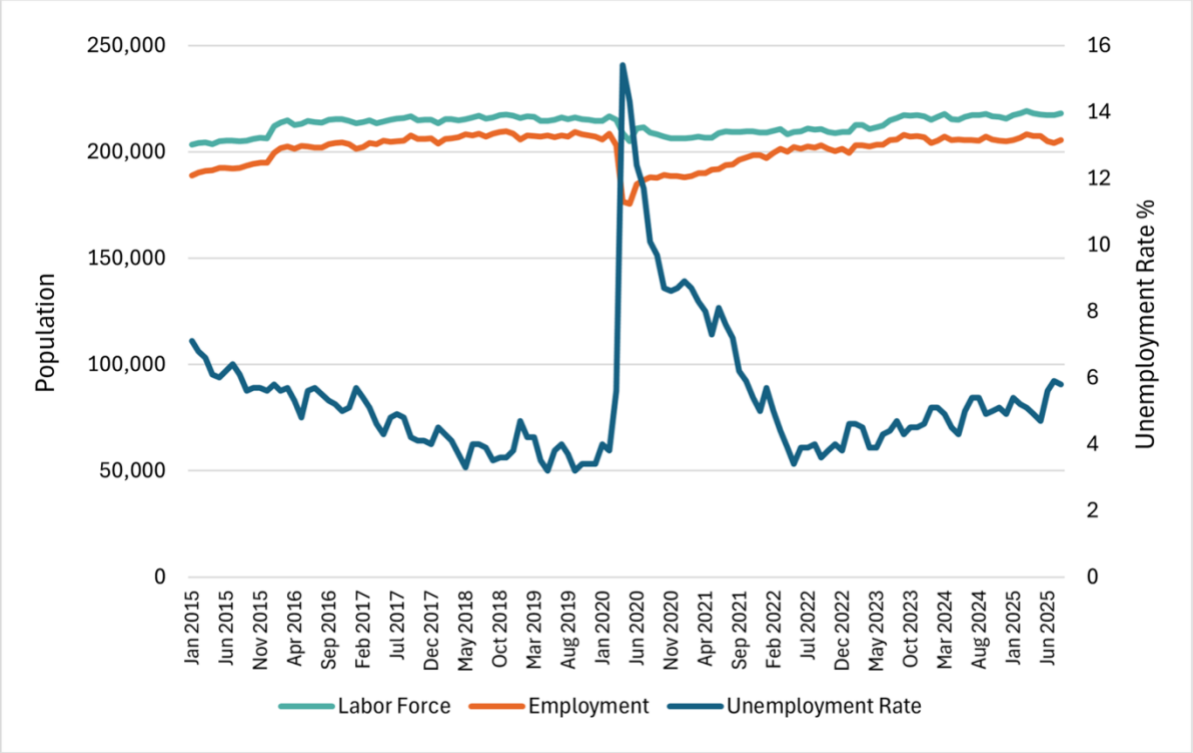


FIGURE 2-6: AGENCY AREA EMPLOYMENT DATA[19]

DEMOGRAPHICS

According to the 2020 US Census, the ethnic composition of Benicia is 63.1% White, 14,8% Hispanic/Latino, 12% Asian, 5.1% Black or African American, 14.9% other races or mixed race, 0.6% Native American, 0.4% Pacific Islander. The 2020 US Census lists Benicia's poverty rate at 7.6%, with a median household income of $121,204 and a per capita income of $63,686. California Department of Finance estimates occupancy in Benicia to be 2.42 persons per household.[20]

2.3. DELIVERY SYSTEM DETAILS

This subsection focuses specifically on Benicia's potable and raw delivery systems. The water supplies are described in Chapter 3, with water uses described in Chapter 4.

2.3.1. POTABLE WATER SYSTEM

The City operates a potable water system to provide water service to its customers. **Figure** 2-7 illustrates the main features of the raw water conveyance system, while **Figure** 2-8 represents the main features of the potable water delivery system. The existing Benicia Water

[19] U.S. Bureau of Labor Statistics: Vallejo-Fairfield, CA Metropolitan Statistical Area

[20] US Census Bureau, 2020-2024 Demographics and Families & Living Arrangements Table for Benicia city, California.

Treatment Plant (WTP) was constructed in 1971. Originally designed for a capacity of six million gallons per day (mgd), the WTP's capacity was expanded to 12 mgd in 1989. Additional reliability and redundancy improvements were made in 2006. The distribution system consists of three pump stations, eight pressure-reducing stations, and approximately 150 miles of pipelines. Benicia's storage system includes five treated water reservoirs, or tanks, and Lake Herman, which has storage capacity of approximately 1,800 acre-feet of untreated water. Raw water is delivered to the City via the raw water transmission system, which consists of two pump stations and approximately 18 miles of pipelines.

The California State Water Project (SWP) serves as the City's primary source for raw water. SWP water is delivered to the City from Barker Slough on the Delta via the North Bay Aqueduct (NBA). Additional raw water is sourced from the Solano Project (SP) via the Putah South Canal (PSC) to the Terminal Reservoir. Raw water from the SWP and SP are respectively conveyed from the NBA Cordelia Pumping Plant and PSC Cordelia Pump Station to a diversion structure located at the City's WTP. The flows in excess of daily demand are diverted to Lake Herman, via gravity through a pipeline. Additionally, raw water is delivered to the Valero Refinery. The City can also convey raw water to Lake Herman as an operational buffer and use the lake for up to 1,800 acre-feet of auxiliary water storage.

It should be noted that the meter on the PSC supply failed in December of 2021 and was placed back into service in January 2025. During this period, the City quantified the PSC supplies using the Water Treatment Plant flow meter. The City owns and maintains the PSC meter but does not own or maintain the NBA flow meter.

In 2023, a landslide destroyed a section of the 36" raw water pipeline. A temporary bypass was installed, and permanent repairs to this section of the pipeline are scheduled to be complete by the end of 2026. In 2025, a section of the 36" raw water pipeline was blown out from over-pressurization. This failure was repaired and the system was placed back in service. Both these events resulted in mandatory conservation actions.

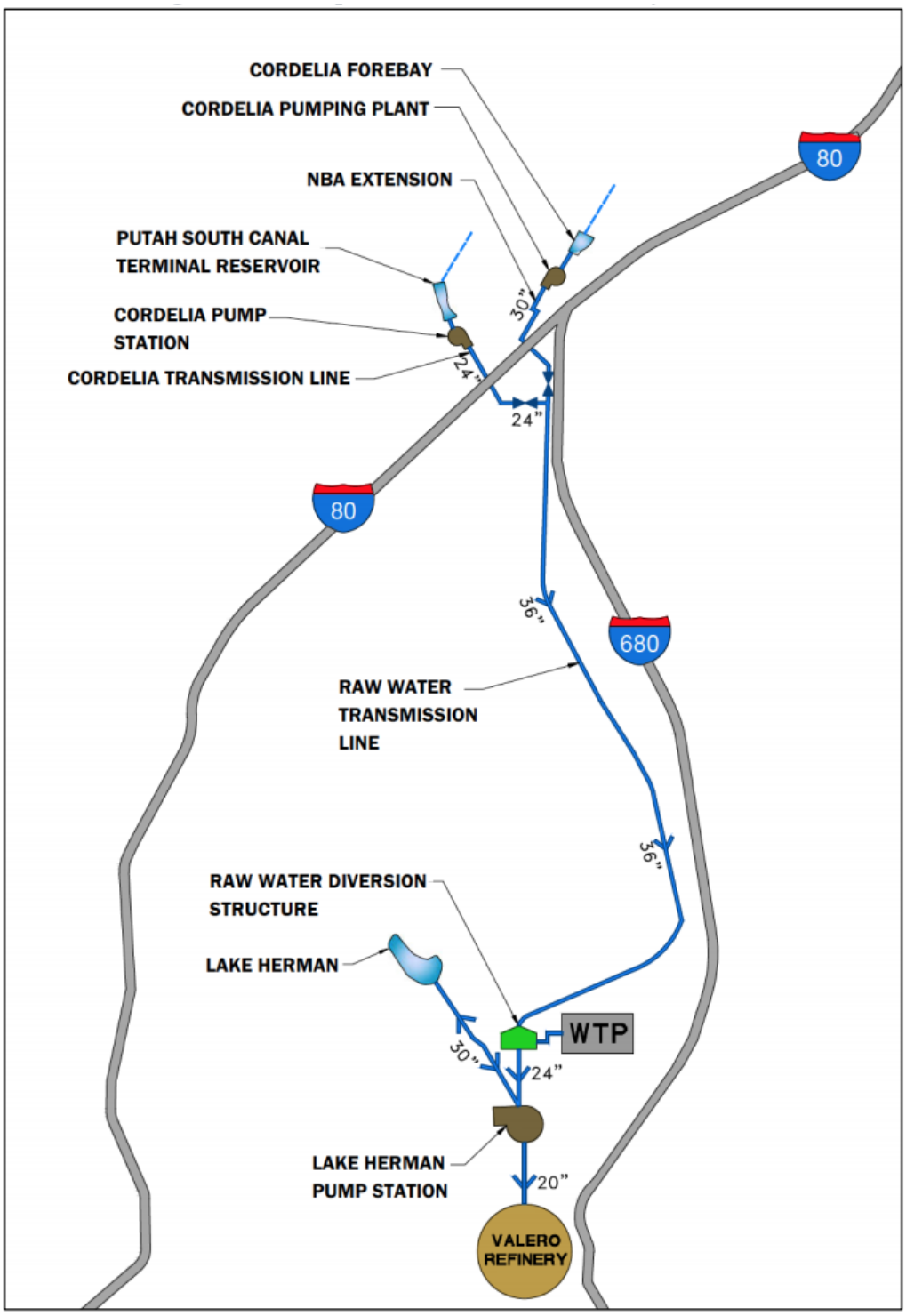


FIGURE 2-7: RAW WATER SYSTEM

The potable water distribution system consists of three main pressure (or service) zones: Zone I primarily serves Commercial/Institutional/Industrial (CII) connections along the eastern sector of the City; Zone II primarily serves the western residential area; Zone III primarily serves residential area north of I-780 and west of East 2nd Street. Zone III includes several intermediate pressure zones which rely on pressure-reducing valve stations. Storage reservoirs are located in each of the main pressure zones to provide water during peak demand periods and to provide fire and emergency storage capacity. There are currently six water storage tanks (located at three reservoir sites and the WTP) in the distribution system, with a total capacity of 12.8 million gallons. The reservoirs range in size from 1.0 to 3.0 million gallons. Three of the reservoirs are pre-stressed concrete tanks and the other three reservoirs are welded steel tanks. Water is delivered to Pressure Zones II and III by three pump stations. The P-1 Pump Station delivers water to Zone II from Zone I. The P-2 Pump Station conveys water from Zone II to Zone III. The P-3 Pump Station delivers water directly from Zone I to Zone III. The P-1 Pump Station has a stationary emergency generator, manual transfer switch, and load bank. Pipelines for the water distribution system range in diameter from 4-inch pipes to 30-inch pipes. Most pipelines 12-inch in diameter or less are constructed of ductile iron pipe, while most of the larger pipelines are steel.

In 2017, the City began installing Advanced Metering Infrastructure (AMI) to replace its older commercial and residential water meters. The new residential meters were replaced as a single project in 2019 and these meters account for 90% of all system meters. Individual connection Meter Transmission Units (MTUs), which collect hourly water data, were installed along with 26 Data Collector Units (DCUs) to transmit the data to a cloud-based computer system. Benefits include eliminating the need for manually reading meters, an enhanced customer web portal to track and monitor water use, and real-time leak monitoring and water loss notification.

The City does not have an economically viable groundwater supply. The Public Safety Background Report lists a number of confirmed and potential groundwater contamination sites throughout the City. However, Benicia's reliance on imported SWP and SP water for its municipal water supply means that groundwater quality poses minimal impacts on its drinking water quality. Rather, they have the potential to affect the local receiving waterways, like Sulphur Springs Creek and the Carquinez Strait, since groundwater flows to surface locations. Several contamination sites have been identified upstream from Lake Herman and have the potential to affect the City's water supply. While Syar Quarry and the Hastings Mercury Mine have been identified as potential contamination sites, these upstream sites are of relatively low concern compared to downstream sites closer to the Valero Refinery.

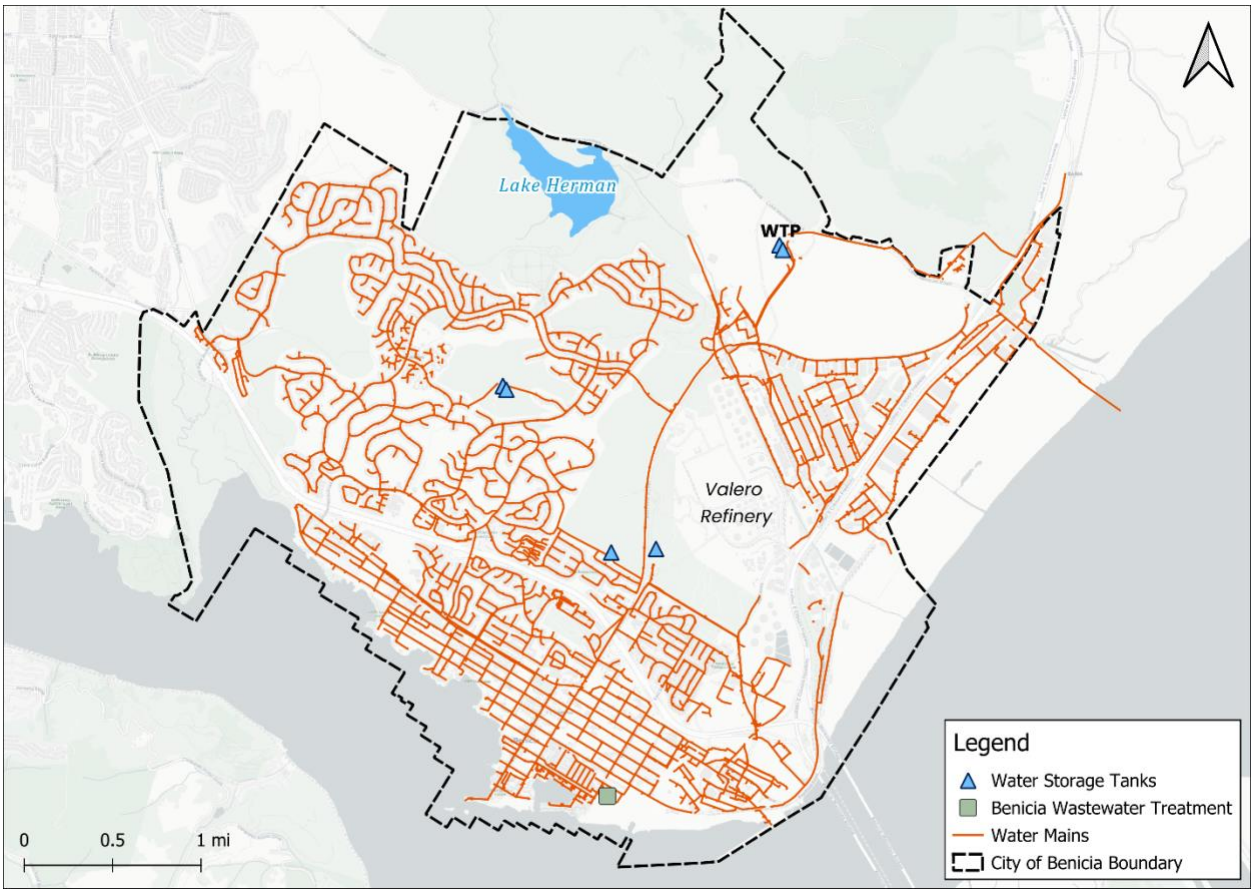


FIGURE 2-8: POTABLE WATER SYSTEM

2.3.2. NON-POTABLE WATER SYSTEM

The City's primary non-potable water system consists of simple delivery infrastructure to serve raw water supplies to Valero. Raw water is delivered to Valero where it is treated at its own facilities for various industrial processes, including cooling tower make-up water and boiler feed water. As noted earlier, Valero represents a significant water demand, frequently matching the City's monthly demand numbers. In October of 2024 a new meter was installed that recorded significantly more water sent to Valero than the old meter had. More discussion of this is in Chapter 4.

The City also provides wastewater collection, treatment, and disposal services to customers within its service boundaries. The City's wastewater collection system consists of approximately 150 miles of pipelines and 23 lift stations. Much of the collection system relies on gravity flow of the wastewater through pipelines. Lift stations are also needed to overcome topographic restrictions and transport collected wastewater from low points to suitable locations for continued gravity transmission. All wastewater collected in the City's service area is treated at the City-operated and maintained 4.5 mgd WWTP facility.

2.4. ENERGY INTENSITY

California Water Code Section 10631.2(a) codified the requirement that urban suppliers must include information it can readily obtain related to the amount of energy consumed to divert, extract, produce, treat, and deliver water. Referred to as "Energy Intensity Reporting" for urban water suppliers. *Energy Intensity* is defined as: the total amount of energy expended in kilowatt-hours (kWh) by the urban water supplier on a per acre-foot basis to convey water from the location where the urban water supplier acquires the water to its point of delivery (i.e., turnout).

Due to the manner in which water is supplied within the City's various service areas, it is only possible to parse out some sections of energy use directly for extraction, treatment, storage, and distribution. This limitation is due to some delivery and treatment facilities combining different functions on single power meters, the use of some gravity-fed storage tanks, and the use of solar at some of the City's facilities. As a result, the City employs a Total Utility Approach, which sums the annual net energy consumed for all water management processes, divided by total volume of water (in acre-feet).[21] These processes include diversion, conveyance, placement into storage, treatment, and distribution. The total energy intensity is reported in **Table** 2-6.

TABLE 2-6: ENERGY INTENSITY – TOTAL UTILITY APPROACH

Sum of All Water Management Processes	
Volume of Water Entering Process (acre-feet)	2,997
Energy Consumed (kWh)	1,497,214
Energy Intensity (kWh/acre-foot)	500

[21] Net energy is used due to solar production partially offsetting consumption at Pump Stations 1-3 and the WTP.

CHAPTER 3
WATER SUPPLY

The City of Benicia, located in Solano County, relies on several water supply sources to meet the needs of its residential, commercial, and industrial customers. The City's diverse water asset portfolio – derived from water rights and contracts – provides significant annual volumes of water that can be used to meet end user demands. However, each water asset carries different contract requirements and conditions that impact the monthly availability of each supply source. These availability variances require prudent management to ensure the City maintains sufficient water supplies during extended drought periods. Furthermore, as noted below, the City's water asset portfolio has additional administrative matters that require resolution in order to support long-term reliability projections. This section details the City's water supply portfolio and identifies the key components within each water asset that impact the City's long-term water supply reliability and security.

3.1. WATER SUPPLY SOURCES

Chapter 3 describes the City of Benicia's existing and planned water supplies. The City's water supply is derived from three general surface water sources: (1) the Sacramento River Watershed, (2) Putah Creek and the Solano Project, and (3) Sulphur Springs Creek Watershed through Lake Herman. All water supplies from these sources are collectively managed to best meet the City's demand across different water year types, reduce delivery costs, manage water quality issues, and handle emergency situations. Solano County Water Agency (SCWA) has historically managed the Sacramento River and Solano Project supplies on the City's behalf.

A fundamental conclusion from the water analysis conducted in this 2025 UWMP is that the City and SCWA will need to closely coordinate future water management efforts in order to prevent water supply deficits during multi-year drought periods. With these management challenges in mind, the water deliveries from each identified water source will likely change in any given year to best preserve water assets for unknown, yet predictable, future dry year conditions. Specifically, the City and SCWA management efforts should focus on preserving as much of the City's water as possible in carryover and/or storage in order to retain those water supplies for future uses.

The City's Sacramento River Watershed water supplies are derived from a variety of water rights and water contracts. Sacramento River watershed supplies are diverted from the Delta through the Barker Slough Pumping Plant (BSPP) and into the North Bay Aqueduct (NBA) – a

SWP facility. Sacramento River watershed supplies, conveyed through the NBA, provide the majority of the City's needs during normal water years.

The Solano Project is an important component of Benicia's water asset portfolio. Lake Berryessa, the Solano Project's primary supply source, is a multi-purpose reservoir that combined with the Putah Diversion Dam and other associated infrastructure comprises the Solano Project – a federal water project operated by the United States Bureau of Reclamation.[22] Lake Berryessa is located in the Vaca Mountains in Napa County and formed by the Monticello Dam. Solano Project water in turn is transported to Benicia through the Putah South Canal and provides a varying percentage of the City's total consumption depending on the hydrological and regulatory conditions.

Sulphur Springs Creek Watershed and Lake Herman contribute locally sourced water to the City's water supply portfolio. The City diverts water to storage from Sulphur Springs Creek Watershed and stores additional water in Lake Herman delivered through the Solano Project and North Bay Aqueduct as needed. Water quality issues limit Lake Herman's utility, resulting in it primarily being used as a backup or peaking supply for Valero, an emergency water supply source, and as a means to regulate raw water supplies coming into the City's system from alternative sources. All three of the City's water supply sources are described in greater detail in the following sections.

3.2. Sacramento River Watershed Water Supplies

Two of the City's primary water assets are derived from contractual entitlements from the Sacramento River Watershed: (1) Participating Agency Contract with Solano County Water Agency for State Water Project water; (2) Settlement Agreement with the California Department of Water Resources. Benicia occasionally receives Sacramento River Watershed water from the City of Vallejo's "Permit Water" supply; however, the City of Vallejo's Sacramento River Watershed water is not relied upon to meet the City's annual needs. The details underlying the City's Sacramento River Watershed water supply sources as well as their respective conveyance and delivery components affect their short-term and long-term reliability.

