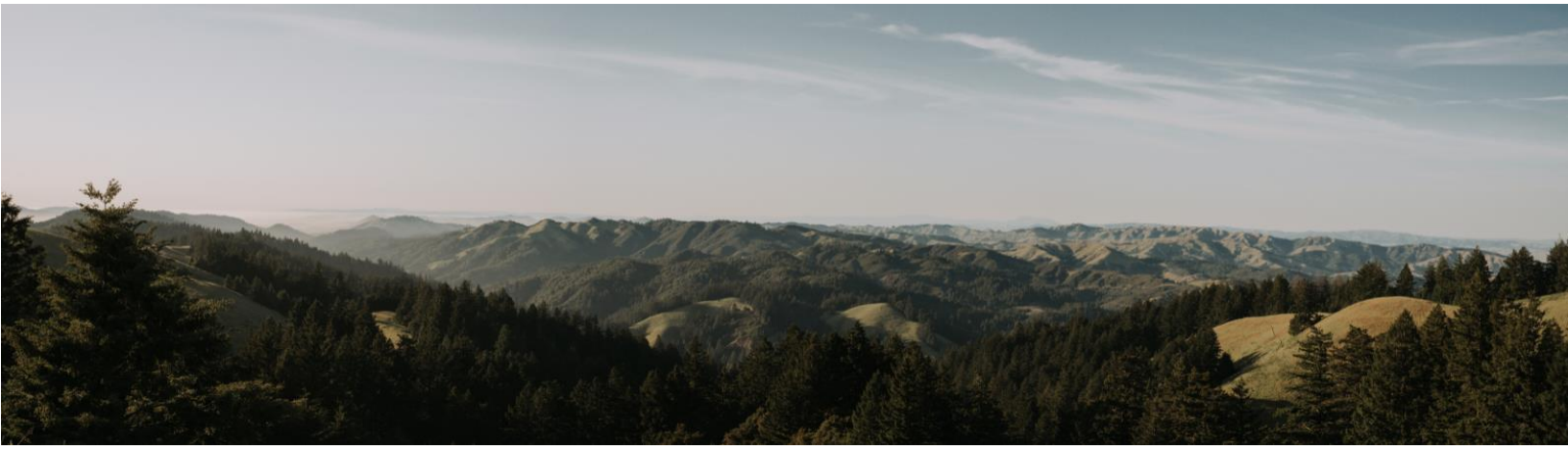
Public Review Draft - November 2023

Updated 2020 Urban Water Management Plan

for Marin Municipal Water District



MARIN MUNICIPAL WATER DISTRICT

eki environment & water

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ABBREVIATIONS

ABAG	Association of Bay Area Governments
AF	acre-feet
AFY	acre-feet per year
Alliance	North Marin-Sonoma Alliance
AMI	Advanced Metering Infrastructure
AWE	Alliance for Water Efficiency
AWSDA	annual water supply and demand assessment
AWWA	American Water Works Association
BMP	best management practices
BTTP	Bon Tempe Treatment Plant
CASGEM	California Statewide Groundwater Elevation Monitoring
CCR	California Code of Regulations
Census	United States Census
CEQA	California Environmental Quality Act
cfs	cubic feet per second
CII	commercial, industrial, and institutional
CIMIS	California Irrigation Management Information System
CMSA	Central Marin Sanitation Agency
COVID-19	coronavirus disease of 2019
CUWCC	California Urban Water Conservation Council
CWC	California Water Code
CY	calendar years
DDW	Division of Drinking Water
Demand Report	*2020 Water Demand Analysis and Water Conservation Measure Update*, Marin Municipal Water District
DMM	demand management measures
DOF	Department of Finance
DWR	Department of Water Resources
eARDWP	electronic Annual Reports to the Drinking Water Program
EBMUD	East Bay Municipal Utility District
EIR	Environmental Impact Report
ETo	reference evapotranspiration
ETWU	estimated total water use
FY	fiscal year
GGNRA	Golden Gate National Recreation Area
GMP	Groundwater Management Plan
GPCD	gallons per capita per day
gpf	gallons per flush

gpm	gallons per minute
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
HECW	High-Efficiency Clothes Washer
HET	High-Efficiency Toilet
HVAC	Heating, ventilation, and air conditioning
kWh	kilowatt hours
kWh/AF	kilowatt hours per acre-foot
LGVSD	Las Gallinas Valley Sanitary District
LHMP	Local Hazard Mitigation Plan
MAWA	maximum applied water allowance
MCL	Maximum Contaminant Level
Methodologies	*Methodologies for Calculating Baseline and Compliance Urban Per Capita Water Use, California Department of Water Resources Division of Statewide Integrated Water Management Water Use and Efficiency Branch*
MFR	multi-family residential
MG	million gallons
mgd	million gallons per day
MMWD	Marin Municipal Water District
NBWRA	North Bay Water Reuse Authority
NMFS	National Marine Fisheries Service
NMWD	North Marin Water District
PG&E	Pacific Gas & Energy
PWS	public water system
RA1	Regional Alliance
R-GPCD	residential gallons per capita per day
RHNA	Regional Housing Needs Allocation
RUWMP	Regional Urban Water Management Plan
RWTF	Recycled Water Treatment Facility
SASM	Sewage Agency of Southern Marin
SB	Senate Bill
SCWA	Sonoma County Water Agency
SFR	single family residential
SGMA	Sustainable Groundwater Management Act
SGTP	San Geronimo Treatment Plant
SMCSD	Sausalito-Marin City Sanitary District
SMSWP	Sonoma-Marin Saving Water Partnership
Sonoma Water	Sonoma County Water Agency
SWRCB	State Water Resources Control Board
SWSA	Strategic Water Supply Assessment

TAC	Technical Advisory Committee
Title 22	California Code of Regulations, Title 22
TUCP	Temporary Urgency Change Petition
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UWMP	Urban Water Management Plan
UWMP Act	Urban Water Management Planning Act
UWMP Guidebook 2020	*2020 Urban Water Management Plans Guidebook for Urban Water Suppliers*
VOMWD	Valley of the Moon Water District
WAC	Water Advisory Committee
WRCC	Western Regional Climate Center
WSCP	Water Shortage Contingency Plan
WUE	water use efficiency
WWTP	wastewater treatment plant

1. INTRODUCTION

This chapter discusses the importance and uses of this Urban Water Management Plan (UWMP or Plan), the relationship of this Plan to the California Water Code (CWC), the relationship of this Plan to other local and regional planning efforts, and how this Plan is organized and developed in general accordance with the 2020 Urban Water Management Plan's Guidebook for Urban Water Suppliers (UWMP Guidebook 2020).[1]

1.1 Background and Purpose

This UWMP addresses the Marin Municipal Water District (MMWD or District) water system. Most of the District's water supply comes from a network of seven local, rain-fed reservoirs. This supply is supplemented with water from Sonoma County Water Agency (SCWA or Sonoma Water), which provides surface water from the Russian River and to a lesser extent groundwater from the Santa Rosa Plain Subbasin of the Santa Rosa Valley Basin (California Department of Water Resources [DWR] Basin No. 1-55.01). Some recycled water is also used for non-potable uses such as landscape irrigation, cooling towers, car washes, and toilet flushing.

This UWMP is a foundational document and source of information about the District's historical and projected water demands, water supplies, supply reliability and potential vulnerabilities, water shortage contingency planning, and demand management programs.

The District's last UWMP was completed in 2020, referred to herein as the "2020 UWMP." This Plan is an update to the 2020 UWMP and carries forward information from that plan that remains current and is relevant to this Plan and provides additional information from the District's 2023 Draft Strategic Water Supply Assessment (SWSA). Although this Plan is an update to the 2020 UWMP, it was developed to be a self-contained, stand-alone document.

1.2 Urban Water Management Planning and the California Water Code

The UWMP Act requires urban water suppliers to prepare a UWMP every five years and to submit this plan to the DWR, the California State Library, and any city or county within which the supplier provides water. All urban water suppliers, either publicly or privately owned, providing water for municipal purposes either directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre-feet annually are required to prepare an UWMP (CWC §10617).

The UWMP Act was enacted in 1983. Over the years it has been amended in response to water resource challenges and planning imperatives confronting California. A significant amendment was made in 2009 as a result of the governor's call for a statewide 20% reduction in urban water use by 2020, referred to as "20x2020," the Water Conservation Act of 2009, and "Senate Bill (SB) X7-7." This amendment required urban retail water suppliers to establish water use targets for 2015 and 2020 that would result in

[1] The UWMP Guidebook 2020 is available at: https://water.ca.gov/Programs/Water-Use-And-Efficiency/Urban-Water-Use-Efficiency/Urban-Water-Management-Plans.

statewide water savings of 20% by 2020. Beginning in 2016, urban retail water suppliers were required to comply with the water conservation requirements in SB X7-7 to be eligible for state water grants or loans. Chapter 5 of this Plan contains the data and calculations used to determine compliance with these requirements.

A subsequent substantial revision to the UWMP Act was made in 2018 through a pair of bills (i.e., Assembly Bill 1668 and Senate Bill 606), referred to as "Making Water Conservation a California Way of Life" or the "2018 Water Conservation Legislation." These changes include, among other things, additional requirements for Water Shortage Contingency Plan (WSCP), expansion of dry year supply reliability assessments to a five-year drought period, establishment of annual drought risk assessment procedures and reporting, and discussion of new conservation targets referred to as "annual water use objectives," which will require retailers to continue to reduce water use beyond the 2020 SB X7-7 targets. The UWMP Act contains numerous other requirements that a UWMP must satisfy. **Appendix A** to this Plan lists each of these requirements and where in the Plan they are addressed.

1.3 Relationship to Other Planning Efforts

This Plan provides information specific to water management and planning by the District. However, water management does not happen in isolation; there are other planning processes that integrate with the UWMP to accomplish urban planning. Some of these relevant planning documents include relevant city and county General Plans, Water Master Plans, and others.

This Plan is informed by and helps to inform these other planning efforts. In particular, this Plan utilizes information contained in county General Plans and local and regional water resource plans to the extent data from these plans are applicable and available.

1.4 Plan Organization

The organization of this Plan follows the same sequence as outlined in the UWMP Guidebook 2020.

Chapter 1 - Introduction

Chapter 2 - Plan Preparation

Chapter 3 - Service Area and System Description

Chapter 4 - System Water Demands

Chapter 5 - Baseline Water Use and SB X7-7 Water Conservation Targets

Chapter 6 - Water Supply Characterization

Chapter 7 - Water Supply Reliability

Chapter 8 - Water Shortage Contingency Planning

Chapter 9 - Demand Management Measures

Chapter 10 - Plan Adoption and Submittal

Chapter 11 - References

In addition to these eleven chapters, this Plan includes a number of appendices providing supporting documentation and supplemental information. Pursuant to CWC §10644(a)(2), this Plan utilizes the standardized forms, tables, and displays developed by DWR for the reporting of water use and supply information required by the UWMP Act. This Plan also includes additional tables, figures, and maps to augment the set developed by DWR, as appropriate. The table headers indicate if the table is part of DWR's standardized set of submittal tables.

1.5 Demonstration of Consistency with the Delta Plan for Participants in Covered Actions

Although not required by the UWMP Act, in the UWMP Guidebook 2020, DWR recommends that all suppliers that are participating in, or may participate in, receiving water from a proposed project that is considered a "covered action" under the Delta Plan—such as a (1) multiyear water transfer; (2) conveyance facility; or (3) new diversion that involves transferring water through, exporting water from, or using water in the Sacramento-San Joaquin Delta (Delta)—provide information in their UWMP to demonstrate consistency with the Delta Plan policy WR P1, Reduce Reliance on the Delta Through Improved Regional Water Self-Reliance (California Code of Regulations, Title 23, Section 5003).

The District's source of water supply is from a network of local, rain-fed reservoirs, imported water purchased from the SCWA, and recycled water, and therefore the District does not receive water or plan to receive water from a "covered action" under the Delta Plan. As such, demonstration of consistency with the Delta Plan is not applicable.

1.6 Lay Description

☑ ***CWC § 10630.5***

Each plan shall include a simple lay description of how much water the agency has on a reliable basis, how much it needs for the foreseeable future, what the agency's strategy is for meeting its water needs, the challenges facing the agency, and any other information necessary to provide a general understanding of the agency's plan.

This Urban Water Management Plan (UWMP or Plan) is prepared for Marin Municipal Water District (also referred to as MMWD or District), which serves drinking water to a population of approximately 191,269 in Marin County, California. This UWMP serves as a foundational planning document and includes descriptions of historical and projected water demands and water supplies and reliability over the UWMP planning horizon. This document also describes the actions the District is taking to promote water conservation, both by the District and by its customers (referred to as "demand management measures"), and includes a plan to address potential water supply shortages such as drought or other impacts to supply availability (the "Water Shortage Contingency Plan"). This UWMP is updated every five years in accordance with state requirements under the Urban Water Management Planning Act (UWMP Act) and amendments (Division 6 Part 2.6 of CWC §10610 – 10656). Past plans developed for the District are available on the California Department of Water Resources (DWR) Water Use Efficiency Data Portal website: https://wuedata.water.ca.gov/. This Plan includes eleven chapters, which are summarized below.

Chapter 1 - Introduction

This chapter presents the background and purpose of the UWMP, identifies the Plan organization, and provides this lay description overview of the document.

Chapter 2 - Plan Preparation

This chapter discusses key structural aspects related to the preparation of the UWMP, and describes the coordination and outreach conducted as part of the preparation of the Plan, including coordination with local agencies (i.e., members of the Sonoma-Marin Saving Water Partnership [SMSWP] and Marin County) and the public.

Chapter 3 - Service Area and System Description

This chapter provides a description of the District's water system and service area, including information related to the climate, population, and demographics. The District serves a population of approximately 191,269 and has a moderate climate characterized by mild dry summers and cool wet winters. The majority of precipitation falls during late autumn, winter, and spring, averaging 47 inches of rainfall annually.

Chapter 4 - System Water Demands

This chapter provides a description and quantifies the District's current and projected demands through the year 2045. The District provides drinking water (also referred to as "potable water"), raw water, and recycled water to its customers. Water demands refer not only to the water used by customers, but also includes the water used as part of the system maintenance and operation, as well as unavoidable losses inherent in the operation of a water distribution system. The District also provides raw water environmental releases from Kent and Soulajule Lakes to meet environmental flow requirements that benefit silver salmon and steelhead populations in Walker Creek and Lagunitas Creek. Total potable and raw water demand within the District (excluding environmental releases) was 25,319 acre-feet per year (AFY) on average between 2016 and 2020.[2] Taking into account historical water use, expected population increase and other growth, climatic variability, and other assumptions, total potable and raw water (excluding environmental releases) demand within the District is projected to increase to 29,316 AFY by 2045, a change of 13.6% compared to the 2016-2020 average.

The District also provides recycled water to customers in the Terra Linda area of San Rafael for non-potable uses, including irrigation, cooling towers, car washes, and toilet flushing. Recycled water demand was 638 AFY on average between 2016 and 2020, and is projected to increase to 750 AFY by 2045, an increase of 15% compared to the 2016-2020 average. The District's recycled water system and demands are described in Chapter 6.

Chapter 5 - Baseline Water Use and SB X7-7 Water Conservation Targets

In this chapter, the District compares its per capita water use with its water use target for the year 2020. The Water Conservation Act of 2009 (Senate Bill [SB] X7-7) was enacted in November 2009 and requires the state of California to achieve a 20% reduction in urban per capita water use by 31 December 2020. In

[2] This water use includes potable water used to meet demands by the recycled water system while the recycled water system was offline to allow for infrastructure upgrades. Plant upgrades were completed in April 2021.

order to achieve this, each urban retail water supplier was required to establish water use targets for 2015 and 2020 using methodologies established by DWR. The District is a member of a "Regional Alliance", which allows retailers to demonstrate compliance with SB X7-7 on a regional basis. In 2020, the North Marin-Sonoma Alliance used 113 gallons per capita per day (GPCD), which is in compliance with and below its 2020 target of 129 GPCD.

Chapter 6 – Water Supply Characterization

This chapter presents an analysis of the District's water supplies, as well as an estimate of water-related energy consumption. The intent of this chapter is to present a comprehensive overview of the District's water supplies, estimate the volume of available supplies over the UWMP planning horizon, and assess the sufficiency of the District's supplies to meet projected demands under "normal" hydrologic conditions.

Most of the District's water supply comes from a network of seven local, rain-fed reservoirs. Total reservoir storage operated by the District is 25.9 billion gallons (79,566 acre-feet [AF]). This supply is supplemented with water imported from the Russian River and purchased from the Sonoma County Water Agency (SCWA or Sonoma Water). The District has contracted with SCWA for this source of water since 1975. The current contract allows for the District to purchase up to 14,300 AF; however, the District's ability to accept this volume is currently limited by infrastructure constraints that restrict conveyance capacity to about 10,000 AFY. To treat this supply, the District operates three water treatment plants, including the Bon Tempe Treatment Plant, the San Geronimo Treatment Plant, and the Ignacio treatment facility.

There are also five wastewater treatment plants within the District's service area that collectively treat roughly 17,200 AFY of wastewater. The District produces its own recycled water by treating secondary effluent provided to the District by the Las Gallinas Valley Sanitary District to tertiary levels before being distributed to customers. MMWD's recycled water system consists of nearly 25 miles of pipeline, which delivered about 748 AFY through approximately 300 service connections in 2020.[3]

Based on comparison of demands and available supplies, the District's water supply is expected to be sufficient to support the District's projected water demand through 2045 during normal hydrologic years.

Calculation and reporting of water system energy intensity was a new requirement for the 2020 UWMPs. Energy intensity is defined as the net energy used for water treatment, conveyance, and distribution for all water entering the distribution system and does not include the energy used to convey or treat wastewater. The energy intensity for the District is estimated to be 495 kilowatt hours per acre-foot of water (kWh/AF).