3.2.1. Participating Agency Contract with Solano County Water Agency

The California State Water Project (SWP) was created in 1957 following the devastating floods that inundated great portions of the Sacramento Valley. In 1960, under the Burns-Porter Act (also known as the California Water Resources Development Bond Act), the SWP was funded for construction, and most facilities were completed by 1973. The State Water Project is the largest state-built, multipurpose water project in the country. Today, the SWP includes 28

[22] https://www.usbr.gov/projects/index.php?id=421

dams and reservoirs, 26 pumping and generating plants, and approximately 660 miles of aqueducts.

The primary water source for the SWP is the Feather River, a tributary of the Sacramento River. The water flowing in the Feather River is captured by the SWP in Oroville dam and reservoir. Storage released from Oroville Dam flows down the Feather River and then the Sacramento River until it reaches the Sacramento-San Joaquin River Delta (Delta). The SWP diverts, stores, and distributes water to 29 agricultural and urban suppliers throughout Northern, Central and Southern California. Approximately 70% of the SWP supply is contracted for urban uses and 30% is contracted for agriculture. The diversion rights are based upon appropriative water rights, with 1927 priority dates, issued by the State Water Resources Control Board.

The total planned annual delivery capability of the SWP and the sum of all contractors' maximum Table A was originally 4.23 million acre-feet. The initial SWP storage and conveyance facilities were designed to meet contractors' water demands with the construction of additional storage facilities planned as demands increased. However, few additional SWP storage facilities have been constructed since the early 1970s, and a portion of the original conveyance design was never completed. SWP conveyance facilities were generally designed and have been constructed to deliver Table A to all contractors. The maximum Table A of all SWP contractors now totals about 4.133 million AF.[23]

The Solano County Water Agency (SCWA) is one of the 29 water suppliers that executed a State Water Project Contract with the California Department of Water Resources. The original contract was signed in 1963 and includes 20 amendments. In 2003, DWR and SCWA signed another agreement that attempted to amalgamate all of the amendments that were added to the 1963 contract. However, DWR disclaims legal validity of the consolidated document by stating that:

> *[the 2003 document] is intended only to provide a convenient reference source, and the Department of Water Resources is unable to provide assurances that this integrated version accurately represents the original documents. For legal purposes, or when precise accuracy is required, users should direct their attention to the original source documents rather than this integrated version.*

As such, the 1963 Contract and its 20 amendments should be consulted when assessing SCWA's SWP water assets.

The City derives a portion of its water supplies from the SWP contract between SCWA and DWR. Importantly, entire portions of SCWA's SWP contract are fully incorporated into the City's

[23] The State Water Project Draft Delivery Capability Report, December 2025. Table 5-1. This Table A water available for delivery excludes Butte County, Yuba City, and Plumas County FCWCD.

Participating Agency contract. Therefore, the City is bound by the qualifying language contained in SCWA's SWP contract that affects supply allocations in the City's Participating Agency Contract.

The City originally entered into a "Member Unit Contract" with SCWA in 1977 in order to receive water derived from SCWA's SWP contract. The City and SCWA entered into a second contract in 1985, superseding the 1977 contract. In 2013, the City and SCWA entered the "Participating Agency Contract," superseding the 1985 contract and its amendments. Accordingly, the City's current SWP-based water supplies are derived from its 2013 Participating Agency Contract (2013 PAC) with SCWA.

City of Benicia Table A Allocation

The 2013 PAC provides the City a Table A Amount of 17,200 acre-feet annually. This entitlement represents the maximum amount of water that is available to the City through its water agreement. However, the 2013 PAC recognizes that SCWA's SWP contract may be subject to shortages that require all participating agencies (i.e., City of Benicia) to reduce water supply deliveries that are derived from SCWA's SWP contract and its 20 amendments. As such, the 2013 PAC allocates proportionate water supply shares in times of shortage. Of SCWA's total annual SWP allocation, Benicia's share accounts for 41%.

The State Water Project's primary source for the City's allocation is Lake Oroville. Additional supplies are sourced from other SWP facilities – including San Luis Reservoir, located south of the Delta. Since 2015, the City has received the following annual Table A allotments (

Table 3-1) under the 1985 Member Unit Contract and 2013 PAC.

TABLE 3-1: CITY OF BENICIA TABLE A PAC ALLOTMENTS 2015-2025

Year	Table A Allocation (acre-feet)	% Allocation
2014	860	5%
2015	4,323	25%
2016	12,900	75%
2017	17,200	100%
2018	6,600	38%
2019	14,620	85%
2020	5,160	30%
2021	860	5%
2022	860	5%
2023	17,200	100%
2024	6,880	40%
2025	8,600	50%

FUTURE SWP ALLOCATIONS AND LONG-TERM RELIABILITY

DWR has indicated that 100% allocation years are less than likely to occur on a regular basis in the future. In July 2024, DWR finalized the "2023 SWP Delivery Capability Report" (DCR) that outlined the probable future water supply allocations for the SWP. Hydrological and regulatory conditions contributed to variations in the DCR's forecasted future Table A deliveries. These conditions are summarized in **Table** 3-2 below.

TABLE 3-2: SWP ESTIMATED TABLE A DELIVERIES FROM DCR (ACRE-FEET PER YEAR)[24]

Year	Long Term Ave	Single Dry Year (1977)	Dry Periods			
			2 Year Drought (1976-77)	4 Year Drought (1980-83)	6 Year Drought (1987-92)	6 Year Drought (1929-34)
2021 Report	2,321 (56%)	233 (6%)	1,377 (33%)	3,212 (78%)	1,163 (28%)	1,039 (25%)
2023 Report	2,202 (53%)	184 (4%)	922 (22%)	3,145 (76%)	860 (21%)	597 (14%)
2025 Report	2,234 (54%)	237 (6%)	936 (23%)	3,118 (75%)	897 (22%)	627 (15%)

As shown in **Table** 3-2, DWR's long-term reliability projections show a 54% average, a slight increase from 53% in the 2023 SWP DCR, but not as high as the 56% in the 2021 DCR. The North of Delta Settlement (December 31, 2013) resulted in the North of Delta (NOD) Allocation being

[24] The State Water Project Draft Delivery Capability Report, December 2025. Table 5-2 at p. 25.

larger than the identified reliability in the 2023 DCR. Specifically, the NOD Allocation should increase future annual Table A allocations by approximately 10%. The City will incorporate the NOD Allocation bump in considering its long-term water supply availability of 64%. **Table** 3-3 depicts the Future SWP Table A Projected Normal Water Year Deliveries.

Is should be noted that the NOD Allocation settlement faces ongoing litigation over the terms of its availability. Currently the NOD bump water is made available by DWR only after all SWP Table A water has been used. This limits the NOD Allocation utility and prompts a management decision over whether NOD Bump water is more useful than preserving Table A as carryover in subsequent years.

TABLE 3-3: SWP FUTURE TABLE A PROJECTED NORMAL WATER YEAR DELIVERIES (ACRE-FEET PER YEAR)

Year Type	% Allocation	North of Delta Increase (%)	Table A Allocation	Total Table A Allocation
Normal Year	54%	10%	9,288	11,008

There has been a general long-term downward trend in reliability with recent allocations being less than historical allocations. The lowest historical SWP allocation of 5% occurred in 2014, 2021, and 2022 as shown in

Table 3-1. Although the City anticipates the NOD allocation applying in critically dry years, out of an abundance of caution and in accordance with the 2021 SWP allocation, the City will assess a critically dry year at 5% allocation. In less dry years, however, the City will increase the baseline allocation by 10%.

The DCR also identifies various drought periods for purposes of characterizing SWP allocation percentages that would accompany those drought periods. The averaging of the allocations over the course of the drought period is not representative of the City's drought planning purposes.

The City will use the following drought characterization for its short-term and long-term planning, incorporating both the 2021 critical year allocation and the NOD allocation adjustment: year 1 at 43%; year 2 at 30%; year 3 at 10%; year 4 at 5%; and year 5 at 15%. This characterization adequately represents a drought over a five consecutive year period based on historical dry-year allocations. **Table** 3-4 shows the rounded Table A allocation over five consecutive dry years from 2026-2030. It is important to note that the Table A allocation available may not be used in the identified dry year as it could be carried over into storage for future year uses.

TABLE 3-4: SWP ALLOCATION FOR FIVE CONSECUTIVE DRY YEARS, 2026-2030 (ACRE-FEET PER YEAR)

Year	Amount	Managed Amount
Normal	11,010	2,170
Single Dry	860	430
Dry Year 1	7,400	3,530
Dry Year 2	5,160	2,580
Dry Year 3	1,720	860
Dry Year 4	860	430
Dry Year 5	2,580	1,290

Table A supply reliability has also been examined over the broader planning horizon considered in this 2025 UWMP. **Table** 3-5 shows the rounded normal year, single dry year, and five consecutive dry years planned SWP Table A Allocation for the City of Benicia through 2050.

TABLE 3-5: FUTURE SWP ALLOCATIONS BY YEAR TYPE THROUGH 2050 (ACRE-FEET PER YEAR)

Year Type		2030	2035	2040	2045	2050
Normal		11,010	11,010	11,010	11,010	11,010
Single Dry Year		860	860	860	860	860
	Year 1	7,050	7,050	7,050	7,050	7,050

Five Consecutive Drought Years	Year 2	5,160	5,160	5,160	5,160	5,160
	Year 3	860	860	860	860	860
	Year 4	2,580	2,580	2,580	2,580	2,580
	Year 5	7,050	7,050	7,050	7,050	7,050

The characterizations of the City's SWP Table A Allocation long-term reliability reflect numerous hydrological and regulatory issues that inform the DCR modeling, are reasonable assessments related to SWP system management, and reflect the City's local conditions. Long-term hydrological and regulatory issues that could affect the water management include the Bay-Delta Water Quality Control Plan (see section 3.8), the Coordinated Operations Agreement, the Delta Biological Opinion, modifications to San Luis Reservoir, SWP Seismic considerations, DWR's Emergency Planning, and assessments related to the City's local conditions and climate. These issues are all considered in the City's planning incorporated into it supply characterizations in this 2025 UWMP.

Table A Carryover Supply

The City's PAC Contract allows it to forego use of its allocated SWP Table A supply and retain a portion of that allocated supply in storage for future use. This retained supply is termed "Article 56 Carryover Water" and is governed under Article 56 of SCWA's SWP contract. Article 56 Carryover water is water that is released from Oroville dam and reservoir, re-diverted at the Delta, and then stored in San Luis Reservoir – an off-stream reservoir located just outside the City of Santa Nella at the junction of Interstate 5 and California State Highway 152. San Luis Reservoir is jointly owned and operated by the state and federal governments and all SWP contractors may use the storage facility to manage Carryover water supplies. In short, the San Luis Reservoir receives, regulates, and stores exported water derived from the State Water Project and Federal Central Valley Project.

The amount of water that the City may carryover in any given year is subject to a set of rules that implicate all SWP contractors throughout California. In brief, the City delivers its Table A supplies to Carryover in San Luis Reservoir with an expectation that it will be able to divert all or a portion of these supplies in a subsequent year. In the event that water supplies are abundant, San Luis Reservoir may "spill," in which DWR reclassifies water and Carryover supplies can be lost. When San Luis Reservoir reaches a "spill" stage, DWR releases the City's Carryover in accordance with the aforementioned rules as they apply in the context and proportional share of all entities with stored water in San Luis Reservoir. Nevertheless, the City generally retains a portion of its Table A Allocation as Article 56 Carryover in any given year and continues to maintain a carryover balance.

Table 3-6 shows the City's Article 56 Carryover balance from 2015 through 2025.

TABLE 3-6: CITY OF BENICIA HISTORIC SWP CARRYOVER (ACRE-FEET PER YEAR)

Year	Carryover
2015	6,525
2016	6,601
2017	13,541
2018	8,600
2019	7,870
2020	8,522
2021	4,300
2022	1,985
2023	0
2024	7,013
2025	8,471

Article 56 Carryover supplies will be available to the City in future years based upon hydrological and regulatory conditions. The Table A Carryover supplies result from a number of variables that are both tied to the SWP Table A annual percent allocation, San Luis Reservoir operations, and water supply management by the City and SCWA. Future Carryover supplies will vary annually but will be largely contingent on the prior year's Table A allocation and management decisions. For example, the City may choose to prioritize other water supplies, thus preserving SWP Table A water for subsequent years' carryover. Preservation of SWP Table A over other water assets will enable the City to increase its carryover supplies, further insulating the City from potential supply shortages.

Amendment No. 16 to the SCWA SWP Contract, sometimes referred to as the "Water Management Tools" updated Articles 21 and 56 of the contract. In brief, Amendment No. 16 supplements and clarifies terms of the SWP Contract related to water transfers and exchanges within the SWP service area to improve water management capabilities and options. Provisions require SCWA, on behalf of the City and other PAC agencies, to submit a preliminary water delivery schedule to the State by October 1 of each year that identifies the quantity of water the Agency wishes to store as Article 56 Carryover Water, and the quantity of Article 56 Carryover Water it wishes to transfer or exchange with another contractor in the next succeeding year. The City participated in a transfer in partnership with SCWA and other PAC agencies in 2024 that moved Article 56 Carryover water to south-of-delta SWP Contractors. Water transfers like this are beneficial for the City when excess supplies exist, allowing the City to maximize its resources with timely water management actions.

To be conservative, future carryover supplies are estimated to be approximately one-half of the City's Table A Allocations. Thus, in a normal year, the City expects the Article 56 Carryover supply to be approximately 5,510 acre-feet. In a single dry year, the Article 56 Carryover

supply is expected to remain at 5,510 acre-feet as a remnant of the previous dry year storage action. However, the supply decreases over time as it relates to the previous year's Table A Allocation. Thus, for five consecutive dry years, the pattern for Carryover would be 50% of the previous year's Table A Allocation. Importantly, however, the City will manage these supplies over the five-year drought planning period to ensure the City's demands are met in light of other constraints on other water resources.[25] Additional analysis is conducted in Chapter 5. **Table** 3-7 shows the representative Table A Carryover supplies under normal, single dry, and five consecutive dry year scenarios from 2025 through 2030. **Table** 3-8 shows the representative Table A Carryover supplies from 2025 through 2045.

TABLE 3-7: FUTURE AVAILABLE TABLE A CARRYOVER SUPPLIES FROM 2026-2030 (ACRE-FEET PER YEAR)

Year	Amount
Normal	5,510
Single Dry	5,510
Dry Year 1	430
Dry Year 2	3,700
Dry Year 3	2,580
Dry Year 4	860
Dry Year 5	430

TABLE 3-8: AVAILABLE TABLE A CARRYOVER SUPPLIES FROM 2030-2050 (ACRE-FEET PER YEAR)

Year Type		2030	2035	2040	2045	2050
Normal		5,510	5,510	5,510	5,510	5,510
Single Dry Year		5,510	5,510	5,510	5,510	5,510
Five Consecutive Drought Years	Year 1	430	430	430	430	430
	Year 2	3,700	3,700	3,700	3,700	3,700
	Year 3	2,580	2,580	2,580	2,580	2,580
	Year 4	860	860	860	860	860
	Year 5	430	430	430	430	430

[25] Carryover supplies in the State Water Project system are managed to address water supply shortages when direct diversion rights are insufficient to satisfy demands. Moreover, the Carryover supplies may have applicability over the course of many years after they are designated for carryover.

3.2.2. Settlement Agreement with Department of Water Resources

In 1998, the City of Benicia, along with Solano County Water Agency, and the Cities of Fairfield and Vacaville, asserted a priority right with the State of California for water from the Sacramento-San Joaquin Delta pursuant to the Watershed-of-Origin statutes. The Watershed-of-Origin statute is one of three Area of Origin statutes created to preserve the water supplies of local areas against the long-term potential export of water supplies to distant places far from the area of origin. Local water users feared becoming the next Owens Valley or Hetch Hetchy, consumed by a distant water exporter. In short, these laws were designed to protect local water users from the federal Central Valley Project and State Water Project exporters. The Cities of Benicia, Fairfield, and Vacaville, concerned over the fate of local Delta water, respectively filed water rights under the Area of Origin statutes.

DWR protested the cities' applications in a matter held before the State Water Resources Control Board (SWRCB). All parties, DWR and cities, negotiated a comprehensive settlement to resolve the dispute. The "Settlement Agreement Among the Department of Water Resources of the State of California, Solano County Water Agency, and Cities of Fairfield, Vacaville and Benicia for Purposes of Water Supply" (hereinafter Settlement Agreement) provided all three cities a total of 31,620 acre-feet of water per year.[26] The subsequent settlement and conveyance agreements defined the basis for water availability in the cities' respective service areas and how the existing DWR facilities would be used to convey the water to the participating cities. SCWA was a necessary party of interest to the Settlement Agreement because of its relationship to the SWP facilities needed to deliver Settlement Agreement water.

DWR diverts water to meet its obligations under various appropriative water rights with priority dates of approximately 1927. These appropriative rights are used to fulfill contractual obligations related to its State Water Project contracts as well as to meet other water delivery obligations in settlement negotiations throughout the state. In this instance, DWR is utilizing surface water derived from its Sacramento River Watershed water rights diversions that otherwise would be diverted to meet SWP contract obligations.

The Settlement Agreement provides all three cities a total of 31,620 acre-feet of water per year. Of the 31,620 acre-feet provided by the Settlement Agreement, Benicia has an annual allocation of 10,500 acre-feet per year. The supplies are derived from the DWR's Sacramento River Watershed water rights diversions. It is unclear whether these rights are tied to water diversions made to storage at Lake Oroville or other SWP facilities. Nevertheless, no water stored in SWP facilities may be used towards Settlement Agreement water supplies, only direct diversions related to those water rights. This distinction is important because when water supplies are unavailable under the direct diversion provisions under DWR's

[26] Settlement Agreement Among the Department of Water Resources of the State of California, Solano County Water Agency, and Cities of Fairfield, Vacaville and Benicia for Purposes of Water Supply, effective May 19, 2003.

appropriative water rights – as happened in 2014 and 2015 – or when "Term 91" is declared, then water under this Settlement Agreement may not be diverted for use in the City of Benicia.

Although DWR's water rights are not subject to Term 91, the Settlement Agreement invokes SWRCB action in declaring Term 91 "in effect" in order to curtail water usage in the Settlement Agreement. When Term 91 is in effect, typically from June to November, permit and licensee holders must cease diversions. Term 91 is declared by the SWRCB when it is determined that the SWP and CVP are required to release stored water in excess of low natural flow to meet Sacramento Valley in-basin uses plus export demands. In short, when natural flows are insufficient to meet water quality standards, resulting in the activation of Term 91, the City of Benicia is denied access to Settlement Agreement water and no water stored in DWR's SWP facilities may be used to meet the City's needs.

TABLE 3-9: CITY OF BENICIA SETTLEMENT AGREEMENT WATER 2021-2030 (ACRE-FEET PER YEAR)

Year	Settlement	Used
2015	10,500	504
2016	10,500	574
2017	10,500	3,072
2018	10,500	1,163
2019	10,500	1,753
2020	10,500	1,028
2021	10,500	2,597
2022	10,500	3,617
2023	10,500	387
2024	10,500	3,503
2025	10,500	2,845

The Settlement Agreement allows the City, in the future, to apply for a Watershed of Origin appropriation for an amount that exceeds the Settlement Agreement amount if demands exceed those upon which the Settlement Agreement was based. The Settlement Agreement automatically expires in 2035 unless it is renewed subject to specific terms identified in Article 9. For purposes of this UWMP, we assume that the Settlement Agreement will be renewed. **Table** 3-10 shows the projected Settlement Agreement water available in normal, single dry, and five consecutive dry year scenarios from 2026 through 2030. **Table** 3-11 shows the availability of Settlement Water from 2030 through 2050.

TABLE 3-10: CITY OF BENICIA SETTLEMENT WATER AVAILABILITY 2026-2030

Year		Amount
Normal		10,500
Single Dry Year		10,500
Multi-Year Drought	Dry Year 1	10,500
	Dry Year 2	10,500
	Dry Year 3	10,500
	Dry Year 4	10,500
	Dry Year 5	10,500

TABLE 3-11: CITY OF BENICIA SETTLEMENT WATER 2030-2050 (ACRE-FEET PER YEAR)

Year Type		2030	2035	2040	2045	2050
Normal		10,500	10,500	10,500	10,500	10,500
Single Dry Year		10,500	10,500	10,500	10,500	10,500
Multi-Year Drought	Year 1	10,500	10,500	10,500	10,500	10,500
	Year 2	10,500	10,500	10,500	10,500	10,500
	Year 3	10,500	10,500	10,500	10,500	10,500
	Year 4	10,500	10,500	10,500	10,500	10,500
	Year 5	10,500	10,500	10,500	10,500	10,500

Settlement Agreement is an additional DWR-derived water asset important to Benicia's broader water asset portfolio. Although the total volumes of Settlement Agreement water are substantial, the availability of these supplies on a monthly basis can be more limited. In other words, because Settlement Water tends to be unavailable in certain months due to Term 91 (see

Table 3-29 in Section 3.7), the City must manage deliveries in order to maximize available Settlement Agreement water. Another distinction is that Settlement Water is characterized as "non-project water." Non-project water is junior in priority to SWP water (and Vallejo Permit Water) for pumping and conveyance through the Barker Slough Pumping Plant and North Bay Aqueduct (NBA). As such, Settlement Agreement water is relegated to a junior position in water asset deliveries which may render the supply vulnerable under certain hydrologic or regulatory conditions. Although these conditions have yet to materialize, since the onset of the Settlement Agreement, it is noted here as a consideration when addressing the City's long-term water management planning.

Settlement Agreement water is conveyed through the North Bay Aqueduct under the provisions of additional conveyance agreements between the Participating Agencies and SCWA described in Section 3.2.1 below. Once conveyance volumes are determined, the water is delivered to the City in the same manner as SWP PAC water. The City generally seeks to use Settlement Agreement water when it and NBA capacity is available.