Chapter 7 - Water Supply Reliability

This chapter assesses the reliability of the District's water supplies, with a specific focus on potential constraints such as water supply availability, water quality, and climate change. The intent of this chapter is to identify any potential constraints that could affect the reliability of the District's supply (such as drought conditions) to support the District's planning efforts. Water service reliability is assessed during

[3] The recycled water plant was non-operational in 2019 and 2020 to allow for infrastructure upgrades. During this time, water demands by the recycled water system were met with potable water. Plant upgrades were completed in April 2021.

normal, single dry-year, and multiple dry-year hydrologic conditions. Based on this analysis, the District expects the available supplies to be sufficient to meet projected demands in all hydrologic conditions, including a five-year drought period, and considering the impacts of climate change.

Further, potential water quality issues are not expected to affect the quality of water served to the District's customers, as water quality is routinely monitored and the District is able to make all appropriate adjustments to its treatment and distribution system to ensure only high-quality drinking water is served.

Chapter 8 - Water Shortage Contingency Planning

This chapter describes the Water Shortage Contingency Plan (WSCP) for the District. The WSCP serves as a standalone document to be engaged in the case of a water shortage event, such as a drought or supply interruption, and defines specific policies and actions that will be implemented at various shortage level scenarios. For example, implementing customer water budgets and surcharges, or restricting landscape irrigation to specific days and/or times. Consistent with DWR requirements, the WSCP includes six levels to address shortage conditions ranging from up to 10% to greater than 50% shortage.

Chapter 9 - Demand Management Measures

This chapter includes descriptions of past and planned conservation programs that the District and the Sonoma-Marin Saving Water Partnership (SMSWP) operate within each demand management measure (DMM) category outlined in the UWMP Act, specifically: (1) water waste prevention ordinances, (2) metering, (3) conservation pricing, (4) public education and outreach, (5) distribution system water loss management, (6) water conservation program coordination and staffing support, and (7) "other" DMMs. The District has developed a suite of conservation programs and policies which address each DMM category.

Chapter 10 - Plan Adoption and Submittal

This chapter provides information on a public hearing, the adoption process for the UWMP Update, the adopted UWMP submittal process, UWMP implementation, and the process for amending the adopted UWMP.

Chapter 11 - References

This chapter contains key references and sources used throughout the Plan.

2. PLAN PREPARATION

This section provides information on the process for developing Marin Municipal Water District's (MMWD's or District's) 2020 Urban Water Management Plan (UWMP or Plan), including an overview of coordination with other agencies and a description of public outreach.

Text from the Urban Water Management Planning Act (UWMP Act) has been included in grey text boxes with italicized font at beginning of relevant sections of this UWMP. The information presented in the respective UWMP sections and the associated text, figures, and tables are collectively intended to fulfill the requirements of that sub-section of the UWMP Act. To the extent practicable, supporting documentation has also been provided in **Appendix A** through **Appendix L**. Other sources for the information contained herein are provided in the references section of this document.

Per CWC §10644(a)(2), selected information for the 2020 UWMP Update must be presented in standardized tables for electronic submittal to DWR. The tables presented in this UWMP have been re-numbered, but the content has been preserved and the original DWR table numbers are included in parentheses in the table titles.

2.1 Basis for Preparing a Plan

☑ ***CWC § 10617***

"Urban water supplier" means a supplier, either publicly or privately owned, providing water for municipal purposes either directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually. An urban water supplier includes a supplier or contractor for water, regardless of the basis of right, which distributes or sells for ultimate resale to customers. This part applies only to water supplied from public water systems subject to Chapter 4 (commencing with Section 116275) of Part 12 of Division 104 of the Health and Safety Code.

☑ ***CWC § 10620***

Every person that becomes an urban water supplier shall adopt an urban water management plan within one year after it has become an urban water supplier.

☑ ***CWC § 10621 (a)***

Each urban water supplier shall update its plan at least once every five years on or before July 1, in years ending in six and one, incorporating updated and new information from the five years preceding each update.

☑ ***CWC § 10621 (f)(1)***

Each urban water supplier shall update and submit its 2020 plan to the department by July 1, 2021.

☑ ***CWC § 10644 (a)(2)***

The plan, or amendments to the plan, submitted to the department … shall include any standardized forms, tables, or displays specified by the department.

In 1983, the California Legislature enacted the UWMP Act (CWC §10610 - §10657). The UWMP Act states that every urban water supplier that provides water to 3,000 or more connections or that provides over 3,000 acre-feet of water per year (AFY) should make every effort to ensure the appropriate level of water service reliability to meet the needs of its customers during normal, dry, and multiple dry years.

As a water system that provides drinking water for human consumption, the District is regulated as a Public Water System (PWS) by the State Water Resources Control Board (SWRCB), Division of Drinking Water. **Table** 2-1 lists the District's PWS identification number. The SWRCB requires that water agencies report water usage and other relevant PWS information via the electronic Annual Reports to the Drinking Water Program (eARDWP). These data are used by the state to determine, among other things, whether an urban retail water supplier has reached the threshold (3,000 or more connections or 3,000 acre-feet [AF] of water supplied) for submitting an UWMP.

As shown in **Table** 2-1, the District served approximately 61,700 connections in 2020 and is therefore subject to the requirements of the UWMP Act.

Table 2-1 Public Water Systems (DWR Table 2-1)

Public Water System Number	Public Water System Name	Number of Municipal Connections 2020	Volume of Water Supplied 2020
2110003	Marin Municipal Water District	61,700	40,149
	TOTAL	61,700	40,149
NOTES: (a) Volumes are in units of AF.			

The District's 2020 UWMP describes how the current and future water resources and demands within the District's service area will be managed to provide an adequate and reliable water supply. Additionally, and as applicable, the District's 2020 UWMP reflects the significant revisions to the UWMP Act that have been made since 2015.

As with the 2010 and 2015 UWMPs, the District's 2020 UWMP has been prepared as an individual rather than a regional plan, as shown in **Table** 2-2 (DWR Table 2-2). However, the 2020 UWMP was developed with close coordination with its wholesaler, Sonoma County Water Agency (SCWA or Sonoma Water), and other parties that receive water from the SCWA (Water Contractors). Furthermore, a regional Alliance was formed in 2011 among these agencies including the cities of Santa Rosa, Rohnert Park, Sonoma, Cotati, Petaluma, Town of Windsor, Marin Municipal Water District, Valley of the Moon Water District, and North Marin Water District to comply with Senate Bill (SB) X7-7, the Water Conservation Act of 2009. This regional Alliance, referred to in **Table** 2-2 as the "North Marin-Sonoma Alliance" but more typically referred to as the Sonoma-Marin Saving Water Partnership (SMSWP), is used within the 2020 UWMP for reporting on regional 2015 and 2020 water use targets (see Chapter 5). All other elements of the CWC requirements are addressed in the District's individual Plan.

Table 2-2 Plan Identification Type (DWR Table 2-2)

Select Only One	Type of Plan		Name of RUWMP or Regional Alliance *if applicable*
X	Individual UWMP		
		Water Supplier is also a member of a RUWMP	
	X	Water Supplier is also a member of a Regional Alliance	North Marin-Sonoma Alliance
	Regional Urban Water Management Plan (RUWMP)		
NOTES:			

2.2 Coordination and Outreach

Coordination with other water suppliers, cities, counties, and other community organizations in the region is an important part of preparing an UWMP and Water Shortage Contingency Plan (WSCP). This section identifies the agencies and organizations the District sought to coordinate with during preparation of this Plan.

2.2.1 Wholesale Coordination

☑ ***CWC § 10631 (h)***

An urban water supplier that relies upon a wholesale agency for a source of water shall provide the wholesale agency with water use projections from that agency for that source of water in five-year increments to 20 years or as far as data is available. The wholesale agency shall provide information to the urban water supplier for inclusion in the urban water supplier's plan that identifies and quantifies, to the extent practicable, the existing and planned sources of water as required by subdivision (b), available from the wholesale agency to the urban water supplier over the same five-year increments, and during various water-year types in accordance with subdivision (f). An urban water supplier may rely upon water supply information provided by the wholesale agency in fulfilling the plan informational requirements of subdivisions (b) and (f).

Urban retail water suppliers relying on one or more wholesalers for water supply are required to provide these wholesalers with information regarding projected water supply and demand. The District meets regularly with other water purveyors to discuss water supply and demand planning. In particular, the District meets at least monthly with its water wholesaler, the SCWA, and with other Water Contractors who purchase water from the SCWA. These monthly meetings occur through the District's participation in the SCWA Technical Advisory Committee (TAC). The primary mission of the TAC is to provide input and guidance to the SCWA regarding technical issues that may have an impact on the Water Contractors (i.e., UWMP coordination, capital projects, operational changes, etc.). Additionally, the District participates in quarterly meetings of the Water Advisory Committee (WAC). The WAC's objectives are to advise the SCWA's Board of Directors on policy and fiscal matters affecting the Water Contractors. The District's

participation in the TAC and WAC has been instrumental in coordinating water supply and demand analyses for the preparation of this Plan.

The District's local water supply is supplemented with water purchased from the SCWA. The District's water supply agreement is separate from that of the other eight Water Contractors that purchase water from SCWA. A copy of the agreement is provided in **Appendix B**. As indicated in **Table** 2-3**,** the District has provided demand projections through 2045 to the SCWA.

Table 2-3 Water Supplier Information Exchange (DWR Table 2-4)

The retail Supplier has informed the following wholesale supplier(s) of projected water use in accordance with Water Code Section 10631.
Wholesale Water Supplier Name
Sonoma County Water Agency
NOTES:

As discussed in Section 4.2, the District's projected water demands were developed as part of a planning effort in 2020 that was implemented in coordination with SCWA and the other Water Contractors (i.e., the 2020 Urban Water Management Plan Water Demand Analysis and Water Conservation Measures Update included as **Appendix C**). The SCWA was provided with the District's water use projections through this process. The District will continue to coordinate with the SCWA to determine the timing of capital improvement projects that may need to be implemented in order to meet the District's projected future water demands.

Additionally, as described in more detail in Chapter 7, the District has relied upon the water supply reliability projections provided by SCWA for the purposes of analyzing the reliability of its Russian River water supplies during normal and dry years through 2045.

2.2.2 Agency Coordination

☑ ***CWC § 10620 (d) (2)***

Each urban water supplier shall coordinate the preparation of its plan with other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practicable.

As part of the development of this Plan, the District coordinated closely with the other SCWA Water Contractors. Among other methods, this coordination occurred through regular meetings of the TAC and WAC (see Section 2.2.1). These agencies also coordinated as part of the regional water conservation partnership, the SMSWP. On 21 July 2023, a letter was sent to each of these entities advising that the District was reviewing and updating its UWMP. The agencies, cities, and counties that were notified by the District during the development of this Plan are listed in **Table** 2-4. A sample copy of the notices is provided in **Appendix D**.

Table 2-4 Notification to Cities, Counties, and Other Agencies (DWR Table 10-1)

City Name	60 Day Notice	Notice of Public Hearing
City of Belvedere	X	X
City of Larkspur	X	X
City of Mill Valley	X	X
City of Novato	X	X
City of San Rafael	X	X
City of Sausalito	X	X
Town of Corte Madera	X	X
Town of Fairfax	X	X
Town of Ross	X	X
Town of San Anselmo	X	X
Town of Tiburon	X	X
County Name	**60 Day Notice**	**Notice of Public Hearing**
Marin County	X	X
Other Agency Name	**60 Day Notice**	**Notice of Public Hearing**
North Marin Water District	X	X
Sonoma County Water Agency	X	X
NOTES:		

2.2.3 Public Participation

☑ ***CWC § 10642***

Each urban water supplier shall encourage the active involvement of diverse social, cultural, and economic elements of the population within the service area prior to and during the preparation of both the plan and the water shortage contingency plan. Prior to adopting either, the urban water supplier shall make both the plan and the water shortage contingency plan available for public inspection and shall hold a public hearing or hearings thereon. Prior to any of these hearings, notice of the time and place of the hearing shall be published within the jurisdiction of the publicly owned water supplier pursuant to Section 6066 of the Government Code. The urban water supplier shall provide notice of the time and place of a hearing to any city or county within which the supplier provides water supplies. Notices by a local public agency pursuant to this section shall be provided pursuant to Chapter 17.5 (commencing with Section 7290) of Division 7 of Title 1 of the Government Code. A privately owned water supplier shall provide an equivalent notice within its service area. After the hearing or hearings, the plan or water shortage contingency plan shall be adopted as prepared or as modified after the hearing or hearings.

Water suppliers are required by the UWMP Act to encourage active involvement of the community within the service area prior to and during the preparation of its UWMP and WSCP. The UWMP Act also requires water suppliers to make a draft of the UWMP available for public review and to hold a public hearing regarding the findings of the UWMP prior to their adoption. In addition to sending notices of the District's intent to update its UWMP to the various agencies listed in Section 2.2.2, the District also included a public notice in the Marin Independent Journal and on the District's website notifying the public that the UWMP were available for review and that the District was seeking public input and comments, including during the public hearing. Public participation in the development of the District's updated 2020 UWMP is summarized in **Appendix E**.

The Public Review Draft updated 2020 UWMP was available for public review at the District's office, and on the District's website (https://www.marinwater.org/UrbanWaterManagementPlan).

2.3 UWMP Structure, Standard Units, and Basis for Reporting

As summarized in **Table** 2-5**,** the District is a water retailer and unless otherwise indicated, the data included in the following sections is presented in units of AF or AFY; annual values represent calendar years (CY) spanning from 1 January to 31 December.

Further, consistent with the Guidebook, the terms "water use", "water consumption", and "water demand" are used interchangeably in this UWMP.

Table 2-5 Supplier Identification (DWR Table 2-3)

Type of Supplier	
	Supplier is a wholesaler
X	Supplier is a retailer
Fiscal or Calendar Year	
X	UWMP Tables are in calendar years
	UWMP Tables are in fiscal years
If using fiscal years provide month and date that the fiscal year begins (mm/dd)	
Units of measure used in UWMP	
Unit	AF
NOTES:	

3. SERVICE AREA AND SYSTEM DESCRIPTION

☑ ***CWC § 10631 (a)*** *A plan shall be adopted in accordance with this chapter that shall do all of the following:*

Describe the service area of the supplier, including current and projected population, climate, and other social, economic, and demographic factors affecting the supplier's water management planning. The projected population estimates shall be based upon data from the state, regional, or local service agency population projections within the service area of the urban water supplier and shall be in five-year increments to 20 years or as far as data is available. The description shall include the current and projected land uses within the existing or anticipated service area affecting the supplier's water management planning. Urban water suppliers shall coordinate with local or regional land use authorities to determine the most appropriate land use information, including, where appropriate, land use information obtained from local or regional land use authorities, as developed pursuant to Article 5 (commencing with Section 65300) of Chapter 3 of Division 1 of Title 7 of the Government Code.

As shown in **Figure** 3-1, Marin Municipal Water District (MMWD or District) serves the populous eastern corridor of Marin County from the Golden Gate Bridge northward up to, but not including the City of Novato. The District is bounded by the San Francisco Bay on the east and stretches through the San Geronimo Valley in the west. The incorporated cities and towns of San Rafael, Mill Valley, Fairfax, San Anselmo, Ross, Larkspur, Corte Madera, Tiburon, Belvedere and Sausalito are within the District's service area.

The District covers approximately 147 square miles and serves customers through about 61,700 active service connections. Five of the seven District reservoirs (Alpine, Bon Tempe, Kent, Lagunitas, and Phoenix Lake) are located on the north slope of Mt. Tamalpais. The remaining two District reservoirs (Nicasio and Soulajule) are outside the District's service area in western Marin County. The District's service area is shown in **Figure** 3-2.

3.1 Population and Employment Trends Within the Service Area

Residential growth in Marin County boomed during the period following World War II up to the early years of the 1970s. Growth during the last two decades has averaged less than 1% per year, and the County Planning Department indicates that only 4% of lands within the County remain available for new development (MMWD, 2016). The population within the District remained level during the 1970s and 1980s. During that same period, the number of water service connections increased by 21%, from 46,000 to 58,000, with the majority being residential services, and the number of people per household declined from 3.1 to 2.5 (MMWD, 2016). Given the above, the District's service area is generally considered to be built-out, and very low population growth is expected within the area.

The 2020 population was calculated per methodologies outlined for use in the Senate Bill (SB) X7-7 analysis, based on Department of Finance (DOF) estimates (DOF, 2020; see Chapter 5). Using this methodology, the District's 2020 service area population was estimated to be 191,269.

3.1.1 Future Population Growth

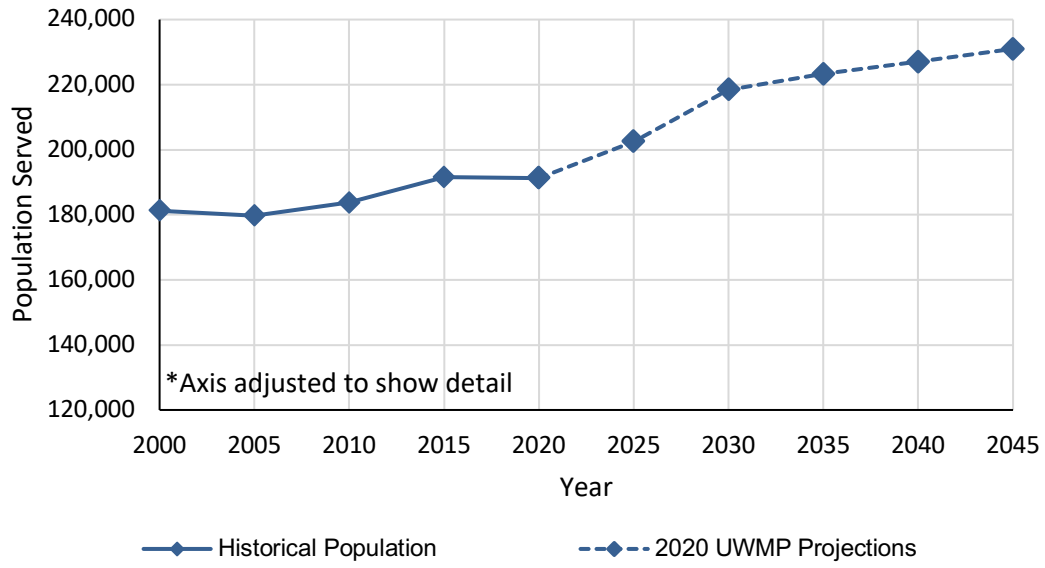
Table 3-1 and its associated chart provides the current and projected population for the District's service area through the year 2045. Population projections were updated from those included in the original 2020 UMWP to account for housing allocations determined by the Association of Bay Area Governments (ABAG) 2023-2031 Final Regional Housing Needs Allocation (RHNA) Plan, which incorporates increases in population due to planned housing developments within the District's service area (ABAG, 2022).