3.2.3. North Bay Aqueduct Conveyance

The North Bay Aqueduct is an infrastructure component of the State Water Project. The NBA extends for 27.6 miles from Barker Slough in the Delta to the end of the Napa Pipeline, providing water supplies to Napa and Solano Counties. The NBA was designed to deliver 175 cubic feet per second (cfs) of water, but construction constraints limited the delivery to 142 cfs. The Barker Slough Pump Station in the Delta was designed to deliver a total of 113 million gallons per day (mgd), but pump tests have shown it can only deliver about 92 mgd due to biofilm growth. Moreover, Longfin Smelt issues – a federally listed endangered species under the federal Endangered Species Act – further limit flows from 130 cfs to 50 cfs under certain conditions. Deliveries are also limited in the month of March when maintenance requires the pipeline to halt operations for around two weeks. DWR delivers Sacramento River watershed water derived from SWP facilities and water rights to SCWA per SCWA's SWP contract. SCWA then delivers water received through the NBA to SCWA's Participating Agencies. In addition, the City's Settlement Agreement water is also diverted at the NBA.

The City of Benicia's turnout on the NBA is at the Cordelia Forebay and Pumping Plant, about 21.3 miles from Barker Slough. Benicia's contracted allotment is 24.7 mgd, but currently it can only receive about 22.5 mgd due to biofilm growth in Barker Slough. The NBA's pipe diameter ranges from 72 inches at Barker Slough to 36 inches at Cordelia Forebay.

Raw water is pumped from the Cordelia Forebay and transmitted to the City's water treatment plant (WTP) through a 30-inch and then 36-inch raw water transmission line. The NBA Cordelia Pumping Plant, operated by the Department of Water Resources, has a rated capacity of 20.7 mgd for three Benicia pumps.

The NBA is responsible for conveying both the City's 2013 PAC water supply and Settlement Agreement water. As described above, NBA diversions have both regulatory and technical limitations. Article 12(f) of SCWA's State Water Project Contract – which is incorporated by reference into both the 2013 PAC and Settlement Agreement – established the priorities to utilize available capacity in the NBA. The designated water delivery priorities are as follows:

1. Project water
2. Interruptible water under Article 1(jj)
3. Project water "not delivered"27
4. Carryover water
5. Non-Project water (i.e., Settlement Water) to meet annual entitlements
6. Additional interruptible water in excess of annual entitlements for that year
7. Additional non-project water in excess of annual entitlements for that year

These priorities are important to consider in light of the NBA serving multiple water purveyors across both Napa and Solano counties.[28] Specifically, if water purveyors that utilize the NBA seek to deliver significant volumes of Project water – applies to its annual allocation and Carryover supplies – other sources may be unable to deliver sources normally used to meet annual demands. The City's Settlement Agreement water is classified as "non-project water," thus holding a junior priority designation, which may render such water less reliable for diversion in the NBA under certain yet-to-be-defined conditions. As discussed, these hierarchal diversion limitations have not impeded access to the City's water asset portfolio.

3.3. SOLANO PROJECT WATER ASSETS

The Solano Project is a federal reclamation project authorized by the Secretary of the Interior in 1948 and approved by Congress in 1949. Assigned to the United States Bureau of Reclamation, the Solano Project was designed for the purposes of flood control, storage, diversion, carriage, distribution, and beneficial use of water from Putah Creek to be stored in Lake Berryessa behind Monticello Dam for delivery to end users throughout Solano County. Lake Berryessa has a storage capacity of 1.6 million acre-feet. All water deliveries to the Solano County Water Agency derived from this project are governed by federal law and a

[27] Project water "not delivered" is defined as: "In the event of any discontinuance or reduction of delivery of project water… the Agency may elect to receive the amount of annual entitlement which otherwise would have been delivered to it during such period under the water delivery schedule for that year at other times during the year or the succeeding year…." At Article 14(b) DWR and SCWA Agreement (2003)

[28] The NBA serves Solano County Water Agency, the cities of Benicia, Vacaville, Fairfield, Vallejo, and Suisun City along with Napa County and Travis Air Force Base.

Water Service Contract between the United States and Solano County Water Agency – Contract No. 14-06-200-4090R (hereinafter "Water Service Contract"). The Water Service Contract determines all aspects of obligations for receiving water supplies from the Solano Project and is incorporated into the Participating Agency Contracts (PACs) of water purveyors linked to the Solano Project through association with SCWA. At one time, the City of Benicia held a PAC for the Solano Project. The City, now, however, derives its water supplies through sub-contracts with other agencies that are more actively linked to Solano Project operations.

Two of the City's water assets originate from the Solano Project: (1) Agreement for Water Service with the City of Vallejo; and (2) the Solano Irrigation District/City of Benicia Solano Project Water Allotment Transfer Agreement. The details underlying both of these water supply sources as well as their conveyance and delivery components affect their short-term and long-term reliability. Generally, Solano Project water is easier and less expensive to treat than SWP water, especially in winter when total organic carbon (TOC) concentrations are markedly higher in SWP water. Treating water with high TOC concentrations increases the amount of disinfected byproducts, which must be kept under the limit per the City's drinking water permit.

3.3.1. UC Davis Contract

The City of Benicia entered into short-term water purchase arrangements with UC Davis from 2021 – 2024. UC Davis has a PAC for Solano Project water and provided up to 2,000 acre-feet per year over the four-year span to the City. This water is not considered a long-term supply; therefore, it is not included in projected supply totals or dry-year assessments. Water use from this period is shown below in **Table** 3-12.

Table 3-12: UC Davis Agreement Water Use 2021-2025 (acre-feet per year)

Year	Vallejo Contract	Used
2020	2,000	0
2021	2,000	2,000
2022	2,000	2,000
2023	2,000	1,785
2024	2,000	64
2025	2,000	0

3.3.2. Agreement for Water Service with the City of Vallejo

The City of Benicia's Agreement for Water Service with the City of Vallejo (Vallejo Agreement) was originally executed in February 1962 and has been amended three times to extend its term and address operational considerations. The first amendment occurred in April 1962,

followed by a second amendment in April 1989 that extended the agreement through February 28, 2025. Most recently, Amendment 3 further extends the Vallejo Agreement through February 28, 2027.

The City of Vallejo holds a contractual right to receive allotments from the Solano Project as a Participating Agency of the Solano County Water Agency, with an annual allocation of 14,600 acre-feet under its Participating Agency Contract. Benicia's access to Solano Project water through Vallejo is derived from this allocation. Under the Vallejo Agreement, Benicia has access to up to 1,100 acre-feet per year of Solano Project water from Lake Berryessa.

The agreement allows Benicia to receive raw water through the Cordelia Pump Station and pipeline system or treated water through an interconnection between the two cities' treated water systems (though this interconnection has not been constructed). The agreement contains shortage provisions under which Vallejo may reduce deliveries to Benicia if there are interruptions or shortages caused by insufficiency of supply or rights of other users, though these provisions indicate that water made available to Benicia represents water surplus to Vallejo's own requirements.

As discussed in the 2020 UWMP, Benicia has historically been able to rely on the full 1,100 acre-foot allocation even during the 2014-2015 and 2020-2022 drought, two of the driest periods in California's recorded history. The Vallejo Agreement also allows for carryover of unused water allocation for use in subsequent years, subject to Solano Project operational rules and the potential loss of carryover supplies if Lake Berryessa spills.

For planning purposes in this 2025 UWMP, the City assumes that the Vallejo Agreement will continue to provide reliable access to 1,100 acre-feet annually through at least February 2027. Renewal beyond February 2027 is undetermined; therefore, future projections are provisional for the purposes of this UWMP.

Table 3-13 below shows the water deliveries under the Vallejo Agreement since 2015. Those deliveries have fluctuated based upon water supplies available to the City in each year.

As shown in **Table** 3-13, the City received more supply from Solano Project water than was normally available under the Vallejo Agreement. This excess delivery is not expected in the future. **Table** 3-14 and **Table** 3-15 show projected Vallejo Agreement water availability in the future in normal, single dry, and five consecutive dry year conditions through 2050. Although this supply has been available in the driest years, out of an abundance of caution the City assumes 50% reliability in all dry years through 2050.

TABLE 3-13: VALLEJO AGREEMENT WATER USE 2015-2025 (ACRE-FEET PER YEAR)

Year	Vallejo Contract	Used

2015	1,100	2,611
2016	1,100	3,089
2017	1,100	455
2018	1,100	711
2019	1,100	289
2020	1,100	0
2021	1,100	1,100
2022	1,100	0
2023	1,100	0
2024	1,100	0
2025	1,100	0

TABLE 3-14: VALLEJO AGREEMENT WATER AVAILABLE FROM 2026 THROUGH 2030 (ACRE-FEET PER YEAR)

Year	Amount
Normal	1,100
Single Dry	550
Dry Year 1	550
Dry Year 2	550
Dry Year 3	550
Dry Year 4	550
Dry Year 5	550

TABLE 3-15: VALLEJO AGREEMENT WATER AVAILABLE FROM 2030 THROUGH 2050 (ACRE-FEET PER YEAR)

Year Type	2030	2035	2040	2045	2050
Normal	1,100	1,100	1,100	1,100	1,100

Single Dry Year		550	550	550	550	550
Five Consecutive Drought Years	Year 1	550	550	550	550	550
	Year 2	550	550	550	550	550
	Year 3	550	550	550	550	550
	Year 4	550	550	550	550	550
	Year 5	550	550	550	550	550

The ability to carryover Vallejo Agreement water in Lake Berryessa is the subject of ongoing discussion between the Cities and SCWA. Although the City of Benicia has not historically relied upon carryover water from Vallejo, the terms of the contract indicate that water storage is a possibility and that carryover supplies may be available to the City during drought conditions. As such, Benicia has incorporated Vallejo Agreement carryover water supplies into its future water supply planning. For the purposes of this assessment, the City considers only 50% of the water to be available for carryover after a normal water year.

Table 3-16 and **Table** 3-17 show potential Vallejo Agreement carryover water supplies from 2026 through 2030 and from 2030 through 2050, respectively.

TABLE 3-16: VALLEJO AGREEMENT CARRYOVER WATER AVAILABLE FROM 2026 THROUGH 2030 (AFY)

Year	Amount
Normal	1,100
Single Dry	550
Dry Year 1	550
Dry Year 2	0
Dry Year 3	0
Dry Year 4	0
Dry Year 5	0

TABLE 3-17: VALLEJO AGREEMENT CARRYOVER WATER AVAILABLE FROM 2030 THROUGH 2050 (AFY)

Year Type		2030	2035	2040	2045	2050
Normal		1,100	1,100	1,100	1,100	1,100
Single Dry Year		550	550	550	550	550
Five Consecutive Drought Years	Year 1	550	550	550	550	550
	Year 2	0	0	0	0	0
	Year 3	0	0	0	0	0
	Year 4	0	0	0	0	0
	Year 5	0	0	0	0	0

3.3.3. SOLANO IRRIGATION DISTRICT AGREEMENT

On 3 March 2009, the City of Benicia executed the *Solano Irrigation District / City of Benicia Solano Project Water Allotment Transfer Agreement* (hereinafter SID Agreement). While the SID Agreement lacks an automatic expiration date, it is subject to a number of conditions for its continuance that are outlined in Article 3. For purposes of this UWMP, we assume that all conditions will continue to be met so that the SID Agreement does not automatically terminate before 2045.

The Solano Irrigation District (SID) is the holder of a contractual right to receive allotments from the Solano Project as a Participating Agency of the SCWA under the terms of its Participating Agency Contract. Per SID's PAC, it has entitlements for 141,000 acre-feet per year of agricultural and domestic water from the Solano Project. Article 1 of the SID Agreement indicates that SID has an additional 10,000 acre-feet per year of Solano Project water resulting from an assignment from Maine Prairie Water District. This additional 10,000 acre-

feet per year is not available to meet delivery obligations outlined under Article 3.1 of the SID Agreement. Nevertheless, SID's Participating Agency Contract was signed in 1999 and has a term of 25 years with a right of renewal.

The SID Agreement provides the City a maximum of 2,000 acre-feet of water per year. This allocation is derived from SID's 141,000 acre-foot Solano Project allotment. SID provides Solano Project water from Lake Berryessa and the Putah South Canal to the City.

The SID Agreement specifies that the water supplied under the SID Agreement may be reduced "in the same Proportion as the reduction in acre feet to be delivered to District bears to its 141,000 acre-feet Annual Allotment…" In other words, if SID's annual allotment is reduced by 10%, then the City of Benicia's 2,000 acre-foot allocation would also be reduced by 10% or 200 acre-feet in a single year. The shortage provision, however, is subject to an unusual caveat in that the reduction or suspension in delivery must be due to "Force Majeure Conditions." In this instance, Force Majeure Conditions can result from "nature" – an ambiguous term – as well as a "governmental order." Although Force Majeure Conditions normally only include unforeseeable and catastrophic events, the inclusion of "nature" and "governmental order" seems to expand the definition to a much broader set of conditions that are quite normal – like drought or regulatory actions and orders. Nevertheless, for purposes of this UWMP we assume that the City of Benicia is subject to proportional reductions in its water supply based upon SCWA Solano Project delivery actions.

Importantly, the SID Agreement is limited in its utility. The SID Agreement water was purchased to improve drinking water quality when the water drawn from the Sacramento River watershed that is delivered through the North Bay Aqueduct is high in total organic carbon. More specifically, in the City Council Minutes accepting the SID Agreement in 2009, Mayor Patterson stated that the City should not "use the SID 2,000 AF as additive to the City's water supply." Thus, although this water source can be counted toward the total water supply available to the City, it was not intended to increase availability for future growth. Any new water use of SID Agreement water that is not supporting drought mitigation or water quality conditions should be analyzed in this context.

Table 3-18 below shows the water deliveries under the SID Agreement. Those deliveries have fluctuated based upon water supplies available to SID in each year since the SID Agreements execution in 2009.

TABLE 3-18: SID AGREEMENT WATER USE 2015-2025 (ACRE-FEET PER YEAR)

Year	SID Contract	Used
2015	2,000	0
2016	2,000	0
2017	2,000	1,064
2018	2,000	1,236
2019	2,000	1,732
2020	2,000	476
2021	2,000	12
2022	2,000	1,843
2023	2,000	369
2024	2,000	0
2025	2,000	62

For purposes of this UWMP, we assume that the maximum available contract amount of 2,000 acre-feet will not be exceeded and that water supply reliability provisions recently prepared by SCWA are used to allocate the supply in different year types. In addition, if Lake Berryessa fills and water spills, then the carryover water of each agency is reduced by a percentage amount related to the amount of total spill. **Table** 3-19 and **Table** 3-20 show the availability of SID Agreement Water in normal, single dry, and five consecutive dry years from 2021 through 2025 as well as from 2025 through 2045.

TABLE 3-19: SID AGREEMENT WATER AVAILABLE FROM 2026 THROUGH 2030 (ACRE-FEET PER YEAR)

Year	Amount
Normal	2,000
Single Dry	1,000
Dry Year 1	1,000
Dry Year 2	1,000
Dry Year 3	1,000
Dry Year 4	1,000
Dry Year 5	1,000

TABLE 3-20: SID AGREEMENT WATER AVAILABLE FROM 2030 THROUGH 2050 (ACRE-FEET PER YEAR)

Year Type		2030	2035	2040	2045	2050
Normal		2,000	2,000	2,000	2,000	2,000
Single Dry Year		1,000	1,000	1,000	1,000	1,000
Five Consecutive Drought Years	Year 1	1,000	1,000	1,000	1,000	1,000
	Year 2	1,000	1,000	1,000	1,000	1,000
	Year 3	1,000	1,000	1,000	1,000	1,000
	Year 4	1,000	1,000	1,000	1,000	1,000
	Year 5	1,000	1,000	1,000	1,000	1,000

Unused SID Agreement water allocations may be carried over for use in subsequent years. While the City has not historically relied on SID carryover supplies, the terms of the agreement preserve this option as a contingency under dry conditions. Accordingly, the City has retained SID Agreement carryover water as a component of its future water supply planning. **Table** 3-21 and

Table 3-22 present potential SID Agreement carryover availability from 2025 through 2030 and from 2025 through 2050, respectively.

TABLE 3-21: SID AGREEMENT CARRYOVER WATER AVAILABLE FROM 2026 THROUGH 2030 (ACRE-FEET PER YEAR)

Year	Amount
Normal	1,000
Single Dry	1,000
Dry Year 1	1,000
Dry Year 2	0
Dry Year 3	0
Dry Year 4	0
Dry Year 5	0

TABLE 3-22: SID AGREEMENT CARRYOVER WATER AVAILABLE FROM 2030 THROUGH 2050 (ACRE-FEET PER YEAR)

Year Type		2030	2035	2040	2045	2050
Normal		1,000	1,000	1,000	1,000	1,000
Single Dry Year		1,000	1,000	1,000	1,000	1,000
Five Consecutive Drought Years	Year 1	1,000	1,000	1,000	1,000	1,000
	Year 2	0	0	0	0	0
	Year 3	0	0	0	0	0
	Year 4	0	0	0	0	0
	Year 5	0	0	0	0	0

The 2025 SID Agreement Carryover and use is shown in **Table** 3-23.

TABLE 3-23: SID AGREEMENT CARRYOVER (ACRE-FEET PER YEAR)

Year	SID CARRYOVER	USED
2025	0	0

3.3.4. SOLANO PROJECT DROUGHT AGREEMENT

The City may be subject to an agreement called the "Solano Project Members' Agreement as to Drought Measures and Water Allocation" (Drought Agreement). The Drought Agreement addresses the storage and use provisions in the Solano Project under certain storage conditions in Lake Berryessa. The Drought Agreement provides the Solano Project Members with additional water supply protection in the event that there is a significant water shortage condition. Specifically, opportunities may exist to purchase Solano Irrigation District water supplies so long as the procedural requirements are followed where SID would fallow land and make water available to the Solano Project Members. Although the Drought Agreement could further insulate the City from drought conditions should it apply to their Solano Project water contracts, the Drought Agreement is considered a supply that would be accessed in only the most drastic situations and is, therefore, not included in the supply reliability assessment for this 2025 UWMP.[29]

[29] Drastic conditions may occur where Sacramento River water supplies and Solano Project water supplies appear insufficient to serve the needs of the City and its service area in critically dry conditions.

3.3.5. Solano Project Water Deliveries

The City receives Solano Project water from several outstanding agreements. All Solano Project water delivered to the City comes from Lake Berryessa and is conveyed through the Putah South Canal and Terminal Reservoir. During these deliveries, the City manually operates the Cordelia Pump Station to transfer water from the Terminal Reservoir to its treatment facility via a 24-inch pipeline connected to the City's 36-inch Raw Water Transmission Line. Currently, the Cordelia Pump Station has a maximum pumping capacity of 10.5 mgd. With proposed modifications, the maximum pumping capacity may be increased to 14 mgd. This flow expansion is based on maximum Total Dynamic Head calculations for the 24-inch Cordelia Pipeline. Other than Vallejo and SID, with which the City has outstanding agreements for Solano Project water, Vallejo may also obtain Solano Project supplies from additional SCWA Member Units. The City's current contract with Vallejo is not likely to be renewed as Vallejo faces its own water management concerns. However, Vacaville, Fairfield, and UC Davis source Solano Project water and have surplus supplies which they may consider transferring to Benicia. Such transfers would utilize existing infrastructure and bolster regional water security.

3.4. Sulphur Springs Watershed

The original water supply for the City of Benicia was Lake Herman, fed by Sulphur Springs Creek. As early as 1880, the City constructed diversion and storage facilities on Sulphur Springs Creek to preserve locally available water supplies for the City's uses that it had been diverting for years. And although the City outgrew its local water supply, it has continually captured and used these supplies since its establishment. The City's Sulphur Springs Creek Watershed water rights consist of (1) pre-1914 appropriative right and (2) License 4900.

3.4.1. Pre-1914 Appropriative Water Right (S028393)

The utilization of Sulphur Springs Creek Watershed began long before the City's founding. In 1849, the first diversions from the creek likely occurred to irrigate pasture or other agricultural activities in the City of Benicia area. The first formal work on diverting and managing water assets in the Sulphur Springs Creek Watershed began in 1879 and by 1884 the first dam was constructed.[30] The water supply has been continually used by the City and its residents since 1879, which the City recently solidified through filing a Statement of Diversion and Use with the State Water Resources Control Board. This pre-1914 appropriation provides the City up to 1,500 acre-feet of water annually. The pre-1914 appropriative water right will be evaluated in conjunction with the City's water right license 4900 described in the following section.

[30] Historical Analysis from JRP Historical Consulting dated September 20, 2019.

3.4.2. WATER RIGHT LICENSE 4900

Water right license 4900 (A010596) was assigned to the City of Benicia from the California Pacific Utilities Company (Company) in 1962. The Company applied for the water right on 28 January 1943, which serves as the License's priority date. License 4900 allows the City to divert up to 1.4 cfs from January 1 to December 31 each year by direct diversion from Sulphur Springs Valley Creek for beneficial uses and to collect 1,200 acre-feet per year in storage from December 1 to May 1 each year. The resulting total face value of License 4900 is 2,213.6 acre-feet per year.[31] The maximum withdrawal from storage under the License is 800 acre-feet per year. Lake Herman serves as the storage reservoir for water derived under License 4900 and the City's pre-1914 appropriation. Lake Herman has a total storage capacity of approximately 1,800 acre-feet. According to the City's Reports of Licensee filed between 2015 and 2025, the City used water derived from License 4900 and stored a portion of that water in Lake Herman. **Table** 3-24 below shows the water supplied from storage from 2015 to 2025 under both its pre-1914 appropriative water right and License 4900.[32]

TABLE 3-24:S028393 AND LICENSE 4900 WATER SUPPLIED 2015-2025 (ACRE-FEET PER YEAR)

Year	Amount Supplied
2015	1,152
2016	918
2017	1,670
2018	1,670
2019	1,026
2020	562
2021	162
2022	461
2023	1,191
2024	456
2025	1,991

Lake Herman also serves as an auxiliary storage reservoir for water supplies imported from the Sacramento River Watershed and Solano Project.[33] Surplus flows from these water sources are diverted by gravity to Lake Herman through a 24-inch diameter pipeline. The City

[31] License 4900 and 2014 Report of Licensee

[32] Supply numbers are approximated from most recent data and water rights reports.