Table 3-1 Population - Current and Projected (DWR Table 3-1)

Population Served	2020	2025	2030	2035	2040	2045
	191,269	202,510	218,444	223,251	227,005	230,996

NOTES:
(a) 2020 population was calculated based on DOF estimates using methodologies outlined for use in the SB X7-7 analysis.
(b) Projected population was calculated by applying the average 2.4 persons per household (pph) from the 2020 Census for Marin County to the total estimated new housing projections for the District's service area per ABAG (2022). Population was adjusted assuming the same ratio of single family residential (SFR) and multi-family residential (MFR) homes as the current District housing ratio (i.e., 93% SFR and 7% MFR).

Chart 3-1 Current and Projected Population



3.1.2 Future Employment Growth

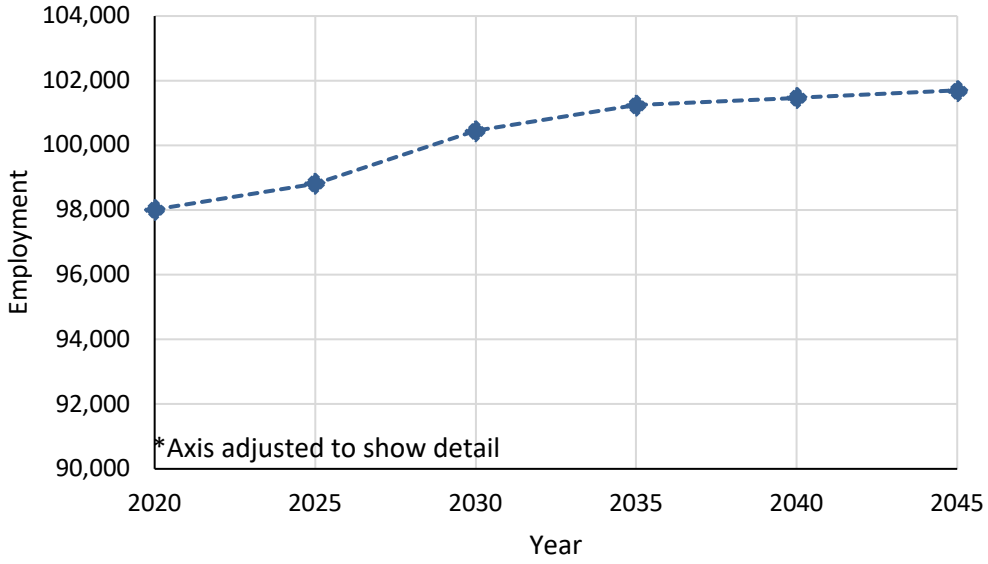
Table 3-2 and its associated chart provides the current and projected employment for the District's service area through the year 2045. Current and projected employment estimates were developed as described in **Appendix C**.

Table 3-2 Employment - Current and Projected

Service Area Employment	2020	2025	2030	2035	2040	2045
	98,019	98,822	100,449	101,246	101,474	101,703

NOTES:
(a) Current and projected employment was calculated by adjusting Marin County ABAG (2018) projections for unincorporated area served by the District (i.e., 76% of unincorporated employment within the County).
(b) ABAG (2018) includes projections through 2040. 2045 employment is estimated based on the 2035-2040 growth rate (0.23%).

Chart 3-2 Current and Projected Employment



3.2 Land Uses within Service Area

Land use within the District is primarily residential, but also includes agricultural, industrial, commercial, and recreational land uses. Current land use maps within the District, per the Land Use Element of the Marin Countywide Plan (County of Marin, 2014), can be found in Section 3.12 of the Countywide Plan.[4] Future land uses are expected to remain generally consistent with current land uses.

[4] The Marin Countywide Plan could be found in the county's website: https://www.marincounty.org/-/media/files/departments/cd/planning/currentplanning/publications/county-wide-plan/cwp_2015_update_r.pdf?la=en.

3.3 Service Area Social, Economic, and Demographic Factors

The District service area includes the majority of the population within Marin County, excluding the City of Novato and selected unincorporated areas. Demographics for Marin County are summarized in **Table** 3-3. The same data are also provided for the state of California as a whole and were obtained from the U.S. Census Bureau QuickFacts website (U.S. Census, 2021) in 2021 during the preparation of the 2020 UMWP. Relative to the rest of California, Marin County's population is slightly older and somewhat less racially diverse. Educational attainment and median household income in Marin County are higher than for the state as a whole, while persons below the poverty level is comparatively lower.

Table 3-3 Demographic and Housing Characteristics

Demographics (a)	Marin County	California
Age and Sex		
Persons under 5 years	4.5%	6.0%
Persons under 18 years	19.8%	22.5%
Persons 65 years and older	23.0%	14.8%
Female persons	51.1%	50.3%
Race and Hispanic Origin		
White alone	85%	71.9%
Black or African American alone	2.8%	6.5%
American Indian and Alaska Native alone	1.0%	1.6%
Asian alone	6.6%	15.5%
Native Hawaiian and Other Pacific Islander alone	0.30%	0.5%
Two or More Races	4.0%	4.0%
Hispanic or Latino	16%	39.4%
White alone, not Hispanic or Latino	71%	36.5%
Families & Living Arrangements		
Persons per household	2.4	2.95
Living in same house 1 year ago, percent of persons age 1 year+	86%	87.1%
Language other than English spoken at home, age 5 years+	22%	44.2%
Education		
High school graduate or higher, persons age 25 years+	93%	83.3%
Bachelor's degree or higher, persons age 25 years+	60%	33.9%
Income & Poverty		
Median Household Income (2019 dollars)	$115,246	$75,235
Per capita income in past 12 months (2019 dollars)	$72,466	$36,955
Persons in poverty	6.9%	11.8%

NOTES:
(a) Demographic data per the U.S. Census Bureau QuickFacts website (U.S. Census, 2021).

3.4 Climate

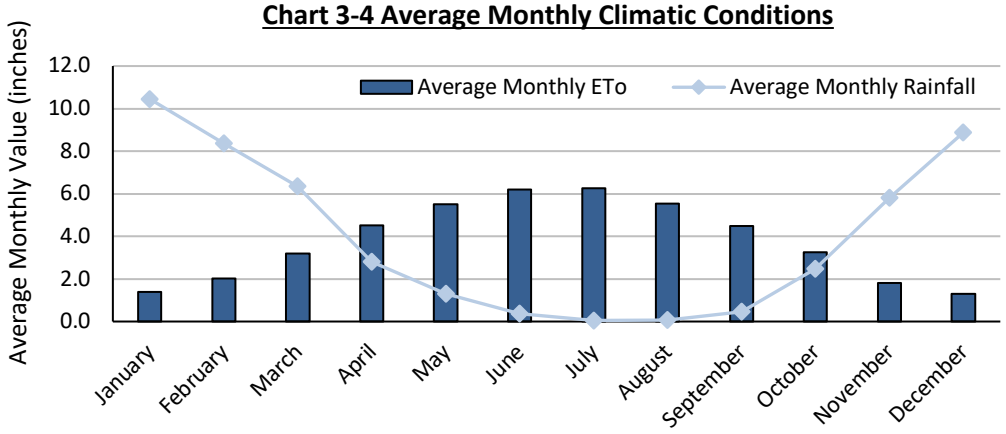
The District has a Mediterranean coastal climate. Summers are mild and dry, and winters are cool and wet, with an annual average of 47 inches of precipitation in the service area. The region is subject to wide variations in annual precipitation and contains a multitude of microclimates. Summer fog helps reduce summer irrigation requirements. **Table** 3-4 and its associated chart present the monthly average evapotranspiration (ETo), precipitation, and maximum and minimum temperature for the service area.

Table 3-4 Climate Characteristics

Month	Average Temperature		Standard Average ETo (inches)	Average Rainfall (inches)
	Min (°F)	Max (°F)		
January	38.6	55.6	1.4	10.45
February	41	60.5	2.0	8.36
March	42	64.5	3.2	6.36
April	43.8	69.3	4.5	2.81
May	46.5	74.1	5.5	1.31
June	49.5	79.8	6.2	0.36
July	50.2	83.4	6.3	0.05
August	50.1	82.7	5.5	0.08
September	49.6	81.4	4.5	0.46
October	47	74.8	3.3	2.46
November	42.8	64.2	1.8	5.82
December	39.1	56.3	1.3	8.89
Annual	**45.0**	**70.6**	**45**	**47**

NOTES:
(a) Temperature and precipitation data taken from the Kentfield climate station (044500) from the Western Regional Climate Center (WRCC) for the period 1 January 1902 through 10 June 2016.
(b) ETo data taken from the California Irrigation Management Information System (CIMIS) Point San Pedro station (157) and has a period of record from December 2002 through November 2020.

Chart 3-4 Average Monthly Climatic Conditions



3.5 Climate Change Considerations

☑ ***CWC § 10630***

It is the intention of the Legislature, in enacting this part, to permit levels of water management planning… while accounting for impacts of climate change.

Water managers throughout California are beginning to see the effects of a changing climate and recognize the risks associated with these changes. A portion of the District's service area is located along the coast of the San Francisco Bay, which, with a changing climate, could see rising sea levels. Over the last 30 years, mean sea level around the San Francisco Bay area, including the District's service area, has been observed to change between 0 and 3 millimeters per year (NOAA, 2021). There are a number of sensitive habitats, as well as man-made structures, located along this coastline that could be affected by a rise in sea level. The Corte Madera Marsh State Marine Park and Bothin Marsh Preserve, as well as several other marsh lands, are located near the coastline. The towns of Tiburon, Sausalito, and San Rafael have marinas that rely on the protection of breakwaters, and developed areas in San Rafael rely on a levee structure for protection from storm surges. There are also a number of ferries that run from San Francisco to Marin County which bring tourists and economic interests to the region.

As the climate changes, less frequent, more intense storms are expected. These storms have an increased potential to cause flooding, both in areas with historical flooding and in new areas. While the District is not located within a 200-year floodplain, it does rely on a network of reservoirs to capture runoff from the local watersheds. A change in precipitation patterns will necessitate water management strategies that are able to capture and store the precipitation from these storms while managing flood risk. With less frequent, more intense storms, there will also be extended dry periods that may have significant impact on available water supplies for the District. These potential impacts are discussed further in Section 6.10.1. The watersheds that MMWD relies on for water supply are heavily wooded. Under climate change, soils and wooded areas are expected to become increasingly dry, which creates additional fuel load for wildfires.

The District's service area provides rich habitat for a healthy ecosystem, which could be affected by a changing climate. Marin County is home to 17 endangered, threatened, or rare fauna species, including the California Tiger Salamander, Western snowy plover, and Longfin smelt. There are also 20 endangered, threatened, or rare flora in Marin County, including the Tiburon paintbrush, two-fork clover, and Sonoma spineflower. As the climate changes, climate variability could lead to changes in habitat distribution for these species, furthering endangering them. The San Francisco Bay is a key estuary for California that relies on freshwater draining from the Sacramento and San Joaquin rivers. Changes in snowmelt and rain/snow patterns in the Sierra Nevada Mountains would alter the flows in both of these rivers, ultimately affecting the seasonal freshwater flow patterns for the Bay.

Impacts associated with climate change are further discussed in the *Marin County Multi-Jurisdictional Local Hazard Mitigation Plan,* dated 2018, which is incorporated into this UWMP by reference (County LHMP; Marin County, 2018). The County LHMP assesses Marin County's vulnerabilities to various hazards and presents mitigation strategies that are planned over the next five years. Risks described in the current County LHMP include flooding, severe storms, wildfires, and landslides that are anticipated to occur due to climate change. The District is also preparing its own LHMP, which will address some of these climate change related risks and vulnerabilities and is expected to be completed by June 2022.

A discussion of climate change impacts specific to the SCWA water system is provided in the *Sonoma County Water Agency Local Hazard Mitigation Plan,* dated 16 October 2018, which is also incorporated into this UWMP by reference (SCWA LHMP; SCWA, 2018). The SCWA LHMP specifically assesses SCWA's natural hazard risks and vulnerabilities facing the SCWA infrastructure and provides a plan of action to address these vulnerabilities. As described in the SCWA LHMP, the most significant climate change-related vulnerabilities for SCWA are associated with floods, wildfires, landslides, and drought.

The District's *Water Resources Plan 2040* dated March 2017 (Water Resources Plan; MMWD, 2017) also considered drought scenarios associated with climate change, as well as other water supply reliability threats such as wildfires, landslides, and other water quality changes that could result from climate change. The Water Resources Plan is also incorporated into this UWMP by reference.

Climate change impacts on the District's water demands are discussed in Section 4.4, and climate change impacts on the District's water supply are discussed in Section 6.10.1.

3.6 Water Distribution System

The District's service area boundaries, location of water treatment plants, and potable water distribution system are illustrated in **Figure** 3-3.

The District's potable and raw water distribution system includes approximately 886 miles of water mains, 94 pump stations, and 121 treated water storage tanks[5] with a total storage capacity of 74.9[6] million gallons (MG). The District treats water at its three treatment plants, the Bon Tempe Treatment Plant

[5] This total does not include 3 clearwells and 7 hydropneumatic tanks.

[6] Excludes 7 MG from clearwells and 12,000 gallons from hydropneumatic tanks.

(BTTP) near Ross, the San Geronimo Treatment Plant (SGTP) in Woodacre, and the Ignacio treatment facility in Novato. Together, these facilities have a combined design capacity of 71 million gallons per day (mgd). Observed high flows have reached 45 mgd in July 2006; however, the average daily maximum flow is approximately 22.4 mgd over the last 10 years. In 2019, the total production of the three plants averaged 22.8 mgd.

The District's potable water system includes pipelines ranging in size from 3/4-inch pipes connecting customers' water meters to the District's mains, to the 42-inch transmission mains that carry source water to the treatment plants.

In addition to the District's potable water system, the District also owns and operates a recycled water system, which is described in detail in Section 6.4.