[33] The legalities of diverting these foreign sources of water into Lake Herman are not discussed in this UWMP but should be addressed.

maintains the ability to pump water back and forth from Lake Herman to its water treatment plant through the Lake Herman Pump Station. Transmissions through the Lake Herman Pump Station typically occur when the availability of Sacramento River Watershed or Solano Project supplies are insufficient. The pump station has a total pumping capacity of 9.6 mgd. Raw water may also be diverted from Lake Herman to the Valero Refinery.

On February 1, 2009, the City of Benicia and Valero Energy Corporation executed the "Agreement Between the City of Benicia and Valero Refining Company – California for the Supply of Untreated Water" (Valero Agreement). The Valero Agreement requires the delivery of a minimum of 3,600 acre-feet of water per year and a maximum of 5,800 acre-feet of water per year to Valero's refinery. This raw water demand is further discussed in Chapter 4.

Pursuant to Article 13 of the Valero Agreement, "the City agrees to operate Lake Herman and to reserve in Lake Herman a minimum pool of 230 acre-feet of water for use by the Refinery as a water supply for emergency needs." As noted above, the Sulphur Springs Creek Watershed may produce less than 230 acre-feet of water in some years, thus requiring the City to draw upon Sacramento River watershed and Solano Project water supplies to maintain the minimum pool for Valero. The 230-acre-foot minimum pool constitutes a hardened demand that must be considered when assessing the City's water system demands. It is important to note that, as described in Chapter 2 and Chapter 4, Valero may cease operations in 2026, however in the interest of conservative planning this supply need is still considered in this UWMP. **Table** 3-25 and **Table** 3-26 show the availability of the Sulphur Springs Creek water supplies under normal, single dry, and five consecutive dry year scenarios from 2026 through 2030 and from 2030 through 2050.

TABLE 3-25: S028393 AND LICENSE 4900 WATER AVAILABILITY FROM 2026 THROUGH 2030 (ACRE-FEET PER YEAR)

Year	Amount
Normal	1,800
Single Dry	900
Dry Year 1	900
Dry Year 2	450
Dry Year 3	300
Dry Year 4	150
Dry Year 5	150

TABLE 3-26: S028393 AND LICENSE 4900 WATER AVAILABILITY FROM 2030 THROUGH 2050 (ACRE-FEET PER YEAR)

Year Type		2030	2035	2040	2045	2050
Normal		1,800	1,800	1,800	1,800	1,800
Single Dry Year		900	900	900	900	900
Multi-Year Drought	Year 1	900	900	900	900	900
	Year 2	450	450	450	450	450
	Year 3	300	300	300	300	300
	Year 4	150	150	150	150	150
	Year 5	150	150	150	150	150

3.5. WATER TREATMENT PLANT

The City of Benicia owns and operates its own water treatment plant alongside its transmission, storage, and distribution systems that deliver potable water to its customers. Originally constructed in 1971 and expanded in 1989, the City's WTP utilizes a conventional water treatment system with a design capacity of 12 mgd to treat raw water sourced from the SWP, Solano Project, and the Sulphur Springs Watershed. Raw water from these three sources is conveyed to the WTP via two pump stations and approximately 18 miles of raw water transmission lines. Upon treatment, potable water is delivered by the City's distribution system which consists of three pump stations, eight pressure-reducing stations, and approximately 150 miles of distribution lines. Potable water is then stored in five treated reservoirs within the service area before final delivery to individual service connections. It is important to note that the City's WTP can selectively treat and deliver water from any of its three supply sources depending on seasonal availability, operation needs, and water quality-related issues.

3.6. OTHER WATER SOURCES

The City of Benicia has considered acquiring additional water assets to buttress its existing water asset portfolio. The City continues to explore other transfer opportunities within its service area and is working with neighboring public agencies to identify and potentially use additional water supplies to address internal and regional water management objectives.

3.6.1. CITY OF VALLEJO LICENSE 7848

The City of Vallejo holds SWRCB issued appropriative water right License 7848. License 7848 (often referred to as "Permit Water") allows the City of Vallejo to divert up to 31.52 cubic feet per second from January 1 through December 31 each year from the Sacramento River (at Barker or Lindsey Slough). License 7848 has a priority date of 2 February 1948. The City of

Benicia falls within the authorized place of use of Vallejo's Permit Water and has received water supplies under License 7848 in the past.

The City does not anticipate relying upon Permit Water from the City of Vallejo to meet its long-term water supply reliability objectives. Although the City may occasionally use this water supply, it does not have a contract with the City of Vallejo that facilitates long-term planning related to this water asset. Accordingly, the City does not include Vallejo's License 7848 in its water asset portfolio. Benicia has not utilized Vallejo's License 7848 water as a supply source since 2015.

3.6.2. Transfer or Exchange Opportunities

The availability of conveyance facilities from the Sacramento River Watershed via the North Bay Aqueduct and from the Solano Project through Lake Berryessa and the Putah South Canal allow for a variety of short-term or long-term water transfer or exchange opportunities. Potential transfers or exchanges may occur with other SCWA member units, other NBA users like Napa County, other SWP Contractors in California, water right holders in the Sacramento River Watershed, or Solano Project members. These shared opportunities highlight the value of statewide and regional water management planning efforts.

Storage Agreement for Solano Project Water

The City maintains a storage agreement with SCWA that provides itself with an option to store up to 9,000 acre-feet of Solano Project water in Lake Berryessa for use as an emergency supply. To exercise this agreement, Benicia must exchange a portion of its SWP water (Table A water) for Solano Project water or purchase it from other members that have the capability to use either source. The other entity uses the NBA water and foregoes the use of the Solano Project water. The City has not exercised this agreement to date since it specifies that the first Project water spilled (released over the dam), if Lake Berryessa is full, is Benicia's water whether the City needs it at the time or not. The City will be addressing opportunities under this agreement in the upcoming years.

Conjunctive Use Management Actions

Several of the SCWA's Solano Project and North Bay Aqueduct members have access to groundwater resources in Solana and Napa Counties. The City of Benicia could pay these agencies to access their groundwater resources in times of water shortage in exchange for delivery of allocated surface water assets delivered through the NBA or Solano Project. In return, the City of Benicia could offset groundwater uses in times when it has surplus water deliveries from the Sacramento River Watershed or Solano Project by delivering those surplus supplies to areas that would normally access groundwater. In short, the net water withdrawals from the groundwater basin would be equalized through the sharing of both types of water assets in times of shortage and surplus.

General Transfers/Exchanges

Water transfers and exchanges in California are voluntary, temporary, or long-term, and market-based transactions where willing water right holders sell or lease water to willing buyers often mitigate shortages during dry years. Generally, water transfers can be structured as either short-term (one year or less) or long-term (more than one year). A variety of transfer/exchange opportunities are available to Benicia.

- *Long-term Transfers* make water available through multi-year contracts that convey a specific amount of water to the buyer each year. The specific conditions depend on the individual agencies involved and contract terms. Examples include Benicia's 2009 SID Agreement and its 1962/1989 Vallejo Agreement.
- *Spot Transfers* make water available for a limited duration (typically one year or less) through a contract executed during the year of delivery. Some examples of spot transfers are the City's 2014 Vacaville Agreement, the State Drought Water Bank in critically dry years like 1991, the State's voluntary 2001 water purchase program, and Benicia's previous short-term agreements with SID.
- *Option Transfers* are multi-year contracts that allow the buyer to obtain a specific quantity of water at some future date at its option. These usually require a minimum payment for water even if the water is not needed in a given year in order to cover the value of the option. An option or "take" price is established in years water is drawn.
- *Storage Agreements* allow an entity to lease or purchase storage in another entity's surface or groundwater storage facility. Benicia's storage agreement for Solano Project water in Lake Berryessa is a prime example.
- *Water Exchanges* are agreements that allow two agencies to exchange water from one source for water from another source, typically within the same year. Exchanges can also involve the same source where one agency exchanges its right to take water at a given time from the source with other agencies and then can take the water from the source at another time. Exchanges may also involve storage agreements.

3.6.3. Groundwater

The City does not currently use groundwater as a potable water source and only has conceptual plans to conjunctively use groundwater in the future with neighboring agencies. The City may establish conjunctive use activities with neighboring water purveyors or distant water purveyors that have access to groundwater resources.

3.6.4. Indirect Water Reuse and Recycled Water

The City owns and operates its own wastewater treatment system, including the sewer and disposal system. This system serves residential, commercial, and light industrial customers within its service area and is managed by the Public Works Department. The majority of the City's wastewater collection system relies on gravity to convey wastewater through approximately 153 miles of sewer line. However, due to terrain restrictions, the City relies on 23 lift stations to help move collected wastewater from topographic low points to suitable locations for continued gravity transmission. The City's wastewater treatment plant has a dry weather design capacity of 4.5 mgd and can accommodate up to 11 mgd to handle increased flows during rain events. Following treatment, wastewater is discharged into the Carquinez Strait through a long outfall pipeline and diffuser system.

While the City does not have a recycled water system, long-term planning will contemplate the addition of recycled water supplies for system resiliency.

3.6.5. Desalinated Water

Desalination is the process of removing salts and other impurities from seawater or non-potable surface water or groundwater to produce fresh, potable supplies. It is primarily achieved through treatment technologies such as reverse osmosis and thermal distillation. Desalination is increasingly used around the world, especially in arid regions with limited freshwater sources. Within the Bay Area, desalination plays a limited but emerging role as most water purveyors import surface water or other more economical supplies. But desalination has garnered growing interest as a drought-resilient supply option.

The main advantage of desalination is that it provides a reliable, drought-resistant water supply, which makes it an attractive option in the face of climate change and growing water demands. However, desalination also has significant obstacles. Desalination facilities are costly to construct and operate relative to the City's current supply sources and face significant environmental and permitting issues associated with the intake of marine life and the disposal of concentrated brine from the treatment process. The City currently does not have any plans for desalination. However, the City's proximity to seawater and brackish water sources may warrant further consideration as a viable future water supply if costs can be controlled.

3.7. Water Supply Portfolio Assessment

This section outlines the City of Benicia's current and projected water supplies and assesses each supply's reliability under certain hydrological and regulatory conditions. The City is uniquely positioned as it possesses significant water assets that can be made available on an annual basis but also faces constraints that make its water assets less reliable on a monthly basis, especially in drought conditions. The following tables represent the overall water supply availability of the City of Benicia in light of monthly demands. In other words, the

supply picture identified in the tables below represents a realistic water demand pattern and presents a holistic management structure for all water assets to satisfy monthly demand.

TABLE 3-27: SWP TABLE A MONTHLY SUPPLY AVAILABILITY WITH MANAGEMENT CONSTRAINTS (ACRE-FEET)

Year Type		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total
Normal		0	0	0	881	1,321	1,762	2,202	1,982	1,541	1,321	0	0	11,010
Single Dry Year		0	0	0	69	103	138	172	155	120	103	0	0	860
Multi-Year Drought	2026	0	0	0	592	888	1,184	1,480	1,332	1,036	888	0	0	7,400
	2027	0	0	0	413	619	826	1,032	929	722	619	0	0	5,160
	2028	0	0	0	138	206	275	344	310	241	206	0	0	1,720
	2029	0	0	0	69	103	138	172	155	120	103	0	0	860
	2030	0	0	0	206	310	413	516	464	361	310	0	0	2,580

TABLE 3-28: SWP TABLE A CARRYOVER FROM PREVIOUS YEAR (ACRE-FEET)

Year Type		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total
Normal		0	0	0	441	661	882	1,102	992	771	661	0	0	5,510
Single Dry Year		0	0	0	441	661	882	1,102	992	771	661	0	0	5,510
Multi-Year Drought	2026	0	0	0	34	52	69	86	77	60	52	0	0	430
	2027	0	0	0	296	444	592	740	666	518	444	0	0	3,700
	2028	0	0	0	206	310	413	516	464	361	310	0	0	2,580
	2029	0	0	0	69	103	138	172	155	120	103	0	0	860
	2030	0	0	0	34	52	69	86	77	60	52	0	0	430

TABLE 3-29: DWR SETTLEMENT CONTRACT WATER MANAGEMENT SUMMARY (ACRE-FEET)

Year Type		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total
Normal		1,313	1,313	1,313	1,313	1,313	0	0	0	0	1,313	1,313	1,313	10,500
Single Dry Year		1,750	1,750	1,750	1,750	0	0	0	0	0	0	1,750	1,750	10,500
Multi-Year Drought	2026	1,750	1,750	1,750	1,750	0	0	0	0	0	0	1,750	1,750	10,500
	2027	2,100	2,100	2,100	0	0	0	0	0	0	0	2,100	2,100	10,500
	2028	2,100	2,100	2,100	0	0	0	0	0	0	0	2,100	2,100	10,500
	2029	2,100	2,100	2,100	0	0	0	0	0	0	0	2,100	2,100	10,500
	2030	1,750	1,750	1,750	1,750	0	0	0	0	0	0	1,750	1,750	10,500

TABLE 3-30: CITY OF VALLEJO AGREEMENT WATER MANAGEMENT SUMMARY (ACRE-FEET)

Year Type		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total
Normal		92	92	92	92	92	92	92	92	92	92	92	92	1,100
Single Dry Year		46	46	46	46	46	46	46	46	46	46	46	46	550
Multi-Year Drought	2026	0	0	0	0	92	72	0	72	92	233	0	0	550
	2027	0	0	0	92	92	72	0	72	46	177	0	0	550
	2028	0	0	0	92	92	72	0	72	46	177	0	0	550
	2029	0	0	0	92	92	72	0	72	46	177	0	0	550
	2030	0	0	0	0	92	72	0	72	46	177	0	0	550

TABLE 3-31: CITY OF VALLEJO AGREEMENT CARRYOVER MANAGEMENT SUMMARY (ACRE-FEET)

Year Type		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total
Normal		46	46	46	46	46	46	46	46	46	46	46	46	550
Single Dry Year		46	46	46	46	46	46	46	46	46	46	46	46	550
Multi-Year Drought	2026	0	0	0	0	46	46	46	46	46	46	0	0	275
	2027	0	0	0	0	0	0	0	0	0	0	0	0	0
	2028	0	0	0	0	0	0	0	0	0	0	0	0	0
	2029	0	0	0	0	0	0	0	0	0	0	0	0	0
	2030	0	0	0	0	0	0	112	92	71	0	0	0	275

TABLE 3-32: SID CONTRACT SUPPLY MANAGEMENT SUMMARY (ACRE-FEET)

Year Type		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total
Normal		167	167	167	167	167	167	167	167	167	167	167	167	2,000
Single Dry Year		83	83	83	83	83	83	83	83	83	83	83	83	1,000
Multi-Year Drought	2026	0	0	0	0	260	260	166	83	83	157	0	0	1,000
	2027	0	0	0	83	167	167	167	167	167	83	0	0	1,000
	2028	0	0	0	83	167	167	167	167	167	83	0	0	1,000
	2029	0	0	0	83	167	167	167	167	167	83	0	0	1,000
	2030	0	0	0	0	167	167	167	167	167	167	0	0	1,000

TABLE 3-33: SID CONTRACT CARRYOVER WATER MANAGEMENT SUMMARY (ACRE-FEET)

Year Type		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total
Normal		83	83	83	83	83	83	83	83	83	83	83	83	1,000
Single Dry Year		83	83	83	83	83	83	83	83	83	83	83	83	1,000
Multi-Year Drought	2026	83	83	83	83	83	83	83	83	83	83	83	83	1,000
	2027	0	0	0	0	0	0	0	0	0	0	0	0	0
	2028	0	0	0	0	0	0	0	0	0	0	0	0	0
	2029	0	0	0	0	0	0	0	0	0	0	0	0	0
	2030	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 3-34: SULPHUR SPRINGS WATERSHED SUMMARY (ACRE-FEET)

Year Type		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total
Normal		150	150	150	150	150	150	150	150	150	150	150	150	1,800
Single Dry Year		75	75	75	75	75	75	75	75	75	75	75	75	900
Multi-Year Drought	2026	75	75	75	75	75	75	75	75	75	75	75	75	900
	2027	75	75	75	75	75	75	0	0	0	0	0	0	450
	2028	50	50	50	50	50	50	0	0	0	0	0	0	300
	2029	25	25	25	25	25	25	0	0	0	0	0	0	150
	2030	0	0	0	0	25	25	0	100	0	0	0	0	150

TABLE 3-35: TOTAL CITY OF BENICIA SUPPLY SUMMARY (ACRE-FEET)

Year Type		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Total
Normal		1,850	1,850	1,850	3,172	3,833	3,181	3,842	3,511	2,850	3,833	1,850	1,850	33,470
Single Dry Year		2,083	2,083	2,083	2,592	1,097	1,352	1,607	1,479	1,225	1,097	2,083	2,083	20,870
Multi-Year Drought	2026	1,908	1,908	1,908	2,534	1,495	1,789	1,936	1,768	1,475	1,534	1,908	1,908	22,055
	2027	2,175	2,175	2,175	958	1,397	1,732	1,939	1,834	1,453	1,323	2,100	2,100	21,360
	2028	2,150	2,150	2,150	569	825	977	1,027	1,013	815	776	2,100	2,100	16,650
	2029	2,125	2,125	2,125	337	490	539	511	549	454	466	2,100	2,100	13,920
	2030	1,750	1,750	1,750	1,991	645	746	881	973	705	705	1,750	1,750	15,485

3.8. BAY DELTA PLAN

The Bay-Delta Water Quality Control Plan Update (Plan) is a pending State Water Resources Control Board (State Board) action that could impact water supplies that connect to the Sacramento-San Joaquin Bay Delta (Delta). Although the Plan has not yet been adopted, the various proposed State Board actions could affect each urban water purveyor's water supply reliability. The Healthy Rivers and Landscapes Program is an alternative to the Plan and provides opportunities for urban purveyors to meet the Plan's aquatic species and water quality objectives through coordinated regional management activities. In addition, the Plan has numerous post-adoption water management activities, such as cold-water storage and management, that are to be determined as the Plan is implemented. These to-be-determined management actions could impact how water supplies are made available to each urban purveyor. Finally, the Plan appears to exempt some tributaries and other geographical areas from strict adherence to the Plan or HRL Program that would not affect long-term urban water planning projections.

The water supply reliability projections described in this Urban Water Management Plan update reflect characterizations of water supplies and demands as they exist based upon reasonably available information. Although the Plan, HRL Program, and post-Plan water management adjustments could change UWMP water supply reliability projections, the water supply implications are not yet suitable for analytical integration into the current water supply reliability projections for this UWMP iteration. Once the Plan or HRL Program is adopted, and post-adoption implementation actions become better known, the projections for urban water supply reliability can be reasonably calculated. It is anticipated that the 2027 through 2030 iterations of Annual Assessments will guide urban purveyors in assessing near term impacts of the Plan on water supply reliability and generate useful information that can be incorporated into the next UWMP update in 2030.

CHAPTER 4
WATER USE

Developing a thorough understanding of water use enables the City to reliably and cost-effectively manage its water supplies to continue to meet customer needs. This chapter characterizes the City's current and forecasted retail customer water needs, examining how various factors such as seasons, land use classifications, and differing hydrologic conditions impact water use.

A thorough analysis of the City's past and current water use enables realistic water use projections to be made for the future that consider anticipated growth, new regulations, changing climate conditions, and trends in customer water use behaviors. After individually analyzing each water use sector, information can be aggregated into a comprehensive projection of customer water use that becomes the foundation for integration with the City's water supplies (see Chapter 3) to assess long-term water system reliability (see Chapter 5).

As discussed previously in this plan, there have been no legislative changes to the UWMPA since the adoption of the City's 2020 UWMP; however, updates to annual water use reporting have been implemented. These include Urban Water Use Objective (UWUO) reports, and monthly drought and conservation reporting to the Safe and Affordable Funding for Equity and Resilience (SAFER) portal that are consolidated annually into an auto-generated Clearinghouse Annual Inventory Report (CAIR).

This section is organized as follows:

- Current Customer Water Use – This subsection presents data reflecting the City's residential and non-residential customers for 2021 through 2024 as well as the actual 2025 water use. It also presents the City's distribution system losses for this same period.
- Compliance with Urban Water Use Objectives and past urban water use efficiency efforts – This subsection documents the derivation of the City's UWUO, comparison to the City's actual water use, UWUO reporting process, and past urban water use efficiency efforts, including the City's 2020 GPCD target.
- Demand Management Measures – This subsection provides a narrative description of each water demand management measure implemented by the City over the past five years and describes the City's planned measures for the foreseeable future.

- Forecasting Customer Use – This subsection presents the derivation and results of future water use forecasts for potable and non-potable water within the City's service area, including land-use classifications, unit demand factors, and estimation of distribution system losses. This subsection also estimates the variations in customer water use the City should expect during years with low rainfall as well as discusses longer-term climate change considerations.
- Forecasting Water Use for DRA and Annual Assessment – This subsection focuses on the subset of the customer water use forecast that is necessary for completing the City's five-year Drought Risk Assessment (DRA) and the annual supply and demand assessments, which includes the current year unconstrained demand.
- Projecting Disadvantaged Community Water Use – This subsection presents the estimated water use necessary to meet lower income households, pursuant to California Water Code 10631.1.

4.1. Current Customer Water Use

As described in Chapter 2, the City serves potable water to approximately 9,648 customer connections. Under normal circumstances, customers are served potable water derived from multiple sources (see Chapter 3) and treated at the Benicia Water Treatment Plant. Information about the City's current customers, their recent and expected water use trends, and the City's on-going demand management efforts targeting these customers provide a foundational basis for this UWMP's water use forecast to 2050.

Furthermore, annual records of actual water use is the basis for determining the City's compliance with its urban water use objective, reported annually to the Department of Water Resources beginning in January of 2024. This subsection presents relevant water use information.

4.1.1. Customer Water Use: 2021 to 2024

Recent customer water use data can help the City understand water use trends, effects of temporary use restrictions imposed during the most recent prolonged drought and recovery from such temporary restrictions, effects of long-term demand management measures, and other pertinent water use factors relevant to its forecast of future water use. Additionally, the City is required to quantify past customer water use pursuant to Water Code Section 10631(d)(1).

Table 4-1 presents the City's past customer potable water use by customer classification for 2021 through 2024 in acre-feet. The City records potable water use within five primary categories:

- Single-family residential
- Multi-family residential
- Commercial and Institutional
- Industrial
- Landscape Irrigation

The City also records a small quantity of water under "other" which captures a range of small, non-standard uses such as hydrant flushing and street sweeping. Additionally, the City supplies non-potable supplies to the Valero refinery, where the refinery provides its own necessary treatment for industrial purposes. **Table** 4-2 provides the historic monthly deliveries of non-potable water.

TABLE 4-1: POTABLE CUSTOMER USE: 2021-2024 (ACRE-FEET)

	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Single-Family Residential	2021	133	122	118	171	191	210	223	247	212	184	145	103	2,058
	2022	102	119	136	151	163	199	188	214	191	186	145	115	1908
	2023	104	99	95	102	133	171	198	214	181	197	149	121	1765
	2024	101	94	94	116	142	183	208	214	205	203	149	120	1828
Multi-Family Residential	2021	47	14	40	13	56	12	69	15	71	13	55	11	416
	2022	39	12	50	12	59	12	67	13	64	12	49	11	400
	2023	42	10	38	10	45	11	57	12	60	12	50	11	358
	2024	38	11	40	11	48	11	66	12	74	11	53	10	385
Commercial Institutional	2021	19	28	21	33	27	31	30	43	29	36	24	28	348
	2022	20	32	23	34	26	33	26	37	27	36	21	25	339
	2023	20	29	19	30	23	38	26	36	26	41	31	29	349
	2024	17	29	21	32	24	32	28	38	26	35	25	32	338
Industrial	2021	0	16	0	16	0	15	0	24	0	18	0	14	103
	2022	0	18	0	18	0	20	0	20	0	18	0	15	108
	2023	0	16	0	16	0	22	0	27	0	31	0	30	141
	2024	0	29	0	32	0	23	0	19	0	28	0	27	157
Landscape Irrigation	2021	11	16	11	46	52	96	79	116	62	77	18	12	598
	2022	3	17	22	51	41	86	65	92	50	74	25	23	548
	2023	4	14	3	11	11	65	50	84	60	73	25	15	413
	2024	6	6	5	12	23	71	53	95	51	74	28	16	439
Other	2021	0	2	0	2	0	2	0	2	0	1	0	1	9
	2022	0	0	0	4	0	1	0	1	0	1	0	1	9
	2023	0	1	0	2	0	3	0	2	0	2	0	2	12
	2024	0	1	0	2	0	1	53	1	0	1	0	1	60
Total Metered Deliveries	2021	210	197	190	281	326	366	401	446	374	328	243	168	3,531
	2022	164	197	231	271	289	351	346	375	331	327	240	191	3,312
	2023	171	169	155	169	212	309	331	375	327	356	255	207	3,037
	2024	163	170	159	204	236	321	407	378	356	352	255	207	3,207

This historical data also provides insight into the relative ratio of differing customer classifications as well as seasonal variations. For instance, commercial demands remain fairly constant month to month and generally year to year. In contrast, landscape irrigation is significantly higher in the summer months compared to the winter, when rainfall is generally sufficient to meet the water needs of large landscapes (e.g., parks and play fields). The

monthly variance seen in the multi-family class results from bi-monthly meter readings. The same is true of the Industrial class with bi-monthly readings.

TABLE 4-2: VALERO NON-POTABLE USE: 2021 TO 2024 (ACRE-FEET)[34]

	Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Valero Raw Water Use	2021	443	375	428	433	456	460	472	480	462	359	319	384	5,071
	2022	407	372	417	390	438	453	477	501	446	422	473	368	5164
	2023	342	313	317	356	379	361	383	387	346	348	300	309	4142
	2024	323	302	291	306	346	346	349	320	264	547	546	589	4528
	2025	473	522	522	550	612	533	580	621	609	549	481	349	6400

Valero is the City's most significant water user, as shown in **Table** 4-2. It accounts for over half of the City's raw water demand. In September 2024 a faulty meter for the Valero connection was discovered and replaced. The readings prior to the replacement are thought to have been artificially low and the spike in use is reflected in the October 2024 and subsequent meter readings.

The single-family residential classification continues to illustrate two important characteristics of the City's water service: (1) it represents about 60% of the City's annual potable water demand, and (2) it has summer demands that are two times the monthly volume needed in winter months. Combined with the multi-family residential use, overall residential use represents over 70% of the City's potable water service. When compared to previous projections, these water use characteristics have remained relatively consistent throughout the last 10 years.

However, when viewed in relation to the non-potable deliveries to Valero through 2025, the entire potable customer use represents less than 50% of the annual demand on the City's water supplies. Additionally, during winter months, the non-potable water need is twice the potable need, while during summer the needs are nearly equivalent.

The potable use seasonal variations along with non-potable as the highest water using classification provide the City with additional insight necessary for assessing the seasonal reliability of its water supplies. Recognizing that not all historical projections will remain consistent, this enables the City to develop successful water management approaches and water shortage contingency response actions with as customer classes and economic trends change.

[34] Valero monthly delivery data was provided through 2025 in this table. Potable use in 2025 is presented in a separate table as it is used to determine compliance with the City's 2020 GPCD target and urban water use objective

4.1.2. Customer Use in 2025

Customers served by the City are metered at their connection to the City's potable water distribution system. As of January 1, 2024, for each customer account, the City is required to collect and submit metered delivery values to the State Water Board on a monthly basis, summarized annually in an auto-generated CAIR Report. This data was formerly submitted as part of the City's annual reporting to the SWRCB Division of Drinking Water and to DWR; although those reports are still required, requirements have been be modified to avoid duplicative reporting.[35] The 2025 actual customer use presented in **Table** 4-3 represents the summarized delivery to all the City's potable customers. It does not, however, include the distribution system losses inherent in a pressurized water delivery system that occur during the City's efforts to treat, store, and route the water throughout the extensive distribution system to each customer's connection.

Compared to the single-family residential water use values in **Table** 4-1, the 2025 annual customer use is about 10% higher than that of 2024, reversing the overall decreasing trend in single family residential customer use since 2021.

Table 4-3: Potable Customer Water Use: 2025 Actual Use (acre-feet)

Use Category	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Single-Family Residential	111	103	104	127	155	206	191	206	193	161	119	110	1,786
Multi-family Residential	37	11	38	10	53	11	63	11	63	11	40	12	360
Commercial/Institutional	20	26	21	27	24	36	27	39	27	33	21	29	331
Industrial	0	24	0	16	0	18	0	16	0	14	0	16	103
Landscape Irrigation	6	6	6	20	35	70	54	80	52	54	16	12	411
Other	0	1	0	1	0	1	0	1	0	1	0	1	6
Total	175	171	168	202	267	342	336	354	335	273	197	179	2,997

4.1.3. Existing Distribution System Losses

Distribution system water losses (also known as "real losses") are the physical water losses from the City's water distribution system up to the point of delivery to the customer's system (e.g., up to the residential water meter).

Since 2016, the City has been required to quantify its distribution system losses using the American Water Works Association (AWWA) Method.[36] An electronic copy of the audit in Excel

[35] The annual SWRCB report is referred to as the 'electronic Annual Report' or eAR, and the annual DWR report is known as the Public Water System Statistics report.

[36] Title 23 California Code of Regulations Section 638.1 et seq.

format is to be submitted to the DWR by October 1 of each year for the prior year's estimated system losses, using DWR's online submittal tool pursuant to Code of Regulations Section 638.5. Although the AWWA-based audit remains in effect as the primary tool for monitoring distribution system losses, mandated water loss reductions are on the horizon pursuant to the SWRCB's April 1, 2023 adoption of volumetric water loss performance standards. In accordance with Section 966, the SWRCB will require suppliers to reduce real loss by January 1, 2028 to no greater than the real water loss standard calculated in its 2027 audit.[37] After 2028, the City shall assess compliance every three years as an average of recent real losses. Additionally, the City will be required to evaluate apparent losses and submit an inventory of apparent losses should average losses exceed the real water loss standard.

As discussed below in Section 4.2.2, a new water use efficiency framework established as part of Senate Bill 606 and Assembly Bill 1668 directly integrates "aggregate estimated efficient water losses" as a component. Importantly, because water loss is subject to enforcement under Section 10608.34, SWRCB will not issue enforcement orders under the Urban Water Use Objectives solely exceeded due to water loss.

Pursuant to DWR's 2025 recommendations, these distribution system losses are losses reported as part of DWR's Water Loss Audit Program.[38] Due to the time lag associated with AWWA reporting, the 2025 estimate has not been officially submitted to DWR as of the drafting of this UWMP, thus, the City's submittals for the last four years are shown in **Table** 4-4.

TABLE 4-4: DISTRIBUTION SYSTEM LOSS: 2021 THROUGH 2025

2021	2022	2023	2024
6.4%	12.1%	16.8%	10.2%
Average:			11.4%

As can be anticipated given the dynamic functions of a pressurized potable water distribution system, the estimated annual distribution system loss as a percentage of water entering the system will vary year-to-year and month to month. On average, however, the City's reported distribution system loss represents about 11.4% of the water entering the City's distribution system. This average is used for purposes of forecasting water use to 2045 and is a conservative number for purposes of demand forecasting.

It should be noted that as part of a system-wide meter testing program in line with AWWA Water Audit Best Practices, the City identified a potential issue with an error adjustment historically used on the City's Water Treatment Plant delivery meter. The City is confirming

[37] Cal. Code Regs. Tit. 23, § 966 - Urban Water Use Objectives

[38] See the City of Sacramento Department of Utilities AWWA Worksheet, submitted annually to DWR's WUEdata - Water Audit Report Data (WUEdata - Water Audit Plans).

how the error adjustment may have negatively affected the recent years of AWWA Water Audit Scores. The City plans to address the error adjustment which it anticipates would correct the loss trend summarized in Table 4-4. Testing and results will be addressed in the 2025 AWWA Water Audit and re-filing of recent Water Loss Audits may be recommended. The City anticipates this process will be completed in late 2026 after the adoption and publishing of this UWMP.

4.1.4. Water Loss Control Standard

The CWC §10608.34 required the State Water Resources Control Board (SWRCB) to develop water loss control and performance standards (Real Water Loss Standards) applicable to urban retail water suppliers. The Real Water Loss Standard for the City was developed using information submitted as part the City's annual water loss reporting to the State, specifically for the period 2017 through 2020. The resulting Baseline Real Loss is 28.9 gallons per (active and inactive) service connection per day. The Real Water Loss Standard is 21.0 gallons per service connection per day, resulting in a required reduction from baseline of 27%. Water loss as an average percent of total water supplied is 8.0%. Using the information from the same period, the average "apparent" water loss averaged 1.5% (of total water supplied). The total water loss estimate as a percentage of total water supplied is 9.5%, although recent AWWA audits discussed above show losses closer to 11%.

4.2. Compliance with Water Use Targets and Objectives

This section examines the City's derivation and compliance with state-mandated water use targets and objectives. The Water Conservation Act of 2009, also known as SB X7-7, introduced water conservation targets that served as a valuable measure of progress through 2020 and beyond.

4.2.1. Compliance with 2020 Urban Water Use Target

SB X7-7, also known as the Water Conservation Act of 2009, introduced sustainable water use and demand reduction legislation requiring the City to make incremental progress in reducing per-capita water use. Specifically, urban water retailers were tasked with achieving a 10% reduction in per capita water use by December 31, 2015, and a 20% reduction by December 31, 2020. Beyond 2020, although reporting on compliance is no longer required, this target remains valuable as a baseline for the City to measure progress on achieving water efficiency goals.

The City's 2020 GPCD target was established in the 2015 UWMP as 180 GPCD, derived as the "gross water use" divided by the population during a defined baseline period, and reduced pursuant to one of four methods defined under California Water Code Section 10608.20(b). The City's calculation of their 2020 actual GPCD used the same methodology:

"Gross water" was defined as the total "Potable Water" leaving the City's water treatment plant, representing both the customer deliveries and the distribution system losses. This value, divided by the City's estimated population in 2020, resulted in a compliance value of 135 GPCD. Because this value was less than the City's established target, the City was determined to be in compliance with CWC Section 10608.24(b).

Although not required by the Act, in 2025, the City was determined to have an actual GPCD of 112, calculated using the same methodology presented above. Compared to the 2020 baseline value of 135, the City's 2020 GPCD value was determined to be in compliance with CWC Section 10608.24(b) and is represented in reporting to the State. Moving forward, the City is required to maintain compliance with its 2020 GPCD target for urban water management planning purposes.

4.2.2. Urban Water Use Objective Compliance

In 2018, the California Legislature passed Senate Bill 606 and Assembly Bill 1668, directing the SWRCB to adopt standards to encourage more efficient urban water use. This legislation, known as "Making Conservation a California Way of Life," was adopted in 2024, establishing individualized Urban Water Use Objectives for each urban retail water supplier. In contrast to the SB X7-7 per-capita targets, this legislation functions as a water budget tailored to a supplier's service area, considering residential indoor use, residential and commercial outdoor use based on local evapotranspiration and irrigable landscape area, water loss, and bonus incentives for potable reuse. In addition to the volumetric UWUO, the regulation establishes performance measures for commercial, industrial, and institutional sectors. The standards become progressively more stringent through 2040. Compliance with efficiency-based UWUOs aligns with both the City's Demand Management Measures detailed in Section 4.3 and the adaptive management strategies outlined in the City's Water Shortage Contingency Plan in Chapter 6.

In each of the first three reporting years, the City submitted required annual reports to the SWRCB demonstrating that actual water use remained below its calculated UWUO, confirming compliance in 2023, 2024, and 2025.

4.3. Demand Management Measures

Pursuant to California Water Code Section 10631(e), the City needs to provide a narrative discussion of the water demand management measures it has implemented, is currently implementing, and plans to implement. The historic and on-going measures can help the City understand the effectiveness of managing existing customer uses to help guide refinements, emphasis or augmentation that will help position the City to best meet its undefined, to-be-established water use objectives.

To date, the City's overall water management efforts have resulted in significant and long-term water conservation savings. During the 2013 to 2015 drought, the City's residents showed tremendous ability to temporarily reduce water usage and many of the efforts have had long-term viability, providing on-going savings well into the future. The City is also a member of the California Urban Water Conservation Council (CUWCC) successor organization, California Water Efficiency Partnership (CalWEP).

The City's demand management measures are highlighted in this subsection.

4.3.1. Foundational Demand Management Measures

This subsection describes the foundational Demand Management Measures (DMMs) that underpin the City's operations and customer deliveries. These particular DMMs represent adopted ordinances, policies, and long-standing budgeted conservation programs.

Water Waste Prevention Ordinances

Wasteful water is prohibited in the City's service area as recognized in Chapter 13.35 of its municipal code. These fundamental prohibitions align with state-mandated requirements. Since 2020, the most common water waste violation was a failure to repair a controllable leak; the City documented two wastewater violations, both of which were resolved when leaks were repaired.

Metering

All water service connections in the City's service area are metered. The City implemented a smart meter program to replace existing meters, including new ultrasonic water meters to provide customers with immediate access to real time water usage, including leak alerts.

Conservation Pricing

The City's water rate structure is set to generate the necessary funds to efficiently operate the City's water system and maintain reliable water supplies. The City uses a single-tier pricing structure for monthly volumes, in addition to a fixed-fee portion. The fee structure, coupled with the new smart meter program will continue to help customers manage their water use in an efficient manner.

Public Education and Outreach

The City regularly engages its customer base with various conservation and demand management outreach programs. Promoting water-wise activities, watering schedules, and educational programs are part of the City's outreach efforts when applicable during drought conditions, which include a conservation web page providing resources to the community for conserving water.

Additionally, the City maintains a contract with the Solano Resource Conservation District to support elementary education and outreach and actively participates in Solano County Water Agency's rebate programs to offer residential and commercial rebate programs, such as for turf replacement. In September 2022, Benicia's City Council kicked off a matching rebate program with a $200,000 budget, matching SCWA rebates dollar for dollar until funds run out. At the beginning of 2026, approximately $40,000 of this rebate matching budget remains.

Programs to Assess and Manage Distribution System Real Loss

The City's water loss assessment and management program includes annual water audits and ongoing leak detection and repair, using WaterSmart monitoring software to provide customers with real-time leak alerts. Additionally, the City provides an ongoing meter calibration and replacement program for all production and distribution meters. The City's activities include:

- Annual water audit and water balance
- Proactive, real-time leak identification and repair in the City's distribution system
- Customer leak identification and repair assistance.

Water Conservation Program Coordination and Staffing Support

Rather than fund one full time equivalent (FTE) staff to run the City's water conservation programs, the City maintains an annual budget of $125,300 used to fund various rebate, conservation, and education programs, including WaterSmart. The City works with customers, neighboring water suppliers and Solano County Water Agency to promote conservation through public education, water audits, landscape studies to affect water conservation, and monitoring conservation efforts.

4.3.2. Recent DMM Activities

The City has continued to promote and implement water conservation actions, most notably during drought or emergency water shortage conditions. The City has reached remarkable on-going conservation levels through the attentive actions of its citizens. Highlights of the City's recent actions and conservation measures include:

- Launching their $200,000 rebate matching program
- Contracting with Solano Resource Conservation District to support their elementary education program
- Providing flyers and brochures on their website
- Sending over 6,000 real-time leak notices to customers using WaterSmart software
- Offering rebate programs for turf and appliances, which resulted in:

- 30+ smart irrigation controller rebates
- 25+ high-efficiency toilet rebates
- 50+ high-efficiency washer rebates
- 25+ rain barrel / pool cover / hot water recirculating rebates

4.3.3. Planned DMM Activities

In addition to ongoing water conservation commitments, the City will continue to evaluate the need for additional programs and actions necessary to achieve water use objectives in compliance with California Water Code Section 10609.20. Resources will be dedicated in the City's budget for demand management activities which will help comply with these future water use objectives. Special consideration will be taken regarding changing urban water use patterns in the service area as well as the configuration of anticipated new residential customers to ensure use remains efficient.

4.4. Forecasting Customer Water Use

Forecasting future water demands begins with understanding existing customer demands and trends, recognizing the additional customers expected through growth, and considering the factors that will influence the water use of both existing and new customer well into the future – especially factors that directly affect the efficiency of water use.

Pursuant to California Water Code 10610.4(c), an urban water supplier "*shall be required to develop water management plans to actively pursue the efficient use of available supplies*." One challenge from this directive is reflecting how the pursuit of efficient use is best represented in the forecast water uses that are the cornerstone of good planning. As required by the Act, the future water uses of both existing customers and those added over the 25-year planning horizon should reflect the efficient use of water.

4.4.1. Representative Current Water Use

The actual monthly potable and non-potable customer water use data for 2021 through 2025 is shown on **Table** 4-1, **Table** 4-2, and **Table** 4-3. As mandated by the state, this monthly water use information is also reported as part of the City's SAFER reporting, in their Annual Assessments, and to demonstrate compliance with UWUO. Using this information, a representative "current" water use by existing customers can be estimated. Developing this estimate requires acknowledging how and why actual use varies slightly year-to-year. This estimate is influenced by a variety of factors, from the timing of spring rain events impacting when landscape irrigation may begin to how the City's population adjusted to a new normal throughout the course of the Covid-19 pandemic. In addition to accounting for some of these variations, the City also has a desire to conservatively assure long-term water system reliability, as described in Chapter 5.

For this UWMP, the City's actual potable water use for 2025 was used to represent current conditions, given the relative absence of extraordinary conditions. In contrast, other years within the 2020-2025 planning period were characterized by both dry and wet conditions, respectively warranting higher or lower landscape irrigation demands. Based on DWR's SWP allocations, 2025 was considered to be a normal water year, with a 50% Table A allocation for north-of-delta SWP contractors. As a result, 2025 actual potable use was chosen to represent the City's potable usage within the 2020-2025 planning period and serve as a baseline for future use estimates.

Representative non-potable use was set to match the maximum contract demand of 5,800 acre-feet, using an average monthly delivery pattern from the past five years. Although non-potable demand is anticipated to change in the coming years, representing the maximum contract demand accounts for a range of possibilities, as described further below.

This representative water use for current conditions provides the foundation for estimating the future needs of these existing customers. **Table** 4-5 provides the representative monthly and annual current water use, not including distribution system losses.

TABLE 4-5: REPRESENTATIVE CURRENT WATER USE (ACRE-FEET)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Potable Use	163	170	159	204	236	321	407	378	356	352	255	207	3,207
Non-Potable Use	452	346	460	421	486	501	543	539	534	543	487	488	5,800

4.4.2. FACTORS AFFECTING FUTURE CUSTOMER USE

There are multiple factors that affect the forecasted future customer use, including State and local landscape regulations, building code requirements, other water-use mandates, new housing developments, and even employment trends as business needs change. These factors are incorporated into determining appropriate per-dwelling unit or per customer connection water demand values for use in forecasting future water needs. Relevant characteristics of the factors are described here.

WATER CONSERVATION OBJECTIVES

In response to multi-year drought conditions, Governor Jerry Brown issued Executive Order B-37-16 in May 2016 entitled "Making Water Conservation a California Way of Life." In May 2018, when Governor Brown signed SB 606 and AB 1668 into law, additional statutory requirements were imposed above and beyond the 20% by 2020 target reflected in the 2009 legislation. The City also met this mandated target. As described in section 4.2.2, in order to demonstrate compliance with its Urban Water Use Objective, efforts to increase water use efficiency and

ultimately to reduce water demands of existing and future water users are and will continue to be of high priority to the City.

Requirements in California Building Code

Beginning in January 2010, the California Building Standards Commission adopted the statewide mandatory Green Building Standards Code (hereafter the "CAL Green Code") requiring the installation of water-efficient indoor and outdoor infrastructure for all new projects after January 1, 2011. The CAL Green Code was incorporated as Part 11 into Title 24 of the California Code of Regulations and was updated in 2016, 2019, and 2022. Revisions to the CAL Green Code in 2019 modified sections to direct users to MWELO regulations contained in other regulatory sections.[39]

The CAL Green Code applies to the planning, design, operation, construction, use and occupancy of every newly constructed or remodeled building or structure. All new residential and non-residential customers must meet the water use requirements of the CAL Green Code as well as the outdoor requirements described by MWELO.