Figure 3-1 Regional Vicinity

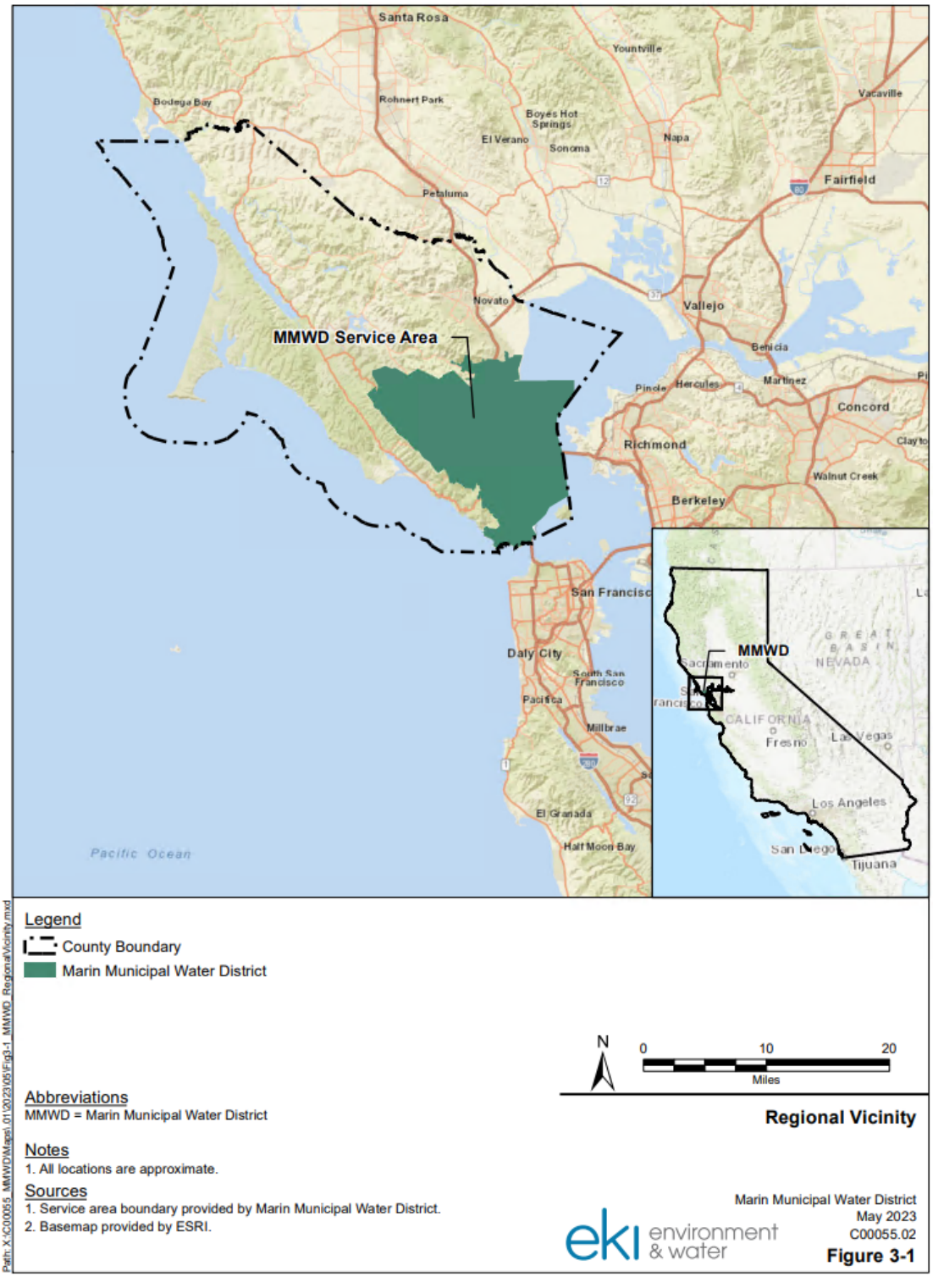


Figure 3-2 District Service Area

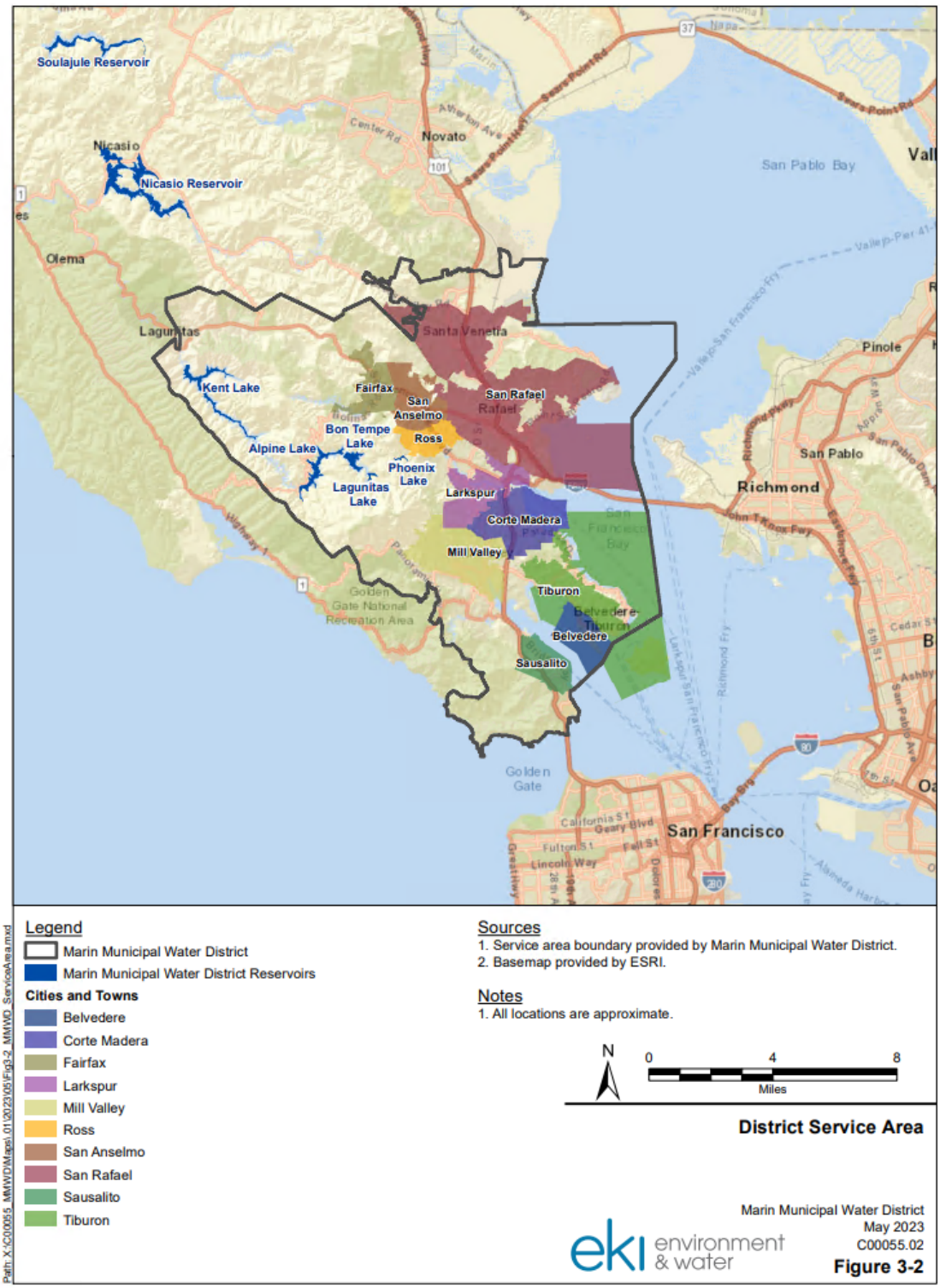


Figure 3-3 District Water System

4. SYSTEM WATER DEMANDS

☑ ***CWC § 10631 (d) (1)*** *A plan shall be adopted in accordance with this chapter that shall do all of the following:*

For an urban retail water supplier, quantify, to the extent records are available, past and current water use, over the same five-year increments described in subdivision (a), and projected water use, based upon information developed pursuant to subdivision (a), identifying the uses among water use sectors, including, but not necessarily limited to, all of the following:

(A) Single-family residential.

(B) Multifamily.

(C) Commercial.

(D) Industrial.

(E) Institutional and governmental.

(F) Landscape.

(G) Sales to other agencies.

(H) Saline water intrusion barriers, groundwater recharge, or conjunctive use, or any combination thereof.

(I) Agricultural.

(J) Distribution system water loss.

(2) *The water use projections shall be in the same five-year increments described in subdivision (a).*

This section describes and quantifies past and current water use and future water use projections through the year 2045. For purposes of this Urban Water Management Plan (UWMP or Plan), "potable water demand" is defined as the volume of water produced by the Marin Municipal Water District (MMWD or District), including both local surface water treated by the District and purchased water from Sonoma County Water Agency (SCWA or Sonoma Water). The District also serves raw and recycled water to customers, referred to herein as "non-potable water demand."[7]

Among other factors, water demand is dependent on climate, population, industry, and the types of development present in a community. Sections 4.1 and 4.2 describe MMWD's historical and projected water uses for residential, commercial, institutional, and landscape irrigation purposes (water use sectors A, B, C, E, and F, per California Water Code [CWC] §10631(e)(1)), as well as raw and recycled water uses. Distribution system water loss (water use sector J) is discussed in Section 4.1.4. As described in Section 4.3, this discussion does not include demands for water use sectors D, G, H, and I as they are not applicable or present within the District's service area. Section 4.4 describes anticipated climate change impacts to demand, and Section 4.5 discusses the District's urban water use objective requirements. Note that future water demand projections are subject to review and revision every five years as part of the UWMP update process.

[7] Given the way the DWR required submittal tables are structured, raw and potable water demands are presented in Chapter 4, and recycled water supply and demand is presented separately, in Chapter 6.

4.1 Current and Historic Total Water Demand

The following sections of the UWMP present the District's current and historical water demands, as well as the projected future demand in five-year increments from 2025 through 2045.

4.1.1 Current and Historical Potable Water Demand

Current and historical potable water demand by water use sector from 2016 through 2020 is provided in **Table** 4-1 and its associated charts. Water demand within the District is primarily measured using water meters that are installed at each customer account. Records of water use are maintained by the District and are based on billing data. Water use within the District is tracked for the following sectors:

- Single Family Residential (SFR);
- Multi-Family Residential (MFR);
- Commercial;
- Institutional/Governmental;
- Landscape; and
- Other.

Water use within the District's service area is predominantly associated with residential use, with 54% of the water use between 2016 and 2020 from SFR accounts and 12% from MFR accounts. Commercial accounts comprised 10% of total water use, landscape accounts comprised 5.5%, and institutional/governmental comprised 5.3%.

As shown in **Table** 4-2 and its associated charts, the total and per capita water use increased from 2011 through 2013, then declined from 2014 through 2016. These trends were likely influenced by the historic drought conditions, mandatory state-wide restrictions in urban water use imposed by the California State Water Resources Control Board (SWRCB), and local drought response. Total and per capita water use has remained lower than pre-drought conditions, with an increase beginning in 2017, indicating a degree of rebound following the drought. **Table** 4-2 and associated charts show total and per capita water use for all potable and raw water (excluding environmental releases), and for potable and raw water adjusted to remove the volume used to meet demands of the recycled water system. Due to infrastructure upgrades at the recycled water plant, all demands by the recycled water system were met by potable water in 2019 and 2020, resulting in increased potable water use by 661 AF in 2019 and 748 AF in 2020; potable water is not anticipated to be needed to supplement the recycled water system going forward as plant upgrades were completed in April 2021. Per capita potable and raw water use in 2020 was 128 GPCD, and adjusted potable water use (excluding recycled water system backup) was 125 GPCD.

In addition to the demands shown below, SCWA also provides a limited amount of water to the North Marin Water District's Point Reyes Public Water System (PWS) as a supplement to the system's groundwater supplies, with the transfer being performed by the District. The Point Reyes PWS has approximately 766 service connections and serves a population of 1,700 (SDWIS, 2021). Historically, transfers to the Point Reyes PWS have been minimal, up to a maximum of 9 AFY in a given year. Given that this water use is *de minimis* (i.e., less than 0.03% of total demand), it is not accounted for separately

in **Table** 4-1 or the demand projections presented in Section 4.2.5, and are not considered to be substantive within the level of precision of these estimates.

Table 4-1 Demands for Potable and Non-Potable Water – Actual (DWR Table 4-1)

Use Type	Additional Description *(as needed)*	Level of Treatment When Delivered	Volume				
			2016	2017	2018	2019	2020
Single Family		Drinking Water	12,419	13,337	13,886	13,579	15,287
Multi-Family		Drinking Water	2,946	3,004	3,065	3,063	3,311
Commercial	Business/Industrial	Drinking Water	2,583	2,628	2,671	2,634	2,282
Institutional/Governmental		Drinking Water	1,295	1,374	1,365	1,386	1,323
Landscape		Drinking Water	1,248	1,369	1,417	1,348	1,525
Other Potable	Fireline/Hydrant	Drinking Water	28	35	38	50	62
Losses	(b)	Drinking Water	2,113	2,795	2,623	2,788	2,732
Other Non-Potable	Water sold to the Meadow Club	Raw Water	301	310	309	164	180
Other Potable	Other non-revenue water (c)	Drinking Water	13	16	13	13	--
Other Potable	Potable water make-up to recycled water system (d)	Drinking Water	65	101	91	661	748
Wetlands or wildlife habitat	Environmental releases from Kent and Soulajule Lakes	Raw Water	10,314	8,377	13,245	8,080	12,699
		TOTAL	33,324	33,345	38,722	33,769	40,149

NOTES:
(a) Volumes are in units of AF.
(b) "Losses" for 2016 through 2019 are the "water losses" estimated using the AWWA Free Water Audit Software and includes both real and apparent losses. Losses for 2016 through 2018 may include potable water make-up to the recycled water system. For 2020 where the AWWA Water Loss Worksheet was unavailable, total non-revenue water is used, calculated as the difference between 2020 potable water production and consumption.
(c) "Other non-revenue water" includes authorized but unbilled, unmetered consumption that does not fall under the category of "losses", such as fire flow, system flushing, hydrant leaks, etc. Other non-revenue water is calculated as the difference between "water losses" and "non-revenue water" as reported in the AWWA Water Loss Worksheets.
(d) Potable water has historically been used to supplement the recycled water system. The recycled water plant was taken offline in 2019 and 2020 to allow for upgrades, and all demands by the recycled water system were met by potable water during this time. Plant upgrades were completed in April 2021 and potable water is not anticipated to be needed to supplement the recycled water system going forward.

Chart 4-1A Annual Water Demand by Sector: 2016-2020

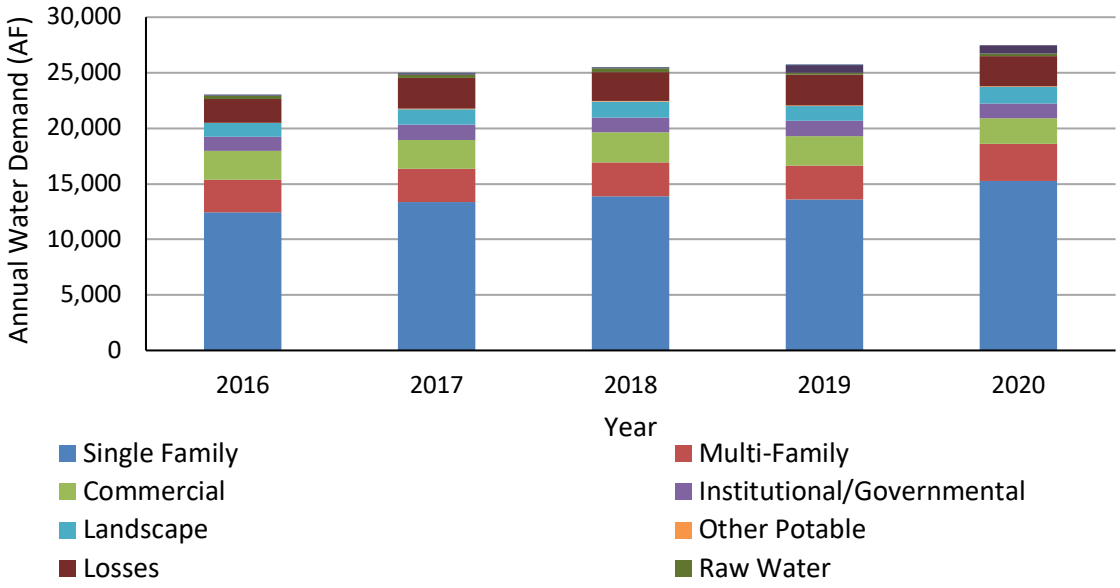


Chart 4-1B Percentage of Total Water Demand by Sector: 2016-2020

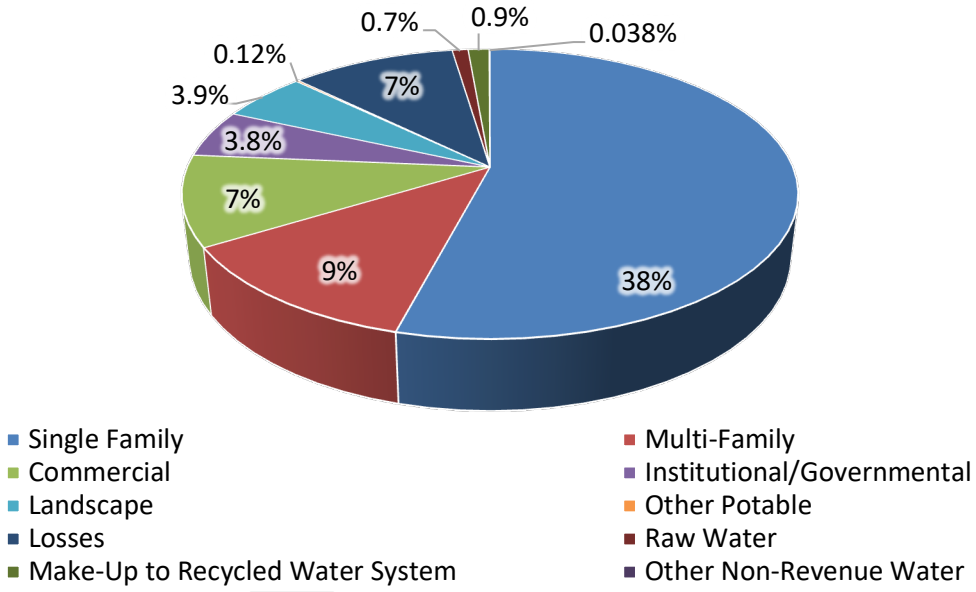


Table 4-1A and 4-1B exclude Environmental Releases averaging 10,543 AF (29%) of the Total Water Demands.

Table 4-2 Historical and Current Potable Water Demand and Population

Year	Potable and Raw Water Demand (AF) (b)	Adjusted Potable and Raw Water Demand (AF) (b) (c)	Service Area Population	Per Capita Potable and Raw Water Demand (GPCD) (b)	Adjusted Per Capita Potable and Raw Water Demand (GPCD) (b) (c)
2010	25,727	25,641	183,716	125	125
2011	25,476	25,295	185,389	123	122
2012	26,893	26,722	187,089	128	128
2013	28,725	28,644	188,218	136	136
2014	24,846	24,790	190,267	117	116
2015	23,207	23,122	191,575	108	108
2016	23,010	22,945	192,402	107	106
2017	24,968	24,868	192,328	116	115
2018	25,477	25,386	192,277	118	118
2019	25,688	25,027	192,138	119	116
2020	27,451	26,703	191,269	128	125

NOTES:
(a) Unless otherwise noted, volumes are in units of AF.
(b) Excludes environmental releases from Kent and Soulajule Lakes.
(c) "Adjusted" and "Adjusted Per Capita" values are demands that are adjusted to remove potable water used to meet recycled water system demands.