The CAL Green Code's requirements generally manifest through: (1) installation of plumbing fixtures and fittings that meet the 20% reduced flow rate specified in the CAL Green Code, or (2) by demonstrating a 20% reduction in water use from the building "water use baseline."[40] Future customers are expected to satisfy one of these two requirements through the use of appliances and fixtures such as high-efficiency toilets, faucet aerators, on-demand water heaters, or other fixtures as well as Energy Star and California Energy Commission-approved appliances.

California Model Water Efficient Landscape Ordinance and County Ordinance

DWR's Model Water Efficient Landscape Ordinance (MWELO) governs new development and retrofitted landscape water efficiency standards. All retail water suppliers or counties are required to adopt the MWELO or enact their own provisions that are equal to or more restrictive than the MWELO provisions.[41] The City's Water Efficient Landscape Ordinance

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[39] The 2019 updated sections to direct CAL Green code users to Title 23 of the California Code of Regulations to allow Title 23 to be the sole location of MWELO requirements.

[40] See CAL Green Code. For Residential construction, Section 4.303.1 provides the residential water conservation standard and Table 4.303.2 identifies the infrastructure requirements to meet this standard. Table 4.303.1 and Worksheets WS-1 and WS-2 are to be used in calculating the baseline and the reduced water use if Option 2 is selected. For non-residential construction, Section 5.303.2.3 provides the water conservation standard as well as the baseline and reduced flow rate infrastructure standards. Note that Worksheets WS-1 and WS-2 incorporate both residential and non-residential fixtures, yet the water use is still to be analyzed by "building or structure" as specified in Chapter 1, Section 101.3.

[41] City of Benicia. Model Water Efficient Landscaping Ordinance, Chapter 15.25.090. Adopted February 3, 2022. Ordinance codified to implement the California Water Conservation in Landscaping Act of 2006 and California Code of Regulations Title 23, Division 2, Chapter 2.7. Accessed at: Chapter 15.25 MANDATORY CONSTRUCTION WASTE REDUCTION, DISPOSAL, AND RECYCLING, AND WATER EFFICIENT LANDSCAPING

implements the State's MWELO through locally codified requirements. The most recent MWELO update in January of 2025 repealed several sections and added a distinction in compliance options for new construction projects between 500 and 2,500 square feet of landscape area and those with 2,500 square feet or more of landscape area.[42]

The MWELO provides a methodology to calculate total water use based upon a given plant factor and irrigation efficiency or sets forth the Maximum Applied Water Allowance ("MAWA") formula to use if project landscaping details are lacking. Additionally, if using the plant factor basis, the MWELO requires the landscape design plan to delineate hydrozones (based upon plant factors) and then to assign a unique water use value for each hydrozone (low, medium, high).[43]

Prohibition on Non-Functional Turf

In 2023, the Legislature determined that the use of treated, potable drinking water for irrigating decorative or aesthetic landscaping that serves no recreational or public use is inefficient and inconsistent with state water conservation and climate resilience objectives.[44] Under CWC §10608.12(m), "nonfunctional turf" (NFT) is defined as "a ground cover surface of turf located in a recreational use area or community space. Turf enclosed by fencing or other barriers to permanently preclude human access for recreation or assembly is not functional turf." This definition explicitly excludes cemeteries, parks, sports fields, and lawns that are regularly used for recreation or community gathering.[45]

The prohibition on NFT applies primarily to commercial, industrial, institutional, and municipal properties, as well as common areas maintained by homeowners' associations and common interest developments[46]. Potable water may continue to be used to maintain the health of trees and other perennial, non-turf landscaping, and where irrigation is necessary to address immediate public health or safety concerns. For example, potable irrigation may be allowed where discontinuation would compromise fire prevention or fuel reduction efforts, dust control, or other measures needed to protect human health and safety.

Implementation of the NFT provisions is phased over several years and may be enforced at the local level by public water systems, cities, and/or counties.[47] Non-compliance of the NFT

[42] CCR Tit. 23, Div. 2, Ch, 2.7, Sec. 491.2

[43] CCR Tit. 23, Div. 2, Ch. 2.7, Secs. 490.2

[44] In 2025 provisions of Assembly Bill 1572 were codified into the California Water Code.

[45] CWC §10608.12

[46] Per Civil Code §4100, common interest developments are defined as community apartment projects, condominium projects, planned developments, and stock cooperatives.

[47] CWC §10608.14

provisions may result in civil penalties imposed on property owners, or other locally defined enforcement actions.

Initial compliance begins in 2026, with progressively broader property categories subject to the prohibition through 2030 and beyond, including later deadlines for properties located in disadvantaged communities.[48] In 2026, public water systems are required to update local ordinances and customer policies to reflect the new restrictions.

The following timeline outlines the dates set forth by the CWC and corresponding requirements:

- By January 1, 2027: Public water systems must update local ordinances, regulations, or policies to reflect NFT requirements and must notify customers.
- Beginning January 1, 2027: State properties owned or leased by the Department of General Services will no longer be allowed to irrigate NFT with potable water. In addition, all potable irrigation of NFT will be prohibited for local governments, public agencies, public water systems[49], as well as municipal and institutional properties. Revised water systems ordinances and customer communications must be in effect statewide.
- Beginning January 1, 2028: All potable irrigation of NFT will be prohibited statewide for all other commercial and industrial properties.
- Beginning January 1, 2029: All potable irrigation of NFT will be prohibited for multifamily residential properties, excluding disadvantaged communities. This limitation also applies to common areas of homeowners' associations and similar entities.
- June 30, 2030: Commercial, industrial, and institutional property owners with more than 5,000 square feet of irrigated area must begin certifying compliance to the State Water Resources Control Board. Certification is required every three years thereafter (through 2039).
- June 30, 2031: Owners of HOA and common-interest development properties with more than 5,000 square feet of irrigated common area must begin certifying compliance. Certification is required every three years thereafter (through 2040).

[48] Per CWC 10608.12 (l), "disadvantaged community" means a community with an annual median household income that is less than 80% of the statewide annual median household income.

[49] Per CWC §10608.14(a)(5), properties owned by public agencies, local governments, and public water systems located in a disadvantaged community have an implementation date beginning January 1, 2031.

Metering, Volumetric Pricing, and Water Budgets

California Water Code section 525 requires water purveyors to install meters on all new service connections after January 1, 1992. California Water Code Section 527 requires water purveyors to charge for water based upon the actual volume of water delivered if a meter has been installed. This action alone is not expected to substantially reduce water use. However, it is anticipated that the retail billing system will encourage and help maintain reasonable use (e.g., through implementation of a tiered rate structure and/or water budgets), so that individual customer demands are reasonably not expected to increase over time.

Anticipated Development

Thoroughly assessing the impact of recently completed or to-be-completed developments throughout the planning horizon is an important part of estimating future customer use. The City anticipates progress on multiple residential, industrial, and commercial developments throughout the planning horizon, previously presented in **Table** 2-5.

Although the majority of these new or in-progress developments are considered minor, the City of Benicia has extensively evaluated the demands of the Rose Estates project to ensure that the City's existing water supply, infrastructure, and services are able to serve the increased demands without compromising system reliability. The increased demand associated with these developments are accounted for in the City's forecasted demand, broken down in section 4.4.2.

Considering the implications of growth on compliance with the requirements of Senate Bill 606 and Assembly Bill 1668, the City is prioritizing conservation and demand-reduction efforts, such as installing efficient water systems and low water-use landscaping. Additionally, the City's increased customer base and associated water demands shall be accounted for in the calculation of their urban water use objectives.

Closure of the Valero Refinery

A fixture of Benicia's economy is the Valero Refinery, which processes petroleum products into fuels and serves as the City's largest water and utility customer. Beyond its industrial operations, Valero provides approximately 400 jobs and regularly supports local organizations through charitable contributions. The refinery serves as the City's largest water user. Pursuant to an agreement made in February of 2009, the refinery is contracted to receive up to 5,800 acre-feet of raw water per year, delivered by the City.

In April of 2025, Valero announced their intention to idle, restructure, or cease refining operations at their Benicia Refinery by the end of April of 2026. In addition to impacting the City's economy, the closure would substantially reduce raw water demand, of which Valero has historically been the primary consumer. At the time this plan was written, Valero has yet to cease operations at its Benicia Refinery. As such, and to ensure conservative reliability

projections, the City will account for continued raw water demand for Valero through the planning horizon.[50] If and when Valero operations idle, restructure, or cease, given Benicia's economic reliance on industrial businesses and the significant investment in raw water delivery infrastructure, the City anticipates pursuing opportunities to replace Valero's operations in one of two ways:

Other Industrial Water Uses

While near-term industrial demand may fluctuate following the refinery's closure, the City anticipates serving non-potable industrial demands in the future to support its industrial economy and maintain a stable tax base.

Re-zoned Development

At the time this plan was written, a replacement entity who would use the existing facilities for a similar industrial use has yet to be identified. To prevent this land from becoming vacant, a potential alternative would be to re-zone the land as residential, and work with a private developer to construct additional residential and/or multi-use properties. In this case, although the City would be losing a non-potable customer, it is presumed that a reduced potable demand may replace the previous demand, potentially within the planning horizon, should a proposed development be approved.

4.4.3. Customer Water Use Forecast

The following subsections detail the assumptions used to forecast customer water use and gross water needs for the City's water service area, separated into the needs of (a) existing potable water use customers, (b) new potable water use customers, and (c) non-potable uses for Valero.

Existing Customer Future Use – Potable

To adequately analyze the reliability of water systems and conservatively estimate future use (see Chapter 5), the City is using water use values for 2025 as a representative annual customer demand. As shown in **Table** 4-5, demand for 2025 includes a total annual customer demand of about 3,200 acre-feet, with a production need of just over 3,550 acre-feet when considering system losses.

While these existing customers may undertake a variety of conservation measures – actively through decisions to modify a behavior or a water use, or passively through the purchase of appliances and fixtures that simply use less water – they may also maintain their use as-is. Holding the current use as a constant for all existing customers into the future will provide a

[50] Valero Press Release, titled "Valero Announces Notice to the California Energy Commission Regarding its Benicia, California, Refinery" dated April 16, 2025

conservative number that can be re-evaluated prior to the 2030 UWMP and compliance with forthcoming water use objectives.[51]

New Customer Future Use – Potable

As detailed in Chapter 2, and more specifically in Section 4.4.2, the City anticipates continued growth largely related to the anticipated Rose Estates housing development that will result in an increased demand placed upon the City's water supplies. Forecasting the needs of these future customers is dependent upon the type and number of customers and the unit water demand factors associated with each customer type.

For this UWMP, two distinct customer classifications are anticipated: residential and non-residential. Residential customers will include both single-family dwelling units built under a variety of densities and multi-family residential dwelling units. Non-residential uses are expected to include a blend of commercial, institutional, industrial, and active landscapes, such as parks, in ratios similar to the City's current residential-to-non-residential customers. Both residential and non-residential water use is anticipated as part of the Rose Estates housing development; specific demands associated with this project, such as that for retail, industrial, open space, and parks are accounted for in **Table** 4-6, displaying forecasted future water use.

Values developed for each distinct land use are based on several sources of information, details of which are provided in the following subsections.

New Residential Customer Water Use

As previously shown on **Table** 2-5, the City anticipates new residential growth associated with the Rose Estates housing development over the UWMP planning horizon, as well as from various other developments throughout the planning horizon.

The City anticipates these new residential elements will be built in accordance with all applicable building codes including the previously discussed Cal Green Code and relevant City ordinances.

Distinct demand factors are provided for the following residential uses:

- Indoor Residential Use – this category identifies the generally anticipated water use for single-family and multi-family dwelling units.
- Outdoor Residential Use – this category addresses the landscape water demands commonly anticipated for single-family and multi-family units.

[51] Per California Water Code Section 10609.20, urban water suppliers shall calculate a water use objective composed of, among other factors, aggregated efficient indoor water use based upon standards of no more than 55 gpcd.

For purposes of this UWMP, residential unit water demand factors are described as "the acre-feet of water use annually per dwelling unit", or acre-feet/dwelling unit ("af/du").

Residential indoor water demands are conservatively estimated using a representative gallons-per person per day value, explained below, multiplied by the assumed occupancy rates for anticipated residential densities for single-family or multi-family classifications in the City. California Water Code Section 10609.4(a) formerly established a standard per-person rate of 55 gallons per day assumed to estimate indoor residential use targets; however, on January 1, 2023, this standard was amended pursuant to legislative changes associated with Senate Bill 606 and Assembly Bill 1668 to reflect a per-person rate of 47 gallons per capita (i.e., per person) per day ("gpcd") value. Similarly, this value was previously required to drop to 50 gpcd by 2030, which has since been amended to 42 gpcd within the same time frame.[52] Aligning with this requirement, the indoor residential use standard of 42 gpcd will be used to calculate indoor residential use for new residential customer use. It can be assumed the City will implement demand management and other water conservation measures for its new and existing customers in order to comply with the Senate Bill 606 and Assembly Bill 1668 requirements throughout the planning horizon.

Notably, it is likely that the homes built for the proposed Rose Estates development will be more efficient than 47 gpcd, as analyses of residential water meter data indicate new suburban single-family dwelling units and older homes retrofitted with new water efficient fixtures and appliances are achieving this value.[53]

Based on this per-capita assumption, the following indoor per-dwelling unit value is assumed for each new residential unit:

- Single-family residential indoor use: 0.14 acre-feet per year based upon an assumed occupancy of 2.68 people per unit (see Chapter 2.2.3).
- Multi-family residential indoor use: 0.11 acre-feet per year based upon an assumed occupancy of 2.08 people per unit (see Chapter 2.2.3)

Outdoor residential water use is primarily a factor of lot size and the type and extent of landscaped area, governed by MWELO. The City's anticipated growth is anticipated to include a range of residential densities (e.g., houses per acre) that mimic the range of existing housing densities.

As described in Chapter 2, the climate that affects landscape use is unique in Benicia. The estimated outdoor demand factor for existing single-family residential customers is generally used as a planning proxy for the new planned single-family units associated with

[52] California Water Code Section 10609.4(a)(3)

[53] Zanjero has evaluated meter data from several water purveyors around California which confirms that some of the newest homes under the existing efficiency requirements are already meeting this efficiency goal.

development of City infill and vacant lands within City limits. Aside from the Rose Estates, no additional single-family units were proposed within the planning horizon. For other developments anticipated to include multi-family units, monthly data presented in **Table** 4-1 was used to estimate outdoor water use; assumed at 50% of the single-family outdoor rate – or 0.03 acre-feet per unit. Although not reflected in the City's forecast, monthly data revealed an outdoor demand factor for single-family customers of 0.06 acre-feet per unit.[54]

According to the Rose Estates Water Supply Assessment, outdoor demand is estimated as a function of landscaped area, calculated by subtracting the house footprint and hardscaping from the lot square footage.[55] This landscape characterization provides for a conservative outdoor demand since the landscaping goals set forth in the development plans will likely result in lower actual outdoor residential water demand.[56] Based on analysis from the WSA, an outdoor demand factor of between 0.3 acre-feet and 0.12 acre-feet per unit was estimated.[57]

The resulting forecasted water use for existing and new residential customers is provided in **Table** 4-6 at the end of Section 4.5.4.

New Non-Residential Customer Water Use

The City also anticipates future non-residential development, thus, non-residential per-connection demand factors were estimated for the purposes of forecasting the water needs of these future commercial, institutional, industrial, and irrigated landscape customers.

Non-residential development can be divided based on demand factors into two categories: Commercial, institutional, and industrial (CII), and Irrigated Landscape.

- CII Connections – this customer classification includes a wide array of different uses, from neighborhood retail centers, to large retail centers, to office and government buildings, to light and even heavy industrial uses. To reflect this variety, each acre of new CII use is assumed to use one acre-foot of water per gross acre. The City's current CII customers have average annual use per connection by classification of Commercial, City, and Industrial ranging from approximately 0.7 acre-feet to 1.75 acre-feet.[58] The water use associated with the

[54] By evaluating winter-time use, which is a reasonably proxy of indoor demand per month, and removing 12-months of that use from the total provides a reasonably estimate of the average outdoor demand factor.

[55] Rose Estates WSA

[56] Rose Estates Planning document indicating landscaping goals

[57] Zanjero, Water Supply Assessment for Rose Estates, administrative draft (prepared for the City of Benicia, April 2026).

[58] The analysis of connections, as shown in Chapter 2, and existing use, as shown in Table 4-1, provides this range of use by connection. The size associated with each connection is unknown. Generally, commercial facilities occupy less than an acre, so several connections may be present on a single acre, while industrial uses may occupy several acres.

retail and industrial land proposed as part of the Rose Estates development is estimated per-square-foot to be higher, at 2.27 af/ac and 2.67 af/ac respectively, reflecting the spectrum of possible activities.

- Irrigated Landscape – this classification includes passive and active parks, streetscapes, and other dedicated landscape areas. Each landscape connection is assumed to have an average annual water need of approximately 1.49 acre-feet per acre. This is based upon the City's existing use for landscape connections. The water use associated with the parks, open spaces, and detention basins proposed as part of the Rose Estates development range in water needs, estimated by use type to be between 1.0 to 3.4 acre-feet per acre.

If implemented as proposed, the anticipated developments outlined in Subsection 4.4.2 will result in additional non-residential future customer water use. Incorporating the substantial water uses for non-residential development associated with the Rose Estates and the proposed cannabis cultivation center warranted an additional analysis beyond applying existing non-residential demand factors. To sufficiently represent these unique and water-intensive developments, relevant planning information from the Rose Estates WSA was applied consistently, and for the Cannabis Cultivation Facility, representative demand factors were calculated from the water use associated with the proposed 1143 Blumenfeld Cannabis Complex Project in the proximate City of Sacramento.[59]

The resulting forecasted future use of existing and new non-residential customers, incorporating the non-residential demands by type for Rose Estates, is provided in **Table** 4-6.

Future Non-Potable Use

As detailed in Chapter 3, the City has a contract to serve raw water to Valero. As shown in **Table** 4-2, recent Valero water use has averaged around 5,200 acre-feet annually. As previously discussed, Valero announced its intention to cease refining operations at the Benicia facility by the end of April 2026. Given the City's significant raw water delivery infrastructure and economic reliance on industrial businesses, the City anticipates pursuing opportunities to serve future industrial users with non-potable water. In an effort to conservatively assess water system reliability through the planning horizon, continued non-potable demand is projected at the maximum contractual quantity of 5,800 acre-feet annually. Although raw water demands will likely fluctuate in the coming years, presuming that the maximum contractual amounts will be delivered helps evaluate potential reliability circumstances the City may realize, as detailed in Chapter 5.

[59] City of Sacramento, Community Development Department, "Power and Water Use Summary," Appendix P, 1143 Blumenfeld Cannabis Environmental Impact Report (Sacramento: City of Sacramento), accessed February 20, 2026, https://www.cityofsacramento.gov/content/dam/portal/cdd/Planning/Environmental-Impact-Reports/1143-Blumenfeld-Cannabis/Appendix-P-Power-and-Water-Use-Summary.pdf.

4.4.4. Summary of Forecast Water Use

Based upon the estimated water use of the existing and new customers, the City anticipates a minor increase in potable water use over the planning horizon while also reflecting the full contract quantity for non-potable uses.

Table 4-6 presents the resulting customer water use forecast. Although the forecast is presented on an annual basis in five-year increments through 2050, the monthly pattern is expected to mimic the current monthly pattern detailed in prior tables. This characterization is important when evaluating the City's water service reliability as detailed in Chapter 5.

TABLE 4-6: FORECAST FUTURE WATER USE (VALUES IN ACRE-FEET PER YEAR)

Classification		2030	2035	2040	2045	2050
Existing	Single-family Residential	1,786	1,786	1,786	1,786	1,786
	Multi-family Residential	360	360	360	360	360
	Commercial	331	331	331	331	331
	Industrial	103	103	103	103	103
	Landscape and Other	416	416	416	416	416
New	Single-family Residential	0	0	113	227	343
	Multi-family Residential	0	0	37	75	113
	Commercial	0	0	6	12	18
	Industrial	0	0	10	14	20
	Landscape and Other	0	0	11	23	35
Potable Customer Water Use Subtotal		2,997	2,997	3,175	3,348	3,527
Distribution System Water Loss		342	342	362	382	402
Total Potable Water Use		3,339	3,339	3,537	3,729	3,929
Total Non-Potable Water Use		5,800	5,800	5,800	5,800	5,800
Total Production		**9,139**	**9,139**	**9,337**	**9,529**	**9,729**

4.4.5. DRY YEAR ADJUSTMENTS

The demand forecasts presented in the prior subsection represent expected water needs under normal hydrologic conditions. To credibly forecast potential maximum future water use, the forecasted normal-year water uses must be modified to reflect anticipated increases in demand during drier conditions.

Conservative modifications to the forecasted normal year water use to more likely reflect use conditions during drier and dry years are warranted to help adequately address water service reliability in Chapter 5. For purposes of this UWMP, the following adjustment is made:

- Single dry year: Landscape irrigation needs would increase to reflect the generalized earlier start of the landscape irrigation season due to limited rainfall in the single driest year. Since this increase only applies to the outdoor portion of a customer's forecast use, an adjustment factor of 5% is applied to the total normal-year forecasts to conservatively reflect the expected increase in demand for water for landscaping.
- Multiple dry years: During multiple dry years, demands are also expected to increase similar to the single dry year. For multiple dry year conditions, the single dry year increase of 5% is held in each of the subsequent years. This is

representative of an "unconstrained demand" as should be represented when evaluating whether Water Shortage Contingency Plan actions may be warranted.[60]

These values are reflected in tables provided for the Drought Risk Assessment and Annual Reliability Assessment presented in later subsections.

4.4.6. Climate Change Considerations

Including climate change analysis into a water use analysis will assist the City in understanding the potential effects on long-term reliability, which in turn allows the City to proactively begin planning appropriate responses. For example, hotter and drier weather may lead to an increased demand in landscape irrigation, especially during spring and fall months, increasing the pressure on water supplies that may have availability restrictions during these periods.

This potential is reflected in the consideration of the single dry year increase of 5% that is used for the water service reliability analysis, as discussed previously. Whether the elevated single dry year water forecast becomes more akin to the "normal" demand will become more apparent as the City continues to assess monthly water use trends throughout its service area.[61]

4.5. Projecting Disadvantaged Community Water Use

Pursuant to CWC §10631.1, retail suppliers are required to include projected water use for lower income households. Per California Health and Safety Code §50079.5, a lower income household has an income below 80% of area median income, adjusted for family size. For purposes of this UWMP, the annual median income was derived from the 2024 U.S. Census Bureau and determined to be about $121,204 for the City. Therefore, 80% of this is estimated to be about $97,000 per year. According to the detailed data, approximately 40% of the households earn at or below this 80-percentile income.[62]

For purposes of estimating the future water needs, 40% of the total single-family and multi-family connections are presumed to represent disadvantaged households. Applying this condition to the forecast water use for the entire City results in the estimate provided in **Table** 4-7.

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[60] California Water Code Section 10632(a)(2) states water suppliers should use "unconstrained demand" when performing their annual water supply and demand assessment.

[61] A closer assessment of the correlation of monthly water use by customer type to rainfall and temperature will help the City improve water use forecasts to assure the effects of climate change are adequately being reflected in water service reliability analyses.

[62] https://censusreporter.org/profiles/16000US0605290-benicia-ca/

TABLE 4-7: ESTIMATED LOW-INCOME WATER USE FORECAST (ACRE-FEET)

	2030	2035	2040	2045	2050
Total Potable Use	3,339	3,339	3,537	3,729	3,929
Low Income Use	1,335	1,335	1,415	1,492	1,571
% of Total Potable	40%	40%	40%	40%	40%

CHAPTER 5
WATER SYSTEM RELIABILITY

This chapter provides the City of Benicia's water system reliability findings as required under Water Code §10635 and provides reliability information that may be used in completing an annual supply and demand assessment pursuant to Water Code §10632.1.

Assessing water service reliability is the fundamental purpose in preparing this 2025 UWMP. Water service reliability reflects Benicia's ability to meet the water needs of its customers, including end-use customers and retail urban suppliers, with water supplies under varying conditions. Benicia's UWMP considers the reliability of meeting customer water use by analyzing plausible hydrological, regulatory, and climate variability, as well as other factors impacting Benicia's water supply and water use. This reliability assessment looks beyond Benicia's previous capabilities and considers what could be reasonably foreseen in the future.

This chapter synthesizes the details embedded in Chapter 3 (Water Supply) and Chapter 4 (Water Use) and provides a rational basis for future decision-making related to supply management, demand management, and project development. The Five-Year Drought Risk Assessment, Long-Term Service Reliability, and Annual Reliability Assessment overview are presented in this chapter.

In short, the findings of these risk and reliability assessments are that Benicia has reliable water supplies available for its service area through 2050.

5.1. Five Year Drought Risk Assessment

The Drought Risk Assessment (DRA) requires a methodical assessment of water supplies and water uses under an assumed drought period lasting five consecutive years.

To adequately assess the monthly variability associated with the City's surface water supplies, Benicia prepared an independent monthly assessment of the water supplies and demands for its system. This assessment also considers system constraints, such as those associated with pumping and treatment facility infrastructure constraints, which may also influence the near-term management of Benicia's water asset portfolio. These constraints are fully examined in Chapter 3.

Benicia currently has access to six sources of supply, each with unique attributes that affect reliability under various hydrological and regulatory conditions. These supply sources have further complexity due to the carryover and storage provisions available to some of the water

assets. This diverse water supply portfolio creates a water management structure that requires careful consideration of applicable hydrological, regulatory, and institutional variability. Specifically, some water assets are particularly susceptible to drought while other water assets have varying degrees of reliability based upon regulatory constraints and historical water use. Nevertheless, Benicia has organized and coordinated its water portfolio management to ensure water supply reliability in the event of a severe drought. The City's DRA represents a consolidation of its surface water supplies into an organized management structure.

Table 5-1 below shows Benicia's DRA, integrating all of its supplies for 2026 through 2030 as described in Chapter 3 and reflecting the dry year unconstrained water uses described in Chapter 4. As the table shows, Benicia has surplus water assets available under its current water management system.

TABLE 5-1: FIVE YEAR DROUGHT RISK ASSESSMENT (ACRE-FEET)

Five Year Drought	2026	2027	2028	2029	2030
Supply	22,055	21,360	16,650	13,920	15,485
Demand	10,195	9,380	9,452	9,524	9,595
Difference	11,860	11,980	7,198	4,396	5,890

5.2. LONG TERM SERVICE RELIABILITY

The Urban Water Management Planning Act directs urban water purveyors to analyze water supply reliability in a normal, single dry, and five consecutive dry years over a 20-year planning horizon. Reflecting 2025 UWMP Guidebook recommendations, the following subsections describe the long-term water service reliability through a 25-year planning horizon.

5.2.1. LONG TERM SERVICE RELIABILITY

Benicia's long-term service reliability reflects the recommended 25-year planning horizon anticipating a normal, single dry, and five consecutive dry years from 2025 through 2050.

NORMAL AND SINGLE DRY CONDITIONS 2030-2050

Benicia's future water supplies in normal and single dry conditions reflect the same hydrological, regulatory, and institutional criteria described in previous sections. In normal years, supplies are generally constrained only by their express limiting features, such as an annual allocation or contractual limit. In dry years, additional hydrological, regulatory, and institutional issues constrain the availability of water. However, future water supplies remain relatively constant as average demands grow over time.

As previously discussed, demands during normal conditions through 2050 tend to reflect typical anticipated uses. In dry conditions, however, demands through 2050 reflect increased water usage for outdoor irrigation. Future water demands are generally predicted to increase as land uses and populations within Benicia's boundaries grow.

Table 5-2 shows the Normal and Single Dry year supplies and demands on an annual timestep from 2030 through 2050.

TABLE 5-2: NORMAL AND SINGLE DRY YEAR WATER SUPPLY AND DEMAND THROUGH 2050 (ACRE-FEET PER YEAR)

Normal Year	2030	2035	2040	2045	2050
Supply	33,470	33,470	33,470	33,470	33,470
Demand	9,139	9,139	9,337	9,529	9,729
Difference	24,331	24,331	24,133	23,941	23,741
Single Dry Year	**2030**	**2035**	**2040**	**2045**	**2050**
Supply	20,870	20,870	20,870	20,870	20,870
Demand	10,509	10,509	10,738	10,959	11,188
Difference	10,361	10,361	10,132	9,911	9,682

FIVE CONSECUTIVE DRY YEARS 2030-2050

The City defines drought conditions lasting five consecutive years as conditions in which Benicia faces restrictions in accessing certain water sources within its supply portfolio due to hydrological, regulatory, and institutional limitations on its water rights and water supply contracts. Although annual volumes may remain above the annual need, restrictive conditions result in altered availability of Benicia's water assets throughout a given year and may influence the use of available supplies in the future to support future growth.

Demands for five consecutive dry years consider historical trends in water usage in drought conditions by Benicia's customers, such as increased outdoor irrigation during dry conditions. As droughts persist, however, demands may decline as the realistic constraints on supply availability are realized at the customer level. The gradual increase in demands shown on a 5-year timestep in

Table 5-3 also accounts for reasonable water conservation measures as a result of improved efficiencies in indoor fixtures, management of outdoor landscape irrigation, and a general awareness of the value of long-term water conservation at the consumer level. In addition, the future dry conditions reflect increased land use and populations that would rely upon available supplies.

Table 5-3 below shows the annual water supply and demand conditions for Benicia's service area in five consecutive dry years from 2030 through 2050.

TABLE 5-3: FIVE CONSECUTIVE DRY YEARS WATER SUPPLY AND DEMAND THROUGH 2050 (ACRE-FEET PER YEAR)

		2030	2035	2040	2045	2050
Year 1	Supply	22,055	22,055	22,055	22,055	22,055
	Demand	10,509	10,509	10,738	10,959	11,188
	Difference	11,546	11,546	11,317	11,096	10,867
Year 2	Supply	21,360	21,360	21,360	21,360	21,360
	Demand	9,595	9,595	9,804	10,006	10,215
	Difference	11,765	11,765	11,556	11,354	11,145
Year 3	Supply	16,650	16,650	16,650	16,650	16,650
	Demand	9,595	9,595	9,804	10,006	10,215
	Difference	7,055	7,055	6,846	6,644	6,435
Year 4	Supply	13,920	13,920	13,920	13,920	13,920
	Demand	9,595	9,595	9,804	10,006	10,215
	Difference	4,325	4,325	4,116	3,914	3,705
Year 5	Supply	15,485	15,485	15,485	15,485	15,485
	Demand	9,595	9,595	9,804	10,006	10,215
	Difference	5,890	5,890	5,681	5,479	5,270

5.3. ANNUAL RELIABILITY ASSESSMENT

Each year, the City considers current supply and demand conditions and performs an annual water supply and demand assessment (AWSDA) pursuant to California Water Code §10632.1 to evaluate real time or near-term circumstances that are different than the DRA scenario. This assessment evaluates actual current water supply and use conditions for a prescribed 12-month forecast (July through the following June). Procedures for conducting the Annual Assessment are contained in the City's Water Shortage Contingency Plan. The City has historically conducted the assessment as required by the California Water Code and will continue this planning exercise to provide a reliability assessment for then-current conditions regarding supplies and expected (unconstrained) demands.

5.4. WATER SUPPLY RELIABILITY SUMMARY

The City of Benicia has a diverse and robust water supply portfolio capable of meeting the water demands in its service area in normal, single dry, and five consecutive dry years from 2025 through 2050 with active management of its supply portfolio. Benicia's diverse water supply portfolio requires coordinated water management between the City and Solano County Water Agency to render the supply reliable in all year types through 2050.

CHAPTER 6
WATER SHORTAGE CONTINGENCY PLAN

This Water Shortage Contingency Plan (WSCP) addresses the requirements in Water Code Section 10632 of the Urban Water Management Planning Act (The Act). The WSCP is incorporated into the 2020 Urban Water Management Plan (UWMP) and is used by the City of Benicia (City or Benicia) to respond to water shortage contingencies as they may arise. The WSCP addresses possible conditions in which the water supply available to customers of the City is insufficient to meet the normally expected customer water use at a given point in time due to drought, regulatory action constraints, and natural and man-made disasters. This WSCP describes the City's strategy for allocating water during such water supply shortages, while assuring customers that at all times it will meet the minimum health and safety requirements of a drinking water purveyor.

This WSCP consists of the following required elements:

1. An analysis of water supply reliability.
2. Procedures for conducting an annual water supply and demand assessment.
3. Six standard water shortage levels corresponding to progressive ranges of up to 10, 20, 30, 40, and 50% shortages and greater than 50% shortage.
4. Shortage response actions that align with the defined shortage levels.
5. Communication protocols and procedures.
6. Customer compliance, enforcement, appeal, and exemption procedures.
7. A description of legal authorities.
8. A description of financial consequences.
9. Monitoring and reporting requirements.
10. Reevaluation and improvement procedures.
11. Special Water Feature Distinction.
12. Plan Adoption, Submittal, and Availability.

The Act contains specific requirements for each of these elements.[63] As required by Water Code Section 10632 this WSCP is incorporated into the UWMP, yet it is also a stand-alone plan that is adopted independently from the UWMP and may be amended or refined and readopted over coming months and years as needed (see subsection 6.13 Plan Adoption, Submittal, and Availability, below).

The City has enacted Chapter 13.35 of the Benicia Municipal Code to address water shortages.[64] These local rules were developed to help manage water shortage conditions in the event of drought, catastrophic outage, or regulatory mandate requiring statewide reduction in water use. This WSCP is fully integrated with the City's most recent Municipal Code Chapter 13.35 update.

6.1. Water Supply Reliability Analysis

The City of Benicia was incorporated in 1851 and shortly thereafter acquired water assets in Sulphur Springs Creek watershed. As the City grew, additional water supplies were acquired to serve Benicia's growing needs. The City's water supply is surface water derived from the Sacramento River watershed, the Solano Project, and Sulphur Springs Creek Watershed. These sources feed the City's potable water treatment plant and a raw water storage facility in Lake Herman. The City's water supply sources may be impacted by climate factors, catastrophic events, and regulatory measures – all of which are considered in the reliability assessment in Chapter 5. The City regularly evaluates its overall water supply reliability through its Urban Water Management Plan and through regional planning efforts in coordination with Solano County Water Agency and other neighboring water purveyors.

Benicia delivers quality, reliable water to approximately 10,000 active service connections within its service area boundary (See Chapter 2). As described in Chapter 5 of this UWMP, the City has a reliable water supply in normal, single dry and five consecutive dry years through 2045. Although Benicia has a secure water supply, this WSCP serves as a roadmap to help the City meet the challenges that may arise from future droughts, regulatory actions, and unforeseen man-made and natural disasters.

6.2. Recent WSCP Considerations

Within the last five years, there have been several instances in which the City activated its WSCP. In June of 2022, the City imposed a Stage 2 "Water Warning" in response to drought conditions and State Water Resources Control Board regulations requiring the City to reduce water use by 20% compared to usage in 2020.[65] In contrast, non-drought related events also

[63] California Water Code Section 10632, available at: (https://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?lawCode=WAT&sectionNum=10632)

[64] Benicia Municipal Code Chapter 13.35 Emergency Water Conservation Plan.

[65] City of Benicia, "Water Conservation," *City of Benicia*, accessed January 7, 2026, https://www.ci.benicia.ca.us/beniciasaveswater?utm

triggered the WSCP. After the City's main drinking water transmission line was damaged in March of 2023, and again in September 2025, the City declared a Stage 4 "Critical Water Shortage" requiring all residents, businesses, schools, and organizations to immediately reduce water use by 40% while repairs occurred.[66] Corresponding with appropriate Stage 4 measures, the public was urged to conserve water by limiting showers to five minutes, running dishwashers and washing machines only with full loads, and stopping all non-essential outdoor water use, including car washing and pool filling. The City provided ongoing updates through media, email, social media, and Alert Solano.[67]

6.3. Annual Water Supply and Demand Assessment Procedures

The WSCP describes the City's procedural methodology for managing shortages and conducting its required Annual Water Supply and Demand Assessment (Annual Assessment). The Annual Assessment is to be submitted to California Department of Water Resources (DWR) by July 1 each year with the first Annual Assessment due July 1, 2022. The Annual Assessment examines Benicia's anticipated water reliability for the current year and one additional dry year. The Annual Assessment will be prepared at the beginning of each calendar year to evaluate near-term water supply reliability and determine what, if any, water shortages stages may be triggered during the required period. The Annual Assessment will be used by Benicia decision-makers to prepare for and initiate implementation of any needed response actions, as well as to inform customers, the general public, interested parties, and local, regional, and state governmental entities to prepare for such required actions.

6.3.1. Analytical and Decision-making Processes

Benicia plans to conduct its Annual Assessment according to the following timeline and process:

By February 1: Initial data collection and analysis
By March 1: Preliminary Draft Annual Assessment internal review and revisions
By April 1: Draft Annual Assessment and results briefing for Benicia decision-makers
By May 1: Public Notification and Release of Draft Annual Assessment
By June 1: Approval of Annual Assessment by Benicia Decision-makers
By June 15: Submit Annual Assessment to DWR in advance of July 1 deadline

[66] City of Benicia, "Mandatory Water Conservation Following Hillside Collapse," *City of Benicia* (March 31, 2023), accessed January 7, 2026, https://www.beniciabusiness.com/in-the-news/2023/03/30/mandatory-water-conservation?

[67] City of Benicia, "Press Release: Urgent Water Conservation Required for All Benicia Residents and Businesses," *City of Benicia* (September 17, 2025), accessed January 7, 2026, https://www.ci.benicia.ca.us/index.asp?SEC=168344BF-D432-4104-A49E-CCC4A509780B&DE=C39D4675-9BAF-4CAD-84DF-A5705D40FFD4

The City will prepare its Annual Assessment using the following key data and analytical procedures (which may be modified as needed):

- Prepare supply estimates for each water source on a monthly basis for the analysis period.
- Update unconstrained customer demand and estimate anticipated actual water use on a monthly basis for the analysis period.
- Update infrastructure assessment, including estimated water supply production capability on a monthly basis for the analysis period.
- Identify and quantify any locally applicable factors that may influence or disrupt supplies during the analysis period.
- Refine the definition of "dry year" as relevant to dry conditions like water year 2015, 2021, and 2022.
- Identify any shortfall between projected supply and anticipated demand.
- Identify and incorporate any applicable constraints (infrastructure, regulatory, etc.).
- Develop, analyze, and propose water resource management strategies to address any shortfall between projected supply and anticipated demand with reference to the water shortage stages identified in this WSCP.
- Present the Annual Assessment (and resulting water shortage stage declaration, if applicable) to the City decision-makers.

If the results of the Annual Assessment indicate the need for any alternative water shortage response actions which may be addition to those specified in Section 6.4, below, the alternative response actions will be described and submitted in the Annual Assessment, as specified in CWC 10632.2. Since 2020, none of the City's Annual Assessments have indicated the need for any alternative response actions.

6.3.2. Submittal Procedure

The City will submit its Annual Assessment to the DWR via email by June 15 each year, but in no case later than July 1 each year. At the time of DWR submittal, Benicia will also notify Solano County Water Agency, Solano County, the public, and other stakeholders concerning the results of the Annual Assessment and where it is available for review.

6.4. Six Standard Water Shortage Stages and Triggers

New state requirements for the WSCP require water suppliers to adopt six water shortage stages, which correspond to progressively severe water shortage conditions (up to 10%, 20%, 30%, 40%, 50%, and greater than 50% shortage), as compared to the normal service reliability condition. The City has adopted the six standard water shortage stages as shown in **Table** 6-1

through **Table** 6-6 that are included in section 13.35.060 of the Municipal Code. Each stage corresponds to a range of reduction in anticipated water supply availability and is aligned with shortage response actions which can reduce water demand as needed to address the water shortage. Reduction of available water supply by the indicated percentages will trigger an appropriate water shortage stage and the City will implement the response actions identified in **Table 6-1** through **Table** 6-6.

6.5. Shortage Response Actions

The WSCP is required to identify locally appropriate shortage response actions that align with the defined shortage stages and include demand reduction actions, supply augmentation actions, system operational changes, and mandatory prohibitions against specific water use practices that are in addition to state-mandated prohibitions and appropriate to the local conditions. For each response action the WSCP is to provide an estimate of the extent to which the gap between supplies and demand will be reduced by implementation of the action.

6.5.1. Stages of Shortage Response Actions

The City has identified shortage response actions to be implemented during each of the six sequential stages and corresponding water shortage conditions. These actions are based on specific hydrological and regulatory conditions and the fundamental need to meet water service requirements within the City's service area. Moreover, the shortage response actions provide the City with some flexibility to address dynamic water shortage conditions while protecting the City against extreme conditions where supplies are drastically reduced beyond 50%. The following is an overview of the staged response actions the City could follow during a given water shortage condition based on shortage severity, relative supply conditions for each stage, and percent shortage reduction levels. A water shortage declaration would be made by the City manager or their designee, upon the recommendation of the director.

The shortage response actions derived from Municipal Code Chapter 13.35 that may be implemented in each stage include, but are not limited to, the following:

Stage 1 (up to 10% shortage) "Water Alert" – If water supplies are threatened with constraint, the Plan calls for an introductory Stage 1 drought response, during which customers are informed of possible shortages and asked to voluntarily conserve 10%. In addition, customers are prohibited from wasting water or unreasonably using water for beneficial purposes. For example, prohibited water uses under this stage include: allowing water to run off unused into a gutter, ditch, or drain; failing to repair a controllable leak; washing sidewalks, driveways, parking areas, tennis courts, patios, or other paved areas; utilizing a hand-held hose without an automatic shut-off nozzle; and irrigating during a precipitation event. Additional recommendations for new developments during Stage 1 include prohibiting single pass-

through cooling water systems, commercial car washes and laundries without recirculating water systems, and decorative fountains without recirculating water systems.

This stage includes performing public outreach and education about the shortage and methods individuals can implement to reduce their water use. The City will inform the public and neighboring governmental bodies of the potential shortage condition and will coordinate with customers to implement the actions consistent with this Stage. However, given that these measures are considered voluntary, the City prioritizes public outreach and education during drought or emergency conditions.

Although discussed in this WSCP as a Stage, the restrictive provisions presented in Stage 1 have been effective as voluntary measures since the ordinance presenting these emergency water shortage stages was codified.

Stage 2 (11 – 20% shortage) "Water Warning" – In the event Stage 2 is implemented, the City will continue to encourage community-oriented voluntary conservation measures, enforce conservation measures, and implement mandatory water use reduction measures to decrease demand by up to 20%. Stage 2 activities include a continuation of activities described under Stage 1, as well as greater conservation and water use restrictions. The additional voluntary restriction beyond those identified in Stage 1 is to limit outdoor irrigation to occur only between the hours of 6:00 PM and 9:00 AM. However, additional recommendations include for vehicle washing to be done using a bucket or hand-held hose with an automatic shut-off nozzle, or take place at a commercial car wash. Customer baseline water use will be monitored and addressed with excess use above the shortage percentage subject to financial penalties under Ordinance 13.35.090.

The City will also continue to engage in public outreach and education as it applies to the water shortage conditions and the actions necessary to achieve up to 20% reduction in use.