Chart 4-2A Current and Historical Potable and Raw Water Demand and Population

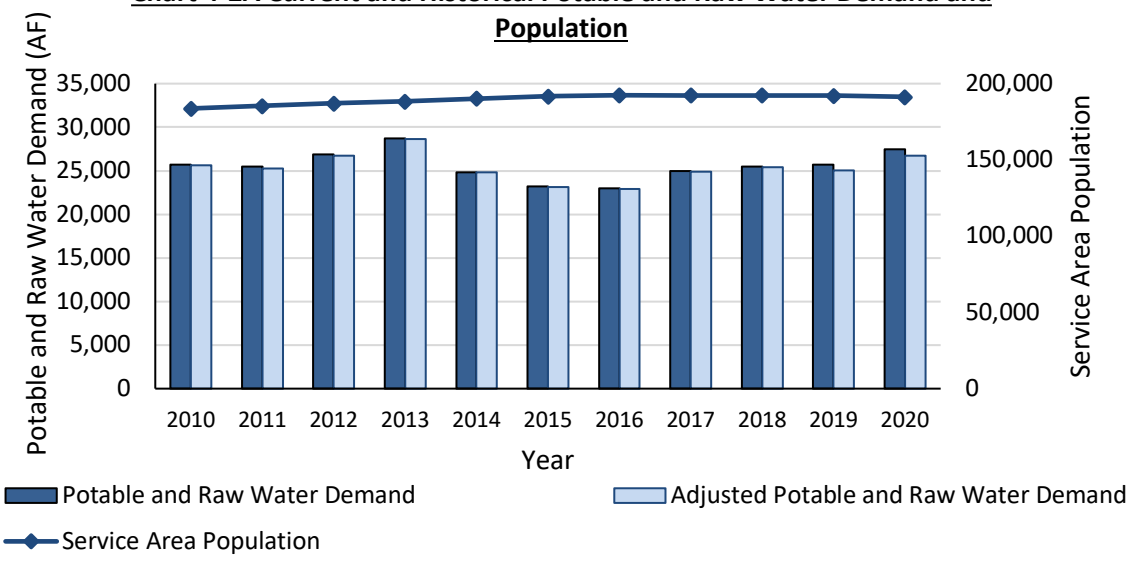
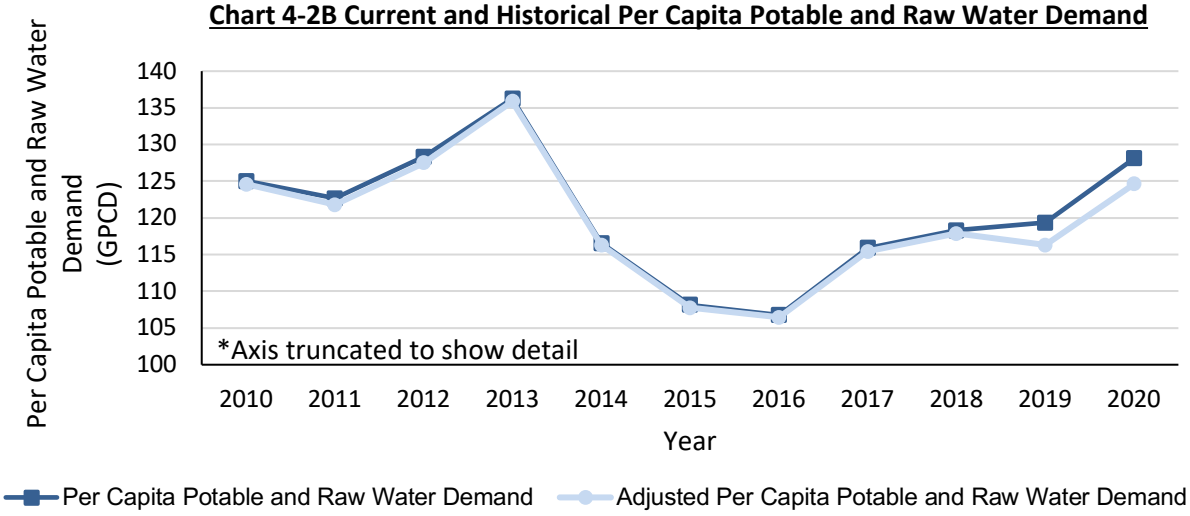


Chart 4-2B Current and Historical Per Capita Potable and Raw Water Demand



4.1.2 Current and Historical Non-Potable Water Demand

As described below, there are two sources of non-potable demand within the District: (1) raw water and (2) recycled water demands.

The District currently serves raw water to the Meadow Club golf course. The District also releases water from the Kent and Soulajule Lakes to meet environmental flow requirements that benefit silver salmon and steelhead populations in Walker Creek and Lagunitas Creek. In total, raw water served to customers averaged 253 AFY, or approximately 1.0%, from 2016 through 2020 and environmental releases averaged 10,543 AFY, or approximately 29% of total water use over the same period.

The District made an agreement with the California Department of Fish and Game in 1976, with an amendment in 1985, to release a volume of water from Soulajule reservoir that maintains a constant streamflow in Walker Creek of 20 cubic feet per second (cfs) during the winter and spring months. The amount of water released is decreased in the summer and fall months and when the reservoir level is low.

The District releases water from Kent reservoir in accordance with the 1995 SWRCB Order 95-17 to maintain the streamflow in Lagunitas Creek of 20 to 25 cfs during winter months in wet years, with decreased flows during the summer and during dry years. Increased upstream migration flows are released from Kent for four three-day periods between November and February to provide for the upstream migration of anadromous fish.

Annual recycled water use represents approximately 2.7% of total water use within the District in 2020. It should be noted that recycled water demands are primarily associated with outdoor irrigation and therefore are highest between the months of April and October. As such, the actual maximum day supply of recycled water can represent up to 7.7% of the District's total demand during summer months. For additional information regarding the recycled water system, refer to Section 6.4.

4.1.3 Potable Water Make-Up to the Recycled Water System

The recycled water system is supplemented with potable water to meet demands, as necessary. This potable make-up represented up to 748 AFY or 2.7% of total potable water demand from 2016 through 2020. In 2019 and 2020, the recycled water system was shut down to allow for treatment plant upgrades and 100% of recycled water demand was met by potable water. Following the completion of treatment plant upgrades in April 2021, MMWD anticipates that all demand by the recycled water system will be met by recycled water. The recycled water system is discussed in further detail in Section 6.4.

4.1.4 Distribution System Water Loss[8]

☑ ***CWC § 10631 (3)***

(A) The distribution system water loss shall be quantified for each of the five years preceding the plan update, in accordance with rules adopted pursuant to Section 10608.34.

(B) The distribution system water loss quantification shall be reported in accordance with a worksheet approved or developed by the department through a public process. The water loss quantification worksheet shall be based on the water system balance methodology developed by the American Water Works Association.

(C) In the plan due July 1, 2021, and in each update thereafter, data shall be included to show whether the urban retail water supplier met the distribution loss standards enacted by the board pursuant to Section 10608.34.

Distribution system water losses for the previous five years are summarized in **Table** 4-3. Water loss is the sum of apparent and real losses. Apparent losses include metering inaccuracies, systematic data handling errors, and unauthorized consumption. Real losses represent water loss attributable to the distribution system and include physical water losses from the pressurized system and storage tanks up to the point of customer consumption. Since 2016, urban retail water suppliers have been required under CWC §10608.34 and California Code of Regulations (CCR) §638.1 et seq to quantify distribution system water losses using the American Water Works Association (AWWA) Free Water Audit Software (referred to as the "AWWA Water Loss Worksheet").

Total water losses calculated in the most recent AWWA Water Loss Worksheets are provided in **Table** 4-3, and are available through DWR's Water Use Efficiency Data Portal.[9] During calendar year 2019, the District's real losses were estimated to be 1,964 AF, or 7.6% of the total volume of water supplied; apparent losses were estimated to be 823 AF, or approximately 3.2% of the total volume of water supplied.

[8] The District acknowledges that the Individual System Water Loss Standard has recently been updated; however, the update is not reflected in this section because the purpose of this UWMP is to accurately represent the updated population figures based on the latest Regional Housing Needs Allocation provided by the Association of Bay Area Governments. This update along with other new requirements will be reflected in the upcoming 2025 UWMP.

[9] DWR's Water Use Efficiency Data Portal: https://wuedata.water.ca.gov/awwa_plans.

CWC §10631 (3)(c) requires that this UWMP demonstrate whether the distribution loss standards enacted by the SWRCB pursuant to §10608.34 have been met. However, the SWRCB has yet to establish these standards, and thus consistency with these standards cannot be demonstrated herein.

Table 4-3 12 Month Water Loss Audit Reporting (DWR Table 4-4)

Reporting Period Start Date	Volume of Water Loss
07/2014	1,500
01/2016	2,113
01/2017	2,795
01/2018	2,623
01/2019	2,788
NOTES: (a) Volumes are in units of AF.	

4.2 Projected Total Water Demand

The District's water demand projections were prepared as part of the 2020 Urban Water Management Plan Water Demand Analysis and Water Conservation Measures Update (Demand Report; EKI, 2020), which is provided in **Appendix C**. Projected total water demand is summarized in the following subsections based on the methods and assumptions included in the Demand Report.

The projected water demands have been adjusted in accordance with the latest ABAG RHNA. This adjustment takes into account various factors such as population growth and the overall demand for water in the region. The revised estimate of water demand provides a more conservative representation of the current and future water needs in the area. These adjustments will help ensure that there is sufficient water supply to meet the demands of the growing population while also addressing any potential challenges related to water availability and sustainability.

4.2.1 Projected Potable Water Demand

As described in more detail below and in the Demand Report (**Appendix C**), projected water demands for the District were estimated by:

- Applying an estimated growth rate to the number of accounts within each water use sector based on projected population and employment growth rates,
- Identifying known planned developments within the District to verify that account growth projections consider all currently anticipated growth,
- Evaluating and selecting water demand factors for each water use sector based on review of recent average per account water use representing three scenarios (i.e., pre-drought conditions, post-drought conditions, and a partial drought rebound scenario),
- Estimating future passive savings using the Alliance for Water Efficiency (AWE) Water Conservation Tracking Tool (AWE model), and

- Calculating estimated future water demand that incorporates the anticipated account growth, water demand factors, and estimated future passive water savings.

This methodology is consistent with CWC §10631(d)(4)(A), which requires that "Water use projections, where available, shall display and account for the water savings estimated to result from adopted codes, standards, ordinances, or transportation and land use plans identified by the urban water supplier, as applicable to the service area." The assumptions used as the basis for the demand projections were developed in close coordination with the District and reflect a land-use based approach consistent with community planning within the District.

Projected customer water demands through 2045 are presented in **Table** 4-4 and its associated chart. These demands are broken down by sector, including water loss, raw water, and potable make-up to the recycled water system. Recycled water demands are not included in **Table** 4-4 and are discussed in Section 6.4. As indicated in **Table** 4-5, the water use projections presented in **Table** 4-4 include assumptions about future water savings due to passive conservation (Section 4.2.4) and water use by lower income households (Section 4.2.3).

Table 4-4 Use for Potable and Non-Potable - Projected (DWR Table 4-2)

Use Type	Additional Description *(as needed)*	Projected Water Use				
		2025	2030	2035	2040	2045
Single Family		15,049	16,065	16,277	16,475	16,728
Multi-Family		3,067	3,077	2,961	2,864	2,799
Commercial	Business/ Industrial	2,845	2,979	2,966	2,916	2,876
Institutional/ Governmental		1,637	1,759	1,788	1,791	1,795
Landscape		1,697	1,824	1,853	1,856	1,861
Other Potable	Fireline/ Hydrant	50	54	55	55	55
Losses	(c)	2,821	2,985	3,001	3,008	3,026
Other Non-Potable	Raw Water sold to the Meadow Club	171	174	176	176	176
Wetlands or wildlife habitat	Environmental releases from Kent and Soulajule Lakes	10,543	10,543	10,543	10,543	10,543
TOTAL		37,882	39,462	39,620	39,685	39,859

NOTES:
(a) Volumes are in units of AF.
(b) Projected water demands were estimated using methodology described in **Appendix C** and incorporate passive conservation savings as described in Section 4.2.4, and were then revised to account for RHNA projections.
(c) Losses represent all non-revenue water, which includes both real and apparent losses, as well as other non-revenue water.

Chart 4-4 Current and Projected Water Demand by Sector

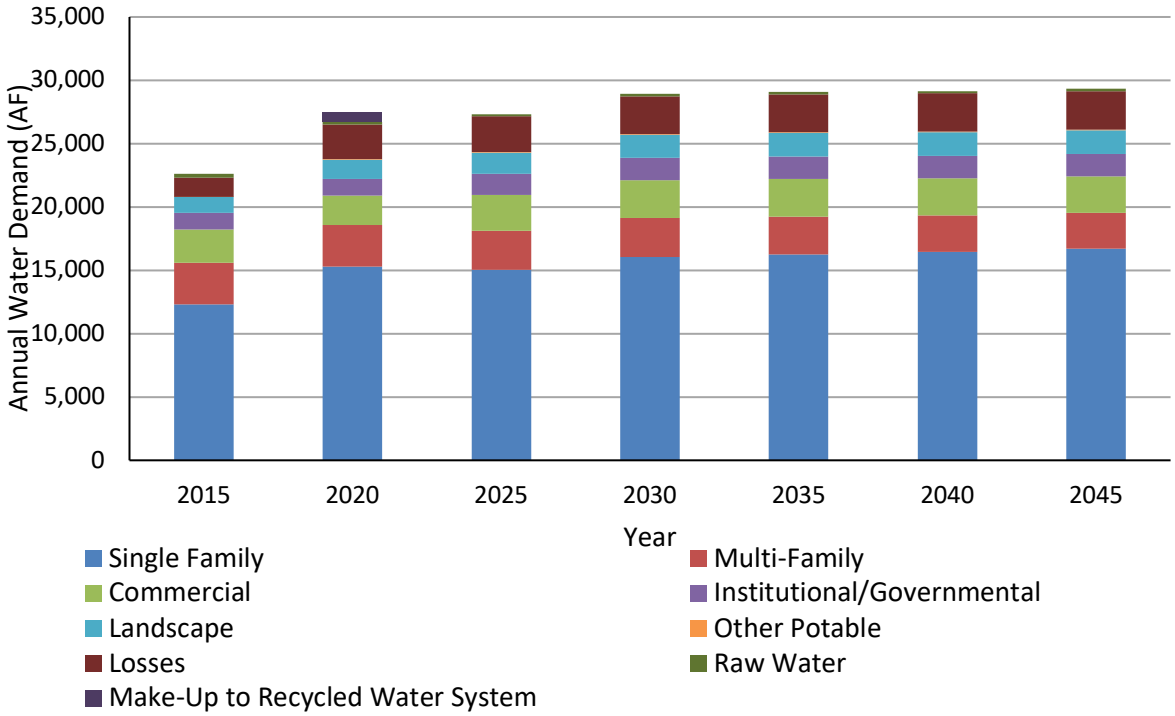


Table 4-5 Inclusion in Water Use Projections (DWR Table 4-5)

Are Future Water Savings Included in Projections?	Yes
If "Yes" to above, state the section or page number, in the cell to the right, where citations of the codes, ordinances, or otherwise are utilized in demand projections are found.	Refer to Section 4.4 and Table 4-6 of **Appendix C**.
Are Lower Income Residential Demands Included In Projections?	Yes
NOTES:	

4.2.2 Projected Non-Potable Water Demand

As shown in **Table** 4-4 and described in **Appendix C**, the projected volume of raw water served to customers is anticipated to be 176 AFY by 2045. Projections for environmental releases from Kent and Soulajule Lakes are projected to be 10,543 AFY by 2045.

As discussed in **Appendix C**, recycled water demand was projected using the same methodology as potable water and is projected to be 750 AFY by 2045. Due to the format of the required DWR submittal tables, projected recycled water demand is not included in **Table** 4-4, but is included in **Table** 4-8 in Section 4.2.5.

4.2.3 Water Use for Lower Income Households

☑ ***CWC § 10631.1***

(a) The water use projections required by Section 10631 shall include projected water use for single-family and multifamily residential housing needed for lower income households, as defined in Section 50079.5 of the Health and Safety Code, as identified in the housing element of any city, county, or city and county in the service area of the supplier.

(b) It is the intent of the Legislature that the identification of projected water use for single-family and multifamily residential housing for lower income households will assist a supplier in complying with the requirements under Section 65589.7 of the Government Code to grant a priority for the provision of service to housing units affordable to lower income households.

California Senate Bill No. 1087 (SB 1087), Chapter 727, was passed in 2005 and amended by Government Code Section 65589.7 and Water Code Section 10631.1. SB 1087 requires local governments to provide a copy of their adopted housing element to water and sewer providers. In addition, it requires water providers to grant priority for service allocations to proposed developments that include housing units for lower income families and workers. Subsequent revisions to the UWMP Act require water providers to develop water demand projections for lower income single and multi-family households.

MMWD is required to serve any development that occurs within its service area, regardless of the income level of the future residents and does not discriminate in terms of supplying water. It is ultimately the City's or County's responsibility to approve or not approve developments within the service area.

As indicated in **Table** 4-5, the water use projections presented in Section 4.2.1 and **Table** 4-4 include projected water use by lower income households. A "lower income household" is defined under California Health and Safety Code §50079.5(a) to be a household with less than 80% of median income, adjusted for family size. ABAG's 2023-2031 Final RHNA Plan for the San Francisco Bay Area was used to estimate the proportion of new lower income households anticipated within the District (ABAG, 2022). New lower income households for all cities within the District's service area, as well as the unincorporated area within Marin County, were estimated to comprise approximately 46% of all new households needed in the District's service area. **Table** 4-6 shows the projected water demands for lower income households based on 46% of the total single-family and multi-family residential projected water uses included in **Table** 4-4.

Table 4-6 Projected Water Use for Lower Income Households

Lower Income Water Demand Sector	Projected Water Use (AFY)				
	2025	2030	2035	2040	2045
Single Family Residential	6,904	7,370	7,467	7,559	7,674
Multi-Family Residential	1,407	1,412	1,358	1,314	1,284
Total	8,311	8,782	8,826	8,873	8,958
NOTES: Volumes are in units of AF.					

4.2.4 Water Savings from Codes, Standards, Ordinances, or Transportation and Land Use Plans

☑ ***CWC § 10631 (d) (4)***

(A) Water use projections, where available, shall display and account for the water savings estimated to result from adopted codes, standards, ordinances, or transportation and land use plans identified by the urban water supplier, as applicable to the service area.

(B) To the extent that an urban water supplier reports the information described in subparagraph (A), an urban water supplier shall do both of the following:

(i) Provide citations of the various codes, standards, ordinances, or transportation and land use plans utilized in making the projections.

(ii) Indicate the extent that the water use projections consider savings from codes, standards, ordinances, or transportation and land use plans. Water use projections that do not account for these water savings shall be noted of that fact.

"Passive conservation" refers to water savings resulting from actions and activities that do not depend on direct financial assistance or educational programs from the District. As described further in **Appendix C**, these savings result primarily from: (1) the natural replacement of existing plumbing fixtures with water-efficient models required under current plumbing code standards, and (2) the installation of water-efficient fixtures and equipment in new buildings and retrofits as required under CALGreen Building Code Standards. The water use projections discussed in Section 4.2.1 and summarized in **Table** 4-4 included water savings associated with these codes and standards. Specifically, passive water savings for the District were calculated using the Alliance for Water Efficiency (AWE) Water Conservation Tracking Tool (referred to as the AWE model; AWE, 2016). The AWE model is an industry standard tool that incorporates historical population, residential building stock, number of accounts, and projected population and account growth to estimate future passive savings. More information regarding the passive savings estimates using the AWE model can be found in **Appendix C**. Projected potable water demand with and without estimated passive savings is shown in **Table** 4-7 and its associated chart.

While projections account for passive savings, the District has taken a more conservative approach to demand projections by not accounting for savings associated with future active conservation measures. However, savings associated with all past active conservation efforts are embedded into the demand projections. This approach is conservative, as it projects a higher estimate of probable demand. Active conservation thus increases resiliency for District customers by further increasing efficient utilization of

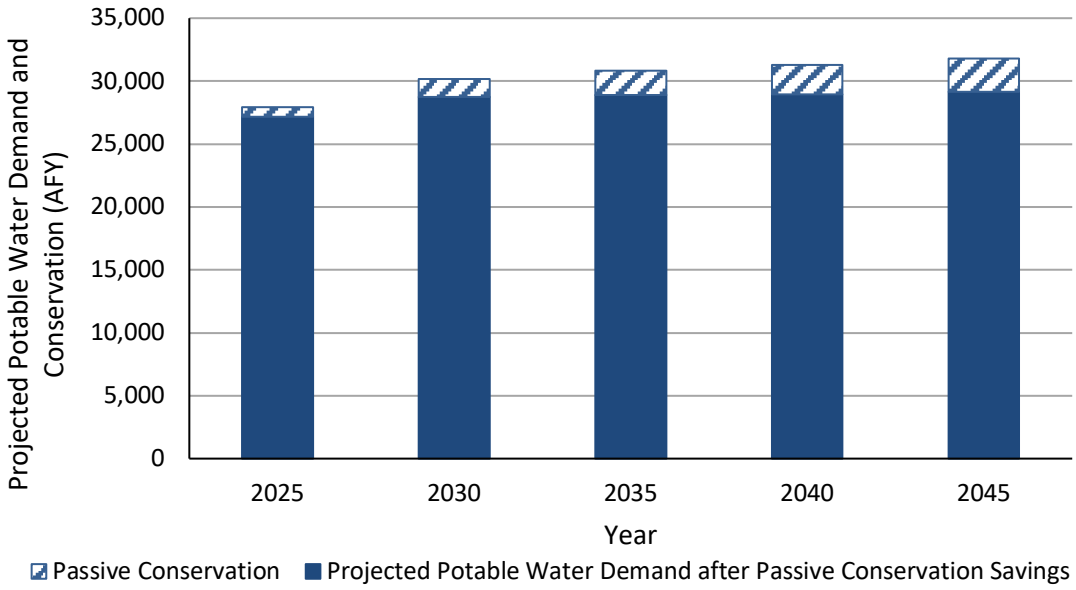
available supplies. It is important to be conservative in estimating potential future shortfalls in water supply planning efforts so that the District can be confident in its ability to meet state-mandated water use reductions in addition to planning for sufficient supply to meet future demands.

Table 4-7 Projected Potable Water Demand and Projected Passive and Active Water Conservation

Water Conservation Type	Projected Potable Water Demand (AFY)				
	2025	2030	2035	2040	2045
Projected Potable Water Demand Without Conservation	27,918	30,151	30,808	31,281	31,795
Projected Passive Conservation Savings	750	1,407	1,907	2,315	2,656
Projected Potable Water Demand after Passive Conservation Savings	27,168	28,744	28,901	28,966	29,139

NOTES:
(a) The District also implements a number of active conservation programs, as discussed in Chapter 9 and **Appendix C**.
(b) Volumes exclude raw water and environmental releases.

Chart 4-7 Projected Potable Water Demand and Conservation



4.2.5 Projected Total Water Demand

The District's total projected water demands are summarized in **Table** 4-8.

Table 4-8 Gross Water Use (DWR Table 4-3)

	2020	2025	2030	2035	2040	2045
Potable Water, Raw, Other Non-potable *From DWR Tables 4-1 and 4-2*	40,149	37,882	39,462	39,620	39,685	39,859
Recycled Water Demand *From DWR Table 6-4*	748	750	750	750	750	750
TOTAL WATER USE	40,897	38,632	40,211	40,369	40,434	40,608
NOTES: (a) Volumes are in units of AF.						

4.3 Water Use Sectors Not Included in the Demand Projections

Several water use sectors listed in CWC §10631(d)(1) are not included in the water demand projections described in Sections 4.2.1 and 4.2.2 because they are not applicable to the District. The following sectors were not included in the demand projections in this Plan:

- Industrial (CWC §10631(d)(1)(D)) – Limited industrial water use occurs within the District, and this water use is tracked within the commercial water use sector, and thus demands by industrial users are captured in the historical and projected water demands described in Sections 4.2.1 and 4.2.2.
- Sales to Other Agencies (CWC §10631(d)(1)(G)) – The District sells water to the National Parks Service Golden Gate National Recreation Area (GGNRA), which operates its own small public water system of approximately 227 service connections (SDWIS, 2021). The District tracks sales to this system as a normal customer account, and thus demands associated with the GGNRA are captured in the historical and projected water demands described in Sections 4.2.1 and 4.2.2. The District also transfers water to the Point Reyes PWS operated by North Marin Water District. As discussed in Section 4.1.1, this constitutes less than 0.03% of MMWD's demands, and is not tracked separately.
- Saline Water Intrusion Barriers, Groundwater Recharge, or Conjunctive Use (CWC §10631(d)(1)(H)) – The District does not currently use, nor does it plan to use, water for saline water intrusion barriers, groundwater recharge, or conjunctive use.
- Agricultural (CWC §10631(d)(1)(I)) – The District does not currently, nor does it plan to, provide water for agricultural uses.

4.4 Climate Change Impacts to Demand

☑ ***CWC § 10635(b)***

(4) Considerations of the historical drought hydrology, plausible changes on projected supplies and demands under climate change conditions, anticipated regulatory changes, and other locally applicable criteria.

The methodology used to develop demand projections herein considers the impacts of climate change on projected demands. California experienced a historic drought between 2011-2017. In 2014, Governor Brown issued Executive Order B-26-14 declaring a Drought State of Emergency and requested all Californians to voluntarily reduce water use by 20%. In 2015, the SWRCB implemented emergency conservation regulations that, among other things, required water agencies to reduce their water use and prohibited certain types of water uses. As a result, the District experienced an overall decrease in demands during the historic drought, most significantly during 2015. As explained further in **Appendix C**, the demand factors evaluated herein consider both the 2011-2013 period, in which customers increased their water use (in part due to the drought conditions, prior to the imposed restrictions), as well as the observed rebound in demand following the drought (2017-2019). Thus, the periods used to develop the demand projections reflect conditions representative of the hotter, drier weather expected as a result of climate change.

4.5 Urban Water Use Objectives (Future Requirements)[10]

☑ ***CWC § 10609.20***

(a) Each urban retail water supplier shall calculate its urban water use objective no later than January 1, 2024, and by January 1 every year thereafter.

(b) The calculation shall be based on the urban retail water supplier's water use conditions for the previous calendar or fiscal year….

☑ ***CWC § 10609.22***

(a) An urban retail water supplier shall calculate its actual urban water use no later than January 1, 2024, and by January 1 every year thereafter.

(b) The calculation shall be based on the urban retail water supplier's water use for the previous calendar or fiscal year….

☑ ***CWC § 10609.24***

(a) An urban retail water supplier shall submit a report to the department no later than January 1, 2024, and by January 1 every year thereafter. The report shall include all of the following:

(1) The urban water use objective calculated pursuant to Section 10609.20 along with relevant supporting data.

(2) The actual urban water use calculated pursuant to Section 10609.22 along with relevant supporting data.

(3) Documentation of the implementation of the performance measures for CII water use.

(4) A description of the progress made towards meeting the urban water use objective.

(5) The validated water loss audit report conducted pursuant to Section 10608.34.

(b) The department shall post the reports and information on its internet website.

(c) The board may issue an information order or conservation order to, or impose civil liability on, an entity or individual for failure to submit a report required by this section.

Beginning in 2023, urban water retailers will be required to report on "annual water use objectives" by 1 November of each year and to achieve these objectives by 1 January 2027. The annual water use objectives will be calculated based on standards for indoor residential water use, outdoor residential water use, and distribution system water loss. Additionally, it is anticipated that performance-based standards for the commercial, industrial, and institutional sectors, separate from the annual water use objectives, will also be developed by DWR and implemented in the future. However, the specific standards that will be used to determine a retailer's annual urban water use objectives are currently under development by DWR, and thus, the annual urban water use objectives for the District cannot be calculated or estimated. Once the urban water use objectives are released, the District will evaluate its

[10] The District acknowledges that the Urban Water Use Objective has recently been updated; however, the update is not reflected in this section because the purpose of this UWMP is to accurately represent the updated population figures based on the latest Regional Housing Needs Allocation provided by the Association of Bay Area Governments. This update, along with other new requirements, will be reflected in the upcoming 2025 UWMP.

historical and current water use compared to the new objectives and will evaluate the need to adjust its conservation and water loss management measures to meet the new objectives.

One of the components for calculating the future water use objectives is provided for in CWC §10609.4.(a), which states "(1) Until January 1, 2025, the standard for indoor residential water use shall be 55 gallons per capita daily. (2) Beginning January 1, 2025, and until January 1, 2030, the standard for indoor residential water use shall be the greater of 52.5 gallons per capita daily or a standard recommended pursuant to subdivision (b). (3) Beginning January 1, 2030, the standard for indoor residential water use shall be the greater of 50 gallons per capita daily or a standard recommended pursuant to subdivision (b)."[11] **Table** 4-9 shows an estimate of future per capita residential water use, broken out by estimated indoor and outdoor water use, per the analysis provided in **Appendix C**. Based on these estimates, per capita indoor residential potable water use within the District is expected to be at or below the indoor use standards presented in the legislation. Although indoor residential water use is expected to be within the indoor residential water use standard, it should be noted that because standards have not yet been developed for the outdoor water use or water loss components of the future water use objectives, it cannot be known whether projected demands for the District will be in compliance with the pending requirements.

Table 4-9 Current and Projected Residential Per Capita Water Use

Year	Residential Potable Water Demand	Service Area Population	Per Capita Residential Potable Water Use (GPCD) [A]	Approximate Per Capita Indoor Residential Potable Water Use (GPCD) [B]	Approximate Per Capita Outdoor Residential Potable Water Use (GPCD) [C]
2020	18,599	191,269	87	56	31
2025	18,117	202,510	80	52	28
2030	19,142	218,444	78	50	28
2035	19,237	223,251	77	50	27
2040	19,340	227,005	76	49	27
2045	19,526	230,996	75	49	27

NOTES:
(a) Unless otherwise noted, volumes are in units of AF.
(b) Indoor and outdoor residential water use estimates are based on the estimated residential indoor and outdoor water use **proportions** of 64% residential indoor water use and 36% residential outdoor water use, as documented in **Appendix C**.

[11] While the legislation appears to be clear on the method to calculate the indoor residential water use component, the SWRCB has begun the California Environmental Quality Act (CEQA) process for the new water use objective requirements and has expressed concern that using the 55 gallons per capita per day (GPCD) number in the legislation will constitute "backsliding" (compared to the reduction required by SB X7-7) and thus may need to be lowered.

5. BASELINE WATER USE AND SB X7-7 WATER CONSERVATION TARGETS

☑ ***CWC § 10608.24 (b)***

Each urban retail water supplier shall meet its urban water use target by December 31, 2020.

☑ ***CWC § 10608.28***

(a) An urban retail water supplier may meet its urban water use target within its retail service area, or through mutual agreement, by any of the following:

(1) Through an urban wholesale water supplier.

(2) Through a regional agency authorized to plan and implement water conservation, including, but not limited to, an agency established under the Bay Area Water Supply and Conservation Agency Act (Division 31 (commencing with Section 81300)).

(3) Through a regional water management group as defined in Section 10537.

(4) By an integrated regional water management funding area.

(5) By hydrologic region.

(6) Through other appropriate geographic scales for which computation methods have been developed by the department.

(b) A regional water management group, with the written consent of its member agencies, may undertake any or all planning, reporting, and implementation functions under this chapter for the member agencies that consent to those activities. Any data or reports shall provide information both for the regional water management group and separately for each consenting urban retail water supplier and urban wholesale water supplier.

With the adoption of the Water Conservation Act of 2009, also known as Senate Bill (SB) X7-7, the state is required to reduce urban water use by 20% by the year 2020. Each urban retail water supplier was required to develop a baseline daily per capita water use ("baseline water use") in their 2010 Urban Water Management Plan (UWMP or Plan) and establish per capita water use targets for 2015 and 2020 in order to help the state achieve the 20% reduction. Under SB X7-7, urban retail water suppliers may either comply with their 2020 targets on an individual basis or as part of a regional Alliance. As identified in **Table** 2-2, Marin Municipal Water District (MMWD or District) is part of the North Marin-Sonoma Alliance (Alliance), which includes eight other regional water retailers.

In support of implementing the requirements of SB X7-7, the California Department of Water Resources (DWR) produced a set of methodologies for developing baseline and compliance water use and targets, which are included in *Methodologies for Calculating Baseline and Compliance Urban Per Capita Water, California Department of Water Resources Division of Statewide Integrated Water Management Water Use and Efficiency Branch* (Methodologies; DWR, 2016b). The District and its regional Alliance have not made any changes to the information pertaining to the baseline water use or interim 2015 target compliance reported in the District's 2015 UWMP.

In this chapter, the District demonstrates compliance with its 2020 per capita water use target based on its participation in the regional Alliance. Per the Methodologies, regional Alliances may calculate their baseline and targets using several methods. The Alliance has opted to use Option 1, in which individual

agencies calculate their own baseline and target year per capita water use, and the regional Alliance values are calculated as a population-weighted average of all members' water use.

As part of the compliance reporting for SB X7-7, water suppliers are required to complete and submit a set of standardized verification tables in their 2020 UWMPs. The information in these tables is discussed and summarized in the following subsections, and the complete set of SB X7-7 standardized tables is included in **Appendix F**.

5.1 Service Area Population

☑ ***CWC § 10608.20 (e)***

An urban retail water supplier shall include in its urban water management plan due in 2010 pursuant to Part 2.6 (commencing with Section 10610) the baseline daily per capita water use, urban water use target, interim urban water use target, and compliance daily per capita water use, along with the bases for determining those estimates, including references to supporting data.

☑ ***CWC § 10608.20 (g)***

An urban retail water supplier may update its 2020 urban water use target in its 2015 urban water management plan required pursuant to Part 2.6 (commencing with Section 10610).

☑ ***Methodology 2 Service Area Population****.*

DWR will examine discrepancy between the actual population estimate and DOF's projections for 2010; if significant discrepancies are discovered, DWR may require some or all suppliers to update their baseline population estimates. (DWR, 2016b)

As reported in its 2015 UWMP, the District calculated its baseline population using the California Department of Finance (DOF) data method described in the Methodologies (i.e., Methodology 2 – Service Area Population) in its 2010 UWMP and updated the calculations in its 2015 UWMP. The District's service area includes several city boundaries within Marin County. Populations for these cities were taken directly from DOF reports. The District's service area also includes a portion of unincorporated Marin County. As reported in the 2015 UWMP, the population within unincorporated Marin County served by the District was estimated as a proportion (76%) of the total unincorporated County population.

As required by California Water Code (CWC) §10680.20 and the Methodologies, the District recalculated its baseline population using 2010 Census data (which was made available in 2012) in its 2015 UWMP. The District's 5- and 10-year baseline populations, per the 2015 UWMP are presented in **Table** 5-1 below. The District's 2020 population is estimated to be 191,269 (**Table** 5-1**)**.

Table 5-1 SB X7-7 Service Area Population (SB X7-7 Table 3)

Year		Population
10 to 15 Year Baseline Population		
Year 1	1995	172,700
Year 2	1996	174,300
Year 3	1997	176,400
Year 4	1998	178,000
Year 5	1999	179,300
Year 6	2000	181,300
Year 7	2001	181,400
Year 8	2002	181,300
Year 9	2003	181,400
Year 10	2004	180,600
5 Year Baseline Population		
Year 1	2003	181,400
Year 2	2004	180,600
Year 3	2005	179,700
Year 4	2006	179,800
Year 5	2007	180,100
2020 Compliance Year Population		
2020		191,269
NOTES: (a) Historical population numbers have been rounded to the nearest hundred.		

5.2 Baseline Water Use

The baseline water use is the water supplier's average gross daily water use per capita measured in gallons. This baseline includes all water entering the delivery system, including water losses.[12] Water suppliers were required to define a 10- or 15-year base (or baseline) period for water use that was then used to develop their future target per capita water use in their 2010 and 2015 UWMPs.[13] Water suppliers were also required to calculate their water use over a five-year baseline period and use that value to determine a minimum required reduction in water use by 2020. For the development of the District's baseline water use, a 10-year average was used from 1995 to 2004. The 10-year baseline water use calculated and reported in the District's 2015 UWMP was 149 GPCD. No deductions were made to the District's gross water use. The District was also required to determine its five-year base daily per capita water use in its prior UWMPs, which was determined to be 148 GPCD.