Stage 3 (21 – 30% shortage) "Severe Shortage" – Stage 3 includes all response actions taken in Stages 1 and 2 and is focused on continuing to encourage customers to voluntarily reduce water use regarding turf watering, fillings pools, etc., mandatory-watering restrictions will be implemented following additional shortage actions described in Stage 2. Increased monitoring related to prescribed water conservation actions will occur under this stage. Customer baseline water use will be monitored and addressed with excess use above the shortage percentage subject to financial penalties under Ordinance 13.35.090.

The City will also continue to engage in public outreach and education as it applies to the water shortage conditions and the actions necessary to achieve up to 30% reduction in use.

Stage 4 (31 – 40% shortage) "Critical Shortage" – Stage 4 includes all response actions taken in prior stages regarding mandatory conservation and intensifies their implementation and enforcement. Stage 4 restrictions will be implemented if the Stage 3 demand reduction

and other response actions are deemed insufficient to achieve reductions due to water supply shortages. All Stage 3 response actions will be intensified, and water production will be monitored daily by Benicia for compliance with necessary reductions. Additionally, building permits shall be restricted for only priority uses. Customer baseline water use will be monitored and addressed with excess use above the shortage percentage subject to financial penalties under Ordinance 13.35.090.

The City will also continue to engage in public outreach and education as it applies to the water shortage conditions and the actions necessary to achieve up to 40% reduction in use.

Stage 5 (41 – 50% shortage) "Water Crisis" – Stage 5 includes all response actions taken in prior stages regarding mandatory conservation. The primary focus of Stage 5 is to ensure the protection of the water supply for all public health and safety purposes. This Stage will require reductions in water demand by up to 50% and will follow all voluntary and mandatory actions described in Stages 1-4. Customer baseline water use will be monitored and addressed with excess use above the shortage percentage subject to financial penalties under Ordinance 13.35.090.

The City will also continue to engage in public outreach and education as it applies to the water shortage conditions and the actions necessary to achieve up to 50% reduction in use.

Stage 6 (greater than 50% shortage) "Water Emergency" – Stage 6 includes all response actions taken in prior stages focused on reducing water demands in response to greater than 50% water shortages. This stage requires only use of water for human health and safety purposes. No additional water uses are permitted, including any outdoor irrigation for anything other than maintenance of legacy vegetation.[68] Customer baseline water use will be monitored and addressed with excess use above the shortage percentage subject to financial penalties under Ordinance 13.35.090.

The City will also continue to engage in public outreach and education as it applies to the water shortage conditions and the actions necessary to achieve greater than 50% reduction in use.

Table 6-1 through **Table** 6-6 show a summary of the staged response actions.

TABLE 6-1: WSCP ACTIONS TO REDUCE CUSTOMER USE - STAGE 1

Water Alert: Savings up to 10%

[68] "Legacy vegetation" generally refers to established, mature landscapes or historic gardens that require a minimum amount of water to survive. These are prioritized over non-essential high-water use landscaping like turf grass during a water shortage.

1. Waste and Unreasonable Use of Water Prohibited and Voluntary conservation encouraged (up to 10%)
2. Situation and possible subsequent water shortage stages explained to the public and governmental bodies (up to 10%)
3. Focus on customers with high per capita water usage to achieve proportionally greater reduction than those with low use
4. Actions include, but not limited to:
    - Public information campaign consisting of distribution of literature, speaking engagements, website updates, bill inserts, and conversation messages printed in local newspapers
    - Educational programs in area schools
    - Discussion of equitable water waste response policy. (combined up to 10%)
5. Consumption Reduction Methods, including:
    - Demand reduction program
    - Plumbing and irrigation fixture replacement
    - Water conservation kits
    - Education programs
    - Voluntary rationing (combined up to 10%)

TABLE 6-2: WSCP ACTIONS TO REDUCE CUSTOMER USE - STAGE 2

Moderate Shortage: Savings up to 20%
1. All measures implemented in Stage 1 2. Voluntary conservation allotments/usage reductions (up to 20%) 3. Mandatory Conservation Rules and Restrictions and Prohibitions on End Uses (10-20%) 4. Usage in excess of customer baseline normal use subject to drought penalty (13.35.090) 5. All Consumption Reduction Methods from Stage I and intensified as needed; additionally: 6. Use prohibitions 7. Voluntary outdoor irrigation restrictions including limiting number of watering days per week, and time when irrigation can occur (e.g., between 6:00 pm and 9:00 am)

TABLE 6-3: WSCP ACTIONS TO REDUCE CUSTOMER USE - STAGE 3

Severe Shortage: Savings up to 30%
1. All measures implemented in Stages 1 and 2 2. Some or all of the following: • Adherence to customer baselines and actual water use reductions water allocations and mandatory conservation rules; • Water usage goals established by an authorized government agency or official; • Customer water usage in excess of baseline to be monitored and recorded • Water use prohibitions can include restrictions of days and daytime hours for watering, excessive watering resulting in gutter flooding, using a hose without a positive shutoff device, use of decorative fountains with non-recirculating pumps, etc. (up to 30%) 3. Monitor water production weekly for compliance with necessary reductions; 4. All activities are intensified and production is monitored daily for compliance with necessary reductions. (up to 30%)

Severe Shortage: Savings up to 30%

5. All Consumption Reduction Methods from Stage 2 and intensified as needed; additionally:
    - Reduce pressure in water lines; flow restriction
    - Mandatory rationing
    - Incentives to reduce water consumption; excess use penalty
    - Percentage reduction by customer type (combined up to 30%)
6. Penalties and Charges for Excessive Use, including penalties for not reducing consumption, charges for excess use under 13.35.090

TABLE 6-4: WSCP ACTIONS TO REDUCE CUSTOMER USE - STAGE 4

Critical Shortage: Savings up to 40%
1. All measures implemented in Stages 1-3 2. All activities are intensified and production is monitored daily for compliance with necessary reductions. (up to 40%) 3. All Consumption Reduction Methods from Stage 3 and intensified as needed; additionally: • Restrict building permits; restrict for only priority uses 4. Penalties and Charges for Excessive Use, including penalties for not reducing consumption, charges for excess use (up to 40%) • Continue monitoring and addressing water use above baseline with penalties under 13.35.090 5. Catastrophic Event (Supply reduction up to 40%): Implement Applicable Actions for Catastrophic Events

TABLE 6-5: WSCP ACTIONS TO REDUCE CUSTOMER USE - STAGE 5

Shortage Crisis: Savings up to 50%
1. All measures implemented in Stages 1-4 2. Source of supply for the System is severely curtailed to the level that requires each customer to restrict their water use for only human health and safety purposes (up to 50%) 3. All activities are intensified and production is monitored daily for compliance with necessary reductions (up to 50%) 4. All Consumption Reduction Methods from previous stages and intensified as needed 5. Possible reductions in customer baselines and actual water use reductions (up to 50%) 6. Usage in excess of customer baseline to be charged at regular rate plus an additional drought emergency surcharge amount (up to 50%)

Shortage Crisis: Savings up to 50%
7. Update current water shortage condition response measures based on Council approvals and direction, state policy directives, emergency conditions, or to improve customer response 8. Catastrophic Event (Supply reduction up to 50%): Implement Applicable Actions for Catastrophic Events (such as boil water order) 9. Continue water monitoring for reduction from baseline with potential penalties under Ordinance 13.35.090

TABLE 6-6: WSCP ACTIONS TO REDUCE CUSTOMER USE - STAGE 6

Emergency Shortage: Savings greater than 50%
1. All measures implemented in Stages 1-5 2. Source of supply for the System is severely curtailed to the level that requires each customer to restrict their water use for only human health and safety purposes (>50%) 3. All activities are intensified and production is monitored continually for compliance with necessary reductions (up to >50%) 4. All Consumption Reduction Methods from previous stages and intensified as needed 5. Possible reductions in customer baselines and actual water use reductions (up to >50%) 6. Usage in excess of customer baseline to be charged at regular rate plus an additional drought emergency surcharge amount (up to >50%) 7. Update current water shortage condition response measures based on Council approvals and direction, state policy directives, emergency conditions, or to improve customer response 8. Catastrophic Event (Supply reduction greater than 50%): Implement Applicable Actions for Catastrophic Events. Continue water monitoring for reduction from baseline with potential penalties under Ordinance 13.35.090

6.5.2. Demand Reduction Actions

The City has identified a range of available and feasible customer demand reduction actions that can be used adaptively and implemented with progressively greater intensity to meet the supply shortage challenges faced under each water shortage condition. These demand reduction actions are identified by the associated water shortage stage in which they may be implemented. Other response actions not specified in this Plan may also be identified by the City to implement the essential purposes of this Plan or the UWMP (see CWC 10632.2).

Table 6-1 through **Table** 6-6 through summarizes Benicia Demand Reduction Actions associated with each water shortage stage and shortage level, providing an estimate of the action's effectiveness as related to that stage.

6.5.3. Mandatory Prohibitions

This section is required to identify any mandatory prohibitions against specific water use practices that are in addition to state-mandated prohibitions and appropriate to the local conditions. Benicia adopted a regulation to prohibit water waste, Chapter 13.35 of the Municipal Code. The ordinance prohibits intentional or unintentional water waste and unreasonable uses of water and encourages beneficial water use. Certain prohibited activities are also listed among the demand reduction actions in

Table 6-1.

6.5.4. Emergency Operations Plan for Catastrophic Water Shortages

This section identifies actions to be undertaken by Benicia to prepare for, and implement during, a catastrophic interruption of water supplies. In addition to climate, other events that can cause water supply shortages are earthquakes, chemical spills, dam failures, canal breaks, waterline ruptures, and energy outages at treatment and pumping facilities, which could cause a water shortage severe enough to trigger a Stage 1-6 water supply shortage condition.

The City has an adopted an Emergency Operations Plan, which provides procedures and guidance to City personnel in responding to emergency situations including catastrophic events, both natural and manmade. The plan provides procedures for preparing, mobilizing, and employing City resources and coordinating outside resources during an emergency. The City provides periodic training, including simulated events and responses to keep City personnel fully trained on implementation of emergency procedures. Mobilization is consistent with Standardized Emergency Management and the Incident Command System.

In addition to specific actions to be undertaken during a catastrophic event, Benicia performs maintenance activities, such as annual inspections for earthquake safety, and budgets for emergency items, such as auxiliary generators, to prepare for potential events. Benicia's coordination with with nearby agencies to develop an emergency intertie would enable the

City to maintain water services during catastrophic events when they would otherwise be unable to support internally.

Table 6-7 is a summary of actions cross-referenced against specific catastrophes for three of the most common possible catastrophic events: regional power outage (such as Public Safety Power Shutoff or "PSPS" events), natural disasters (such as earthquake, flood or storm damage, or fire), and malevolent acts.

TABLE 6-7: SUMMARY OF ACTIONS FOR CATASTROPHIC EVENTS

Possible Catastrophe	Summary of Potential Actions
Regional Power Outage	1. Isolate areas that will take the longest to repair and/or present a public health threat. Arrange to provide emergency water. 2. Establish water distribution points and ration water if necessary. 3. If water service is restricted, attempt to provide potable water tankers or bottled water to the area. 4. Make arrangements to conduct bacteriological tests, in order to determine possible contamination. 5. Utilize backup power supply to operate pumps in conjunction with elevated storage.
Natural Disaster	1. Assess the condition of the water supply system. 2. Complete the damage assessment checklist for reservoirs, water treatment plants, system transmission and distribution. 3. Coordinate with Governor's Office of Emergency Services, utilities group or Fire/City to identify immediate firefighting needs. 4. Isolate areas that will take the longest to repair and/or present a public health threat. Arrange to provide emergency water. 5. Prepare report of findings, report assessed damages, advise as to materials of immediate need and identify priorities including hospitals, schools and other emergency operation centers. 6. Take actions to preserve storage.

Possible Catastrophe	Summary of Potential Actions
	7. Determine any health hazard of the water supply and issue any "Boil Water Order" or "Unsafe Water Alert" notification to the customers. 8. Cancel the order or alert information after completing comprehensive water quality testing. 9. Make arrangements to conduct bacteriological tests, in order to determine possible contamination.
Malevolent acts	1. Assess threat or actual intentional contamination of the water system. 2. Notify local law enforcement to investigate the validity of the threat. 3. Get notification from public health officials if potential water contamination 4. Determine any health hazard of the water supply and issue any "Boil Water Order" or "Unsafe Water Alert" notification to the customers, if necessary. 5. Assess any structural damage from an intentional act. 6. Isolate areas that will take the longest to repair and or present a public health threat. 7. Arrange to provide emergency water.

6.5.5. Seismic Risk Assessment and Mitigation Plan

Beginning January 2020, CWC Section 10632.5 mandates urban water suppliers include in their UWMP a seismic risk assessment and mitigation plan to assess the vulnerability of each of the various facilities of a water system and mitigate those vulnerabilities. This requirement can be met by submittal of a copy of the most recent adopted local hazard mitigation plan or multi-hazard mitigation plan under the federal Disaster Mitigation Act of 2000 (Public Law

106-390) if the local hazard mitigation plan or multi-hazard mitigation plan addresses seismic risk.

Benicia intends to submit a copy of the updated Solano County Multi-Jurisdiction Hazard Mitigation Plan (2022 LMHMP), which addresses seismic risk, landslides, and Dam Failure, and Drought, among other items, in Solano County, including the City's entire service area.

The 2022 LMHMP concludes that earthquake likelihood in Solano County is a significant concern and "likely" to "highly likely".[69]

6.6. COMMUNICATION PROTOCOLS

The City maintains an established and effective communications program to inform its customers, neighbors, and other stakeholders of water service issues, updates, and policies. Implementation of the WSCP will utilize the existing communication program structure to inform customers and others of the declared shortage stage and respective actions and restrictions in place.

The City Council meetings addressing the Annual Assessment and any potential water shortage declaration will be noticed using normal City Council meeting public notification procedures. The meeting will also be announced through regular press release protocols.

Once a shortage stage has been declared by the City Council, the City will notify its customers and others through a range of efforts. The stage and restrictions will be identified in a press release, customer billing statements, posted on the City's website, and published in the weekly newspaper until restrictions are removed. Specifically, the City's website will be updated to feature the shortage declaration, restrictions, and resources available to customers from the City and other entities to help meet the restrictions. Subsequent City Council meetings will include a review of the shortage condition, customer response results, and discussion and recommendations for potential modifications. The City will also coordinate with the neighboring public agencies to declare a local emergency with respect to anticipated water supplies and demands in the event conditions necessitate.

The City's communications protocols may include, but are not limited to, some or all of the following locally relevant actions. These communications protocols will be used at the discretion of City staff based on then-current and anticipated water shortage conditions:

- Publishing information on Benicia's website.
- Staffing a telephone hotline.
- Providing bill inserts and direct mailings above and beyond those legally required.
- Directly calling customers.

[69] 2022 LMHMP at 1-9.

- Developing materials for non-English speaking customers.
- Preparing social media posts to communicate Benicia actions.
- Advertising actions on other local audio and video media.
- Coordinating voluntary and mandatory water conservation activities with other local and regional governing bodies.
- Using the WaterSmart system to directly email customers.

6.7. Compliance and Enforcement

The City's Emergency Water Conservation Plan has significant compliance and enforcement options. Section 13.35.090 allows the City to assess a drought penalty where water use exceeds a baseline established by the City. Although the baseline may be contested and exceptions for the drought penalty may occur, the City Council has the authority to use this mechanism to assure compliance with the identified drought stages.

In addition, Section 13.35.120 provides significant compliance and enforcement actions for the City of Benicia in implementing its water shortage planning. Financial penalties, flow restrictors, and disconnected water service are among the options available to the City to ensure compliance with the required water shortage actions. Appeals processes are also available for those that are subject to the enforcement provisions of the Municipal Code.

6.8. Legal Authorities

The City is empowered to implement and enforce its WSCP under its organizing statutes and through use of its Emergency Water Conservation Plan in the City's Municipal Code.

In addition, the City is able to exercise general powers granted to water distributors in CWC §§350-359. CWC §350 authorizes the governing body of a distributor of a public water supply to declare a water shortage emergency whenever it finds and determines that the ordinary demands and requirements of water consumers cannot be satisfied without depleting the water supply of the distributor to the extent there would be insufficient water for human consumption, sanitation, and fire protection. Upon a finding of such an emergency condition, the distributor can adopt such regulations and restrictions on the delivery and consumption of water as will conserve the water supply for the greatest public benefit, with particular regard to domestic use, sanitation, and fire protection (CWC §353). The regulations and restrictions remain in force and effect until the supply of water available for distribution within such area has been replenished or augmented, and restrictions may include the right to deny new service connections and discontinue service for willful violations (CWC §355 and §356). The City also coordinates with the Solano County Water Agency and Solano County within which it provides water supply services for the possible proclamation of a "local emergency" under California Government Code, California Emergency Services Act (Article 2, Section 8558).

6.9. Financial Consequences of WSCP

The Act requires an analysis of the impacts of implementation of this WSCP and likely financial consequences to the City. This section addresses aspects of revenue reduction, expense increases, and additional costs that may arise, and identifies financial response actions.

6.9.1. Revenue and Expenditure Impacts

Benicia has established water rates that support its on-going operation and maintenance activities, as well as the capital projects required to provide a safe and reliable water supply to its customers. Water rates are tied to Benicia's customers' normal water consumption activities, which will be reduced through voluntary or mandatory water conservation by customers. Thus, in times of shortage, there will be revenue reductions to Benicia. In addition to the revenue reductions, Benicia will also experience an increase in expenses resulting from augmented communication actions, increased enforcement activities, and the administration of water shortage management actions identified in the WSCP.

When a drought or water shortage occurs, the City's costs increase due to the additional activities and duties of instituting a stage of action. Not only will there be costs for materials, and time from permanent staff, but additional staff may need to be hired to assist in implementing the Water Shortage Contingency Plan. Staff will regularly report the identified and anticipated revenue and expenditure impacts and recommend appropriate responses to the City Council.

6.9.2. Drought Rate Structures and Surcharges

As conservation measures and requirements increase and the water supply decreases, the City will potentially see a reduction in revenue. To combat this and help pay for the expenses discussed above, the City Council is authorized to adopt a "drought surcharge" per Municipal Code 13.35.100.

Drought surcharges may be adopted by resolution of the City Council at the time of imposition and will remain until drought-related costs are recovered. Drought surcharges would be discontinued when triggered water shortage conditions are deactivated and no longer in effect.

6.10. Monitoring and Reporting

The City will conduct regular monitoring and reporting to ensure WSCP implementation is effective and responsive to conditions as they unfold. The City will then use this information to restore and maintain the water supply and demand balance. Similar to the supply and demand projections used to establish a shortage condition, the City will monitor the same data to determine effectiveness and efficacy.

Monitoring activity is expected to include, but not be limited to:

- Gathering monthly or bi-weekly customer water use data.
- Preparing technical assessments of customer water use and identifying deficiencies.
- Analyzing trends in water supply availability, including meteorological events, regional water supply coordination actions, and statewide regulatory trends.
- Assessing water conservation activities and the effectiveness of enforcement actions as applicable to achieving conservation objectives.

City staff will report to decision makers at least quarterly on status and results. Data reporting will include preparation of written reports and presentations, as necessary, for Benicia management meetings and other public meetings summarizing key information and data, including but not limited to:

- Actual water demands compared to projected demands by customer class and in total.
- Actual supply availability and utilized compared to projected availability for each supply source.
- Projected supply availability for next 12 months for each supply source.
- Monthly reporting of water production and conservation, as required by the State Water Resources Control Board.

These and other data will be regularly evaluated by staff to assess the effectiveness of response measures and to identify the need for any changes or modifications to the declared water shortage stage or actions based on the results. With regard to monitoring and reporting, City staff may determine the need for additional monitoring and reporting measures, or the need to develop or amend ordinances, or update the WSCP as a whole. Any WSCP update or modification will be conducted through the City Council meeting process, unless specific conditions require otherwise.

6.11. Re-evaluation and Improvement Procedures

Benicia will continually review and assess its procedures for implementing the WSCP. Specifically, Benicia will use the monitoring and reporting protocols identified above as a quality assurance and quality control measure to understand the effectiveness of water conservation activities. These re-evaluation and improvement procedures will include developing reports, memoranda, and presentations that assess the effectiveness of water conservation actions and the WSCP. These materials will be provided to Benicia's customers and decision-makers for consideration. Public comments on the published materials and management considerations should be incorporated into the development and

implementation of future actions. These protocols will be continually assessed and updated by Benicia management staff.

6.12. Special Water Feature Distinction

For purposes of water shortage contingency planning and implementation, the City defines as "special water features" those that are artificially supplied with water, including ponds, lakes, waterfalls, and fountains. Such special water features are considered distinct from swimming pools and spas (as defined in subdivision (a) of Section 115921 of the Health and Safety Code).

Water shortage response actions will focus on health and safety issues and balancing continuation of these uses with the severity of the water shortage condition. The relative total water use from these sources is a consideration for how special water features and swimming pool uses could be curtailed during specific water shortage conditions. For instance, when swimming pool filling and refilling would exceed a customer's use allocation under the various drought stages in the Municipal Code, then these actions are prohibited and can be subject to drought penalties and other City enforcement actions. Benicia determined that special water features are a relatively small discretionary use but may be restricted under all identified water shortage condition.

6.13. Plan Adoption, Submittal, and Availability

The WSCP has been adopted, submitted, and is available as required by the Urban Water Management Planning Act. As a stand-alone document, the WSCP is also subject to the following separate adoption, submittal, and availability processes, and whenever it is separately amended or revised in the future. Benicia may refine or amend this WSCP as necessary and in compliance with the normal public notice and adoption. Benicia has followed all applicable laws in adopting the WSCP. The current adopted WSCP shall be available to City customers and to Solano County Water Agency and Solano County within 30 days of its adoption. A copy of the current WSCP is available for public inspection during business hours at City Hall located at 250 East L Street, Benicia. The current WSCP is posted and available for download here: https://www.ci.benicia.ca.us/publications

APPENDIX A
NOTIFICATIONS

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APPENDIX B
DELTA RELIANCE

[placeholder]

APPENDIX C
DWR TABLES/CHECKLIST

[placeholder]

APPENDIX D
ADOPTING RESOLUTIONS

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