[12] A water supplier may deduct from its gross water use water conveyed to other urban water suppliers, water placed into long-term storage, recycled water delivered within the supplier's service area, water delivered for agricultural use, water conveyed to other urban water suppliers, and water used for industrial processes.
[13] Utilizing a 15-year baseline period is only allowed for water suppliers that meet at least 10 percent of their 2008 measured retail water demand through recycled water; the District does not meet this criterion and thus selected a 10-year baseline.

Table 5-2 below shows the weighted baseline as calculated for the Alliance in 2015. Taking the population-weighted average of all of its members, the Alliance's baseline was calculated to be 156 GPCD.

Table 5-2 RA1 – Weighted Baseline

SB X7-7 RA1 - Weighted Baseline				
Participating Member Agency Name	**10-15 year Baseline GPCD***	**Average Population During 10-15 Year Baseline Period**	**(Baseline GPCD) X (Population)**	**Regional Alliance Weighted Average 10-15 Year Baseline GPCD**
City of Cotati	159	6,559	1,043,146	
Marin Municipal Water District	149	178,670	26,690,318	
North Marin Water District	173	54,061	9,370,435	
City of Petaluma	180	52,622	9,491,997	
City of Rohnert Park	161	40,811	6,582,847	
City of Santa Rosa	145	143,109	20,806,963	
City of Sonoma	225	9,679	2,173,212	
Valley of the Moon Water District	146	20,969	3,058,648	
Town of Windsor	156	24,572	3,834,809	
Regional Alliance Total	1,495	531,051	83,052,375	**156**

**All participating agencies must submit individual SB X7-7 Tables, as applicable, showing the individual agency's calculations. These tables are: SB X7-7 Tables 0 through 6 , Table 7, any required supporting tables (as stated in SB X7-7 Table 7), and SB X7-7 Table 9, as applicable. These individual agency tables will be submitted with the individual or Regional Urban Water Management Plan.*

NOTES

5.3 Water Use Targets

☑ ***CWC § 10608.20 (b)***

An urban retail water supplier shall adopt one of the following methods for determining its urban water use target pursuant to subdivision (a):

(1) Eighty percent of the urban retail water supplier's baseline per capita daily water use.

(2) The per capita daily water use that is estimated using the sum of the following performance standards:

(A) For indoor residential water use, 55 gallons per capita daily water use as a provisional standard. Upon completion of the department's 2017 report to the Legislature pursuant to Section 10608.42, this standard may be adjusted by the Legislature by statute.

(B) For landscape irrigated through dedicated or residential meters or connections, water efficiency equivalent to the standards of the Model Water Efficient Landscape Ordinance set forth in Chapter 2.7 (commencing with Section 490) of Division 2 of Title 23 of the California Code of Regulations, as in effect the later of the year of the landscape's installation or 1992. An urban retail water supplier using the approach specified in this subparagraph shall use satellite imagery, site visits, or other best available technology to develop an accurate estimate of landscaped areas.

(C) For commercial, industrial, and institutional uses, a 10-percent reduction in water use from the baseline commercial, industrial, and institutional water use by 2020.

(3) Ninety-five percent of the applicable state hydrologic region target, as set forth in the state's draft 20x2020 Water Conservation Plan (dated April 30, 2009). If the service area of an urban water supplier includes more than one hydrologic region, the supplier shall apportion its service area to each region based on population or area.

(4) A method that shall be identified and developed by the department, through a public process, and reported to the Legislature no later than December 31, 2010. The method developed by the department shall identify per capita targets that cumulatively result in a statewide 20-percent reduction in urban daily per capita water use by December 31, 2020. In developing urban daily per capita water use targets, the department shall do all of the following:

(A) Consider climatic differences within the state.

(B) Consider population density differences within the state.

(C) Provide flexibility to communities and regions in meeting the targets.

(D) Consider different levels of per capita water use according to plant water needs in different regions.

(E) Consider different levels of commercial, industrial, and institutional water use in different regions of the state.

(F) Avoid placing an undue hardship on communities that have implemented conservation measures or taken actions to keep per capita water use low.

☑ ***CWC § 10608.22***

Notwithstanding the method adopted by an urban retail water supplier pursuant to Section 10608.20, an urban retail water supplier's per capita daily water use reduction shall be no less than 5 percent of base daily per capita water use as defined in paragraph (3) of subdivision (b) of Section 10608.12. This section does not apply to an urban retail water supplier with a base daily per capita water use at or below 100 gallons per capita per day.

5.3.1. Individual Water Use Targets

Table 5-3 shows the District's 5- and 10-year baseline periods, its baseline GPCD for these periods, and its confirmed 2020 target, which were previously developed and reported in its 2015 UWMP. This individual target is used for the development of the Alliance's regional water use target, as shown in Section 5.3.2.

Table 5-3 Baselines and Targets Summary (DWR Table 5-1)

Baseline Period	Start Year	End Year	Average Baseline GPCD	Confirmed 2020 Target GPCD
10-15 year	1995	2004	149	124
5 Year	2003	2007	148	
NOTES:				

5.3.2 Regional Water Use Targets

Instead of, or in addition to, individual water use targets, urban water retail suppliers may plan, comply, and report on SB X7-7 requirements on a regional basis as part of a "Regional Alliance." As described in Section 2.2.2, the District is one of eight Water Contractors that purchase water from the Sonoma County Water Agency (SCWA or Sonoma Water). As such, the Water Contractors formed a Regional Alliance in 2011 under the provisions of SB X7-7 because they are recipients of water from a common wholesale water supplier.

The membership of the Alliance is consistent with that of a previously established water conservation regional partnership of eight Water Contractors, known as the Sonoma Marin Saving Water Partnership (SMSWP). As identified in **Table** 2-2, this regional group, which collaborates on regional water conservation efforts, formed a regional Alliance for the purposes of meeting regional water use targets. The members of the North Marin-Sonoma Alliance include: the District, City of Sonoma, Valley of the Moon Water District, City of Santa Rosa, Town of Windsor, City of Rohnert Park, City of Cotati, City of Petaluma, and North Marin Water District.[14]

The DWR established three options for calculating a regional Alliance water use target. The District, along with the other Water Contractors in the regional alliance, selected Option 1, which preserves maximum flexibility at the supplier level. Under Option 1, each member of the regional Alliance calculates their individual targets and then weighs the individual targets by each member's population. The weighted targets are then averaged to determine the regional Alliance target. Detailed calculations conducted by the Alliance are included in **Appendix F**. The Alliance's 2015 Interim and 2020 targets, as reported to DWR by the Alliance in 2015 are provided in **Table** 5-4 below.

[14] The letter approving the District's membership in the regional Alliance: http://www.savingwaterpartnership.org/wp-content/uploads/20x2020-regional-alliance-agreement.doc.pdf.

Table 5-4 DWR Regional Alliance Weighted 2020 Target

SB X7-7 RA1 - Weighted 2020 Target				
Participating Member Agency Name	**2020 Target GPCD***	**2015 Population**	**(Target) X (Population)**	**Regional Alliance Weighted Average 2020 Target**
City of Cotati	130	7,288	947,440	
Marin Municipal Water District	124	189,000	23,436,000	
North Marin Water District	139	61,381	8,531,959	
City of Petaluma	141	61,798	8,713,518	
City of Rohnert Park	119	41,675	4,959,325	
City of Santa Rosa	126	173,071	21,806,946	
City of Sonoma	180	11,147	2,006,460	
Valley of the Moon Water District	124	23,478	2,911,272	
Town of Windsor	130	27,486	3,573,180	
Regional Alliance Total	1,213	596,324	76,886,100	**129**

**All participating agencies must submit individual SB X7-7 Tables, as applicable, showing the individual agency's calculations. These tables are: SB X7-7 Tables 0 through 6, Table 7, any required supporting tables (as stated in SB X7-7 Table 7), and SB X7-7 Table 9, as applicable. These individual agency tables will be submitted with the individual or Regional Urban Water Management Plan.*

NOTES:

5.4 2020 Target Compliance

☑ ***CWC § 10608.24 (b)***

Each urban retail water supplier shall meet its urban water use target by December 31, 2020.

☑ ***CWC § 10608.24 (d)***

(1) When determining compliance daily per capita water use, an urban retail water supplier may consider the following factors:

(A) Differences in evapotranspiration and rainfall in the baseline period compared to the compliance reporting period.

(B) Substantial changes to commercial or industrial water use resulting from increased business output and economic development that have occurred during the reporting period.

(C) Substantial changes to institutional water use resulting from fire suppression services or other extraordinary events, or from new or expanded operations, that have occurred during the reporting period.

(2) If the urban retail water supplier elects to adjust its estimate of compliance daily per capita water use due to one or more of the factors described in paragraph (1), it shall provide the basis for, and data supporting, the adjustment in the report required by Section 10608.40.

☑ ***CWC § 10608.40***

Urban water retail suppliers shall report to the department on their progress in meeting their urban water use targets as part of their urban water management plans submitted pursuant to Section 10631. The data shall be reported using a standardized form developed pursuant to Section 10608.52.

Table 5-5 demonstrates the Alliance's compliance with its 2020 GPCD target. The Alliance's 2020 GPCD of 113, calculated in the first table included in Appendix F, is below the regional target of 129 GPCD and the Alliance and District are therefore in compliance with SB X7-7 requirements.

Table 5-5 2020 Compliance for North Marin-Sonoma Regional Alliance (DWR Table 5-2)

2020 GPCD			2020 Confirmed Target GPCD	Did Supplier Achieve Targeted Reduction for 2020?
Actual 2020 GPCD	2020 TOTAL Adjustments	Adjusted 2020 GPCD *(Adjusted if applicable)*		
113	0	113	129	Yes
NOTES:				

6. WATER SUPPLY CHARACTERIZATION

☑ ***CWC § 10631 (b)*** *A plan shall be adopted in accordance with this chapter that shall do all of the following:*

Identify and quantify, to the extent practicable, the existing and planned sources of water available to the supplier over the same five-year increments described in subdivision (a).

☑ ***CWC § 10631 (b) (2)***

When multiple sources of water supply are identified, a description of the management of each supply in correlation with the other identified supplies.

This section describes existing and future sources of water available to Marin Municipal Water District (MMWD or District). It includes a description of each water source, source limitations, water quality, and future opportunities for additional supply development. The District's water supplies presently come from a combination of local surface water supplies, imported water from Sonoma County Water Agency (SCWA or Sonoma Water), and recycled water. Each water supply is described further in the following sections.

6.1 Purchased Water

☑ ***CWC § 10631 (h)*** *A plan shall be adopted in accordance with this chapter and shall do all of the following:*

An urban water supplier that relies upon a wholesale agency for a source of water shall provide the wholesale agency with water use projections from that agency for that source of water in five-year increments to 20 years or as far as data is available. The wholesale agency shall provide information to the urban water supplier for inclusion in the urban water supplier's plan that identifies and quantifies, to the extent practicable, the existing and planned sources of water as required by subdivision (b), available from the wholesale agency to the urban water supplier over the same five-year increments, and during various water-year types in accordance with subdivision (f). An urban water supplier may rely upon water supply information provided by the wholesale agency in fulfilling the plan informational requirements of subdivisions (b) and (f).

6.1.1 Sonoma County Water Agency Surface Water Supply

The District receives its supplemental water supply from Sonoma County Water Agency's (SCWA's or Sonoma Water's) transmission system, which provides treated water purchased from SCWA's Russian River Project. The Russian River flows are augmented by Pacific Gas and Electric's (PG&E's) Potter Valley Project, which diverts a portion of the Eel River flows to the East Fork of the Russian River. Water is diverted and extracted from the stretch of the Russian River located just upstream of Wohler Bridge via six radial wells known as "Ranney collectors." The diverted river water percolates through sand and gravel and only needs the addition of chlorine to meet drinking water quality standards. Although the water extracted via Ranney collectors does percolate through the ground, due to the connection to the surface water source, this diversion is considered and is permitted as a surface water supply under existing surface water rights to the Russian River and Dry Creek water, described further in Section 6.1.2 (SCWA, 2016). The SCWA supply also includes a relatively small amount of groundwater from groundwater supply wells located in the central Santa Rosa Plain subbasin (SCWA, 2016).

The District's present contract with SCWA is based on two documents: the 1975 Off-Peak Water Supply Agreement (Off-Peak Agreement) and its amendments, and the 1991 Agreement for the Sale of Water

between SCWA and the District. In 1996, these two contracts were combined into a single new agreement, the Supplemental Water Supply Agreement (Agreement).

In its original form, the Off-Peak Agreement allowed the District to take delivery, in the months of October through April, of up to 4,300 acre-feet (AF) of water surplus to the needs of all other SCWA customers. The contract was amended twice before its inclusion in the Supplemental Water Supply Agreement of 1996. The first amendment changed the basis of delivery of this water from "surplus" to "firm," meaning that the District's water deliveries would be as reliable as that provided to SCWA's other contractors. The second amendment allowed deliveries up to 360 AF per month from May to September.

The 1991 Agreement for Water Supply allowed the District to take deliveries of up to 10,000 AF of water per year beyond the amount included in the Off-Peak Agreement. These water deliveries were classified as "as available." This meant that the contracted water supply was secondary to water provided to SCWA's other contractors and to water provided under the Off-Peak Agreement but would be provided unless certain predefined conditions existed.

The Supplemental Water Supply Agreement combined the two prior agreements such that the District can now take deliveries of up to 14,300 acre-feet per year (AFY) from SCWA. All of these deliveries are also now classified as "firm" water. In addition to the annual delivery limit, the Agreement also places seasonal limitations on water delivery rates to the District, with deliveries limited to 23.1 million gallons per day (mgd) from December to March, 12.8 mgd from May to September, 20.1 mgd in April and November, and 17.1 mgd in October.

The Supplemental Water Supply Agreement expired on 30 June 2014, but a Temporary Extension of the Supplemental Water Supply Agreement extended the Off-Peak Agreement and Water Sale Agreement until 30 June 2015. A formal Agreement renewal was subsequently approved and became effective on 1 July 2015. This renewed Agreement, dated 16 June 2015, will remain in force through 30 June 2025, and includes a renewal provision that will extend the Agreement through 30 June 2040. A copy of the renewed Agreement is included in **Appendix B.**

In addition to contractual delivery limits, Russian River water deliveries to the District are subject to available pipeline capacity in facilities owned by SCWA and North Marin Water District (NMWD). The Interconnection Agreement from 2014 describes the District's rights to use the excess capacity in NMWD's facilities. The Interconnection Agreement runs contiguous with the SCWA Restructured Agreement for Water Supply, which will expire on 30 June 2040 and has renewal options.

Water imported from SCWA is naturally filtered in the deep sand and gravel below the riverbed and requires no further clarification. This water enters the District's system at the Ignacio Water Quality and Pumping Station, where water quality is monitored continually and adjusted as needed.

6.1.2 Sonoma County Water Agency Surface Water Rights

According to SCWA's 2015 UWMP, currently, four water rights permits (Permits 12947A, 12949, 12950, and 16596) issued by the State Water Resources Control Board (SWRCB) authorize SCWA to store up to 122,500 AFY of water in Lake Mendocino and up to 245,000 AFY of water in Lake Sonoma, and to divert or redivert up to 180 cfs of water from the Russian River with a limit of 75,000 AFY. The permits also establish minimum instream flow requirements for fish and wildlife protection and recreation. These minimum instream flow requirements vary based on the hydrologic classifications of normal, dry, and critical water supply conditions as defined by SCWA's water rights permits and SWRCB Decision 1610,

adopted in 1986 (SCWA, 2016). SCWA meets the various instream flow requirements by making releases from Coyote Valley Dam and Warm Springs Dam (SCWA, 2016). The Russian River Biological Opinion requires modification of minimum instream flow requirements on the Russian River and Dry Creek to maintain the Incidental Take Statement provided by the Biological Opinion (SCWA, 2016). SCWA's evaluation of future Russian River supply availability is based upon the assumption that that proposed changes to the minimum instream flow requirements under Decision 1610 set forth in the Biological Opinion are implemented, and that SCWA will obtain water rights approvals necessary to increase its total Russian River diversions above 75,000 AFY by 2035 (SCWA, 2016). The SCWA 2015 UWMP anticipates that SCWA would request at that time an additional 1,000 AFY to increase the overall supply from the Russian River to 76,000 AFY.

6.1.3 Sonoma County Water Agency Groundwater Supply

SCWA pumps a portion of its supply from the Santa Rosa Plain Subbasin of the Santa Rosa Valley Basin (DWR Basin 1-55.01). Groundwater is used primarily as a drought period supply, or when Russian River supplies are otherwise constrained (SCWA, 2016). In 2015, groundwater made up less than 2% of SCWA's supplies; through 2045, groundwater is projected to make up 3% of SCWA's supplies in normal year conditions (SCWA, 2016). It cannot be discerned what specific amount of SCWA supply provided to the District consists of groundwater; however, it is assumed to be proportionate to the overall percentage of groundwater used within SCWA's system. SCWA's groundwater supply is discussed further in Section 6.2.

6.2 Groundwater

☑ ***CWC § 10631***

(b) (4) If groundwater is identified as an existing or planned source of water available to the supplier, all of the following information:

(A) The current version of any groundwater sustainability plan or alternative adopted pursuant to Part 2.74 (commencing with Section 10720), any groundwater management plan adopted by the urban water supplier, including plans adopted pursuant to Part 2.75 (commencing with Section 10750), or any other specific authorization for groundwater management for basins underlying the urban water supplier's service area.

(B) A description of any groundwater basin or basins from which the urban water supplier pumps groundwater. For basins that a court or the board has adjudicated the rights to pump groundwater, a copy of the order or decree adopted by the court or the board and a description of the amount of groundwater the urban water supplier has the legal right to pump under the order or decree. For a basin that has not been adjudicated, information as to whether the department has identified the basin as a high- or medium-priority basin in the most current official departmental bulletin that characterizes the condition of the groundwater basin, and a detailed description of the efforts being undertaken by the urban water supplier to coordinate with groundwater sustainability agencies or groundwater management agencies listed in subdivision (c) of Section 10723 to maintain or achieve sustainable groundwater conditions in accordance with a groundwater sustainability plan or alternative adopted pursuant to Part 2.74 (commencing with Section 10720).

(C) A detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water supplier for the past five years. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.

The District does not pump groundwater and does not plan to use groundwater as a supply source in the future (see **Table** 6-1).

There are three groundwater basins identified in the California Department of Water Resources' (DWR)'s Bulletin 118 that are at least partially within the District's service area. These three basins include Ross Valley Groundwater Basin (DWR Basin 2-18), San Rafael Valley Groundwater Basin (DWR Basin 2-29), and part of the Novato Basin (DWR Basin 2-30). All three basins are categorized by the California Statewide Groundwater Elevation Monitoring (CASGEM) program as low or very low priority basins (DWR, 2019). Studies that have been conducted by the District over the last 40 years have determined that groundwater within the boundaries of the District's service area is very limited as it is either found in fractures in the Franciscan Formation (bedrock) or in shallow alluvial deposits in valleys. Therefore, groundwater is not currently or planned to be used as a water supply source by the District.

Table 6-1 Groundwater Volume Pumped (DWR Table 6-1)

X	Supplier does not pump groundwater. The supplier will not complete the table below.					
	All or part of the groundwater described below is desalinated.					
Groundwater Type	Location or Basin Name	2016	2017	2018	2019	2020
TOTAL						
NOTES:						

Although the District does not pump groundwater directly, as noted in Section 6.1.3, a small portion of the SCWA water supply (i.e., less than 2%) is comprised of groundwater from the Santa Rosa Plain Subbasin of the Santa Rosa Valley Basin (DWR Basin 1-55.01). Given this, characteristics and groundwater management of the Santa Rosa Plain Subbasin are provided below.

6.2.1 Basin Description and Status

The Santa Rosa Subbasin is not adjudicated, and in its recent evaluation of California groundwater basins, DWR determined that the Basin is not in a condition of critical overdraft (DWR, 2019). The Santa Rosa Plain subbasin is currently categorized by the DWR program as a medium priority basin (DWR, 2019).

Under DWR's prioritization process, basins are ranked on eight components, and if a basin is assigned more than 14 total points, but less than 21 total points, it is defined as "medium priority." The main factors driving the Santa Rosa Plain subbasin's designation include population density (3 out of 5 possible ranking points), population growth (3 out of 5 possible points), public supply well density (5 out of 5 possible points), total production well density (5 out of 5 possible points), groundwater reliance (5 out of 5 possible points), and groundwater reliance (3 out of 5 possible points) (DWR, 2019).

Geologically, the Santa Rosa Plain subbasin has one main water-bearing unit, the Merced Formation, and several units with lower water-bearing capacities, including the Glen Ellen Formation and the Alluvium. The shallow Alluvium consists of poorly sorted coarse sand and gravel and moderately-sorted fine sand, silt, and clay. The alluvial deposits are not perennially saturated, have low permeability, and are generally unconfined or slightly confined (DWR, 2006). The Glen Ellen Formation underlies the Alluvium and consists of partially cemented beds of poorly sorted gravel, sand, and silt, and clay that vary widely in thickness and extent, with thicknesses varying from 3,000 feet to less than 1,500 feet on the west side of the valley (DWR, 2006). Underlying the Glen Ellen Formation is the Merced Formation, which is a marine deposit of fine sand and sandstone with thin interbeds of clay and silty-clay and some lenses of gravel and localized fossils. The Merced Formation is Pliocene in age and its thickness is estimated to range from 300 feet to greater than 1,500 feet. Aquifer continuity and water quality in the Merced Formation are generally very good, with well yields from 100 to 1,500 gallons per minute (gpm) (DWR, 2006).

As mentioned above, DWR has designated the Santa Rosa Plain subbasin as a medium priority basin and thus subject to the requirements of the Sustainable Groundwater Management Act (SGMA), including the requirement to be covered by one or more Groundwater Sustainability Agencies (GSAs) and to prepare and submit to DWR one or more Groundwater Sustainability Plans (GSPs) by 31 January 2022. Actions

related to management of the Santa Rosa Plain subbasin both currently and under SGMA are described in the next section.

6.2.2 Non-SGMA Groundwater Management

The Santa Rosa Plain subbasin is currently managed under the Santa Rosa Plain Watershed Groundwater Management Plan (GMP), developed by the Santa Rosa Plain Basin Advisory Panel (Santa Rosa Plain Basin Advisory Panel, 2014). The stated goal of the GMP is "to proactively coordinate public and private groundwater management efforts and leverage funding opportunities to maintain a sustainable, locally-managed, high-quality groundwater resource for current and future users, while sustaining natural groundwater and surface water functions." The GMP outlines eighteen Basin Management Objectives and groups these into seven key management components, including: (1) stakeholder involvement and public awareness, (2) monitoring and modeling program, (3) groundwater protection, (4) increasing water conservation and efficiency, (5) increasing groundwater discharge, (6) increasing water reuse, and (7) integrated groundwater management. The GMP is the groundwater management program for this area, until the SGMA GSP for the Santa Rosa Plain subbasin is adopted.

6.2.3 SGMA Groundwater Management

In 2014, the California State Legislature enacted the SGMA, with subsequent amendments in 2015. The SGMA requires the formation of GSAs and the development and implementation of GSPs for groundwater basins that are designated by DWR as medium or high priority. Because the Santa Rosa Plain subbasin is designated by DWR as a medium basin (DWR, 2019), the Santa Rosa Plain subbasin is subject to the requirements of SGMA, which include the formation of a one or more GSAs and the development and implementation of one or more GSPs.

The Santa Rosa Plain GSA was formed in June 2017 through a Joint Powers Agreement entered into by the SCWA, City of Cotati, City of Rohnert Park, City of Santa Rosa, City of Sebastopol, Town of Windsor, County of Sonoma, Gold Ridge Resource Conservation District, Sonoma Resource Conservation District, Branger Mutual Water Company, California American Water, Willowside Mutual Water Company, and Penngrove Water Company, and covers the entire subbasin. The Santa Rosa Plain GSA is governed by a nine-member Board of Directors, which includes a position held by SCWA. The Board of Directors is advised by an Advisory Committee that includes eighteen members appointed by the Board of Directors, representing various stakeholders. The GSP for the Santa Rosa Plain subbasin was approved by DWR on January 26, 2023. The plan is available on the Santa Rosa Plain GSA website: https://santarosaplaingroundwater.org/.

6.2.4 Coordination with Groundwater Supply Agencies

Because the District does not directly pump groundwater, it does not coordinate with any GSAs. However, as noted above, the SCWA is a member of Santa Rosa Plain GSA and MMWD has coordinated with SCWA on its demand projections through 2045.

6.2.5 Historical Pumping and Supply Sufficiency

As indicated in **Table** 6-1, the District does not pump any groundwater. SCWA's 2020 UWMP provides historical pumping and supply sufficiency information related to their use of groundwater and has factored this into the supply reliability information provided to the District and other Water Contractors.

6.3 Surface Water

The District's primary water supply is local surface water. Until 1976, all of the District's water supply was obtained solely from rainfall collected from a watershed of approximately 28 square miles of District owned lands, and 36 square miles not owned by the District. Six reservoirs in the watershed had a storage capacity of 17.3 billion gallons (53,100 AF). Through a bond issue authorized during the drought of the 1970s, a seventh reservoir was completed in 1980, the Soulajule Reservoir, which added 3.4 billion gallons (10,400 AF) to the total storage. The District's Kent Lake facility was expanded in 1982 by raising Peters Dam 45 feet, increasing the storage capacity from 5.4 billion gallons (16,600 AF) to 10.6 billion gallons (32,500 AF). Presently, the total reservoir storage operated by the District is 25.9 billion gallons (79,566 AF).

A chronology of the District's water rights, and development of its reservoir system is provided in **Table** 6-2. A map of the reservoir system is shown in **Figure** 3-2.

Table 6-2 District Surface Water Reservoir System

Reservoir Name	Year Constructed	Storage Capacity (AF)	Water Rights
Lake Lagunitas	1873	350	Pre-1914
Phoenix Lake	1905	411	Pre-1914
Bon Tempe Reservoir	1948	4,017	Appropriative Permit No. 05633
Alpine Lake	1918 1924 1941	3,069 4,600 8,891	Pre-1914 Appropriative Permit No. 05633
Kent Lake	1953 1982	16,050 32,895	Appropriative Permit No. 05633, 09390, 18546
Nicasio Reservoir	1960	29,000(a)	Appropriative Permit No. 12800
Soulajule Reservoir	1980	10,572	Appropriative License 12807 and Permit No. 16892
Total Existing Reservoir Storage	--	**79,566**	--

NOTES:
(a) Under the water right for storage, 6,570 AF of water from Nicasio Creek can be transferred from Nicasio Reservoir to Kent Lake to fill Kent Lake; this is in addition to any inflows from Lagunitas Creek into Kent Lake. This would free up capacity in Nicasio Reservoir for additional storage up to the total of 29,000 AF (22,430 AF stored in Nicasio Reservoir plus 6,570 transferred and stored in Kent Lake). However, new infrastructure would be required to transfer this supply since it cannot be conveyed via Lagunitas Creek.

On average, the District has an average annual runoff of 83,000 AF (10-year average). The range of annual runoff received into the reservoirs ranges widely from a low of 4,000 AF in 1977 to over 212,000 AF in 2017. Surface water from the Mt. Tamalpais watershed is aerated seasonally in the reservoirs to maintain

adequate dissolved oxygen concentration. From the reservoirs, the water is conveyed to either the BTTP near Ross or the SGTP in Woodacre. Suspended matter is removed in clarifiers, microscopic particles are removed in deep-bed, multi-media filters, and bacteria and pathogens are inactivated by disinfectants. The water is then treated for control corrosion. The District has been fluoridating its water since 1973 as required by a voter approved ballot measure in 1972.

6.4 Stormwater

There are no plans to divert stormwater for beneficial uses in the District.

6.5 Wastewater and Recycled Water

☑ ***CWC § 10633***

The plan shall provide, to the extent available, information on recycled water and its potential for use as a water source in the service area of the urban water supplier. The preparation of the plan shall be coordinated with local water, wastewater, groundwater, and planning agencies that operate within the supplier's service area.

This section provides information on the amount of generated wastewater and existing disposal of wastewater to determine the potential for recycled water use by the District. The amount of recycled water currently used, potentially available, and future potential uses for recycled water for the District are also described.

6.5.1 Recycled Water Coordination

The majority of recycled water used within the District's service area is distributed by the District. The Sewage Agency of Southern Marin (SASM) produces approximately 30 AFY of tertiary-treated recycled water that is used to irrigate playing fields situated adjacent to the SASM treatment plant. SASM treats and distributes this water. Recycled water production occurs at the Las Gallinas Valley Sanitary District (LGVSD) Recycled Water Treatment Facility (RWTF). The wastewater originates from within the LGVSD service area, which is also within the District's service area. The collected wastewater is treated to secondary levels at LGVSD's wastewater treatment plant and then receives further treatment at the RWTF before being distributed to customers.

In 2014 the LGVSD began supplying approximately 150 AFY of tertiary-treated recycled water produced at the newly constructed Las Gallinas Valley RWTF to NMWD. In 2019, LGVSD began construction on a major expansion and upgrade to the RWTF, which will expand the facility's capacity from 1.4 mgd to over 5 mgd. The RWTF expansion is now complete and the RWTF has been producing water since April 2021.

The District has a close working relationship with the LGVSD. Prior to each irrigation season (April through October), the District provides a written estimate of the quantity of recycled water that will be needed for the season. The LGVSD attempts to provide the District with enough recycled water to meet its projected demand, and if the LGVSD is not able to meet the entire demand of the recycled water system, the system is supplemented by potable water.

6.5.2 Wastewater Collection, Treatment, and Disposal

☑ ***CWC § 10633 (a)***

A description of the wastewater collection and treatment systems in the supplier's service area, including a quantification of the amount of wastewater collected and treated and the methods of wastewater disposal.

☑ ***CWC § 10633 (b)***

A description of the quantity of treated wastewater that meets recycled water standards, is being discharged, and is otherwise available for use in a recycled water project.

Within the District's service area, there are 16 wastewater collection entities. Of the 16 wastewater collection entities, 11 are wastewater collection entities and five have treatment facilities.

Three of the five treatment entities utilize secondary effluent for landscape irrigation at their wastewater treatment plant. The Richardson Bay Sanitary District irrigates an adjacent park with secondary effluent. This water does not meet current recycled water regulations, but the existing practice has been "grandfathered." SASM has a small tertiary treatment facility and irrigates an adjacent park; however, saltwater intrusion limits this operation to low tide cycles only. **Table** 6-3 summarizes the 16 wastewater collection and treatment entities within the District's service area. Development within Marin County is limited due to space constraints; therefore, wastewater projections are estimated to remain steady over the planning horizon.

Table 6-4 provides a summary of the volumes of treated effluent discharged and recycled within the District's service area in 2020.

Table 6-3 Wastewater Collected Within Area in 2020 (DWR Table 6-2)

	There is no wastewater collection system. The supplier will not complete the table below.
	Percentage of 2020 service area covered by wastewater collection system *(optional)*
	Percentage of 2020 service area population covered by wastewater collection system *(optional)*

Wastewater Collection			Recipient of Collected Wastewater			
Name of Wastewater Collection Agency	Wastewater Volume Metered or Estimated?	Volume of Wastewater Collected from UWMP Service Area 2020	Name of Wastewater Treatment Agency Receiving Collected Wastewater	Treatment Plant Name	Is WWTP Located Within UWMP Area?	Is WWTP Operation Contracted to a Third Party? *(optional)*
Almonte Sanitary District	Estimated	128	Sewerage Agency of Southern Marin (SASM)	SASM Plant	Yes	No
Alto Sanitary District	Estimated	93	SASM	SASM Plant	Yes	No
Homestead Valley Sanitary District	Estimated	177	SASM	SASM Plant	Yes	No
City of Mill Valley	Estimated	1,199	SASM	SASM Plant	Yes	No
Richardson Bay Sanitary District	Estimated	795	SASM	SASM Plant	Yes	No
Tamalpais Community Services District	Estimated	290	SASM; Sausalito-Marin City Sanitary District (SMCSD)	SASM Plant; SMCSD Plant	Yes	No
San Quentin State Prison	Metered	527	Central Marin Sanitation Agency (CMSA)	CMSA Plant	Yes	No
San Rafael Sanitation District	Metered	4,437	CMSA	CMSA Plant	Yes	No

	There is no wastewater collection system. The supplier will not complete the table below.
	Percentage of 2020 service area covered by wastewater collection system *(optional)*
	Percentage of 2020 service area population covered by wastewater collection system *(optional)*

Wastewater Collection			Recipient of Collected Wastewater			
Name of Wastewater Collection Agency	Wastewater Volume Metered or Estimated?	Volume of Wastewater Collected from UWMP Service Area 2020	Name of Wastewater Treatment Agency Receiving Collected Wastewater	Treatment Plant Name	Is WWTP Located Within UWMP Area?	Is WWTP Operation Contracted to a Third Party? *(optional)*
Sanitary District No. 1 (Ross Valley)	Metered	5,596	CMSA	CMSA Plant	Yes	No
Sanitary District No. 2 (Corte Madera)	Metered	1,190	CMSA	CMSA Plant	Yes	No
City of Sausalito	Estimated	510	SMCSD	SMCSD Plant	Yes	No
National Park Service (Fort Baker)	Estimated	59	SMCSD	SMCSD Plant	Yes	No
SMCSD	Metered	366	SMCSD	SMCSD Plant	Yes	No
Sanitary District No. 5 (Tiburon)	Metered	666	Sanitary District No. 5	Tiburon Main Treatment Plant	Yes	No
Sanitary District No. 5 (Paradise Cove)	Metered	18	Sanitary District No. 5	Paradise Cove Treatment Plant	Yes	No
Las Gallinas Valley Sanitary District (LGVSD)	Metered	2,435	LGVSD	LGVSD Plant	Yes	No
Total Wastewater Collected from Service Area in 2020:		18,486				

NOTES:
(a) Volumes are in units of AF.

	There is no wastewater collection system. The supplier will not complete the table below.
	Percentage of 2020 service area covered by wastewater collection system *(optional)*
	Percentage of 2020 service area population covered by wastewater collection system *(optional)*

Wastewater Collection			Recipient of Collected Wastewater			
Name of Wastewater Collection Agency	Wastewater Volume Metered or Estimated?	Volume of Wastewater Collected from UWMP Service Area 2020	Name of Wastewater Treatment Agency Receiving Collected Wastewater	Treatment Plant Name	Is WWTP Located Within UWMP Area?	Is WWTP Operation Contracted to a Third Party? *(optional)*

(b) Data reported on a fiscal year (FY) basis.
(c) Volumes for SMCSD National Park Service (Fort Baker), City of Sausalito, and Tamalpais Community Services District were estimated based on proportions of total SMCSD 2015 volumes.

Table 6-4 Wastewater Treatment and Discharge Within Service Area in 2020 (DWR Table 6-3)

	No wastewater is treated or disposed of within the UWMP service area. The supplier will not complete the table below.										
Wastewater Treatment Plant Name	Discharge Location Name or Identifier	Discharge Location Description	Wastewater Discharge ID Number *(optional)*	Method of Disposal	Does This Plant Treat Wastewater Generated Outside the Service Area?	Treatment Level	2020 volumes				
							Wastewater Treated	Discharged Treated Wastewater	Recycled Within Service Area	Recycled Outside of Service Area	Instream Flow Permit Requirement
Central Marin Sanitation Agency Plant	San Francisco Bay	Shallow estuary draining roughly 40% of California's water	2 215116001	Bay or estuary outfall	No	Secondary, Disinfected - 23	10,680	9,477	0	1,203	0
Las Gallinas Valley Sanitary Agency Plant	Miller Creek	7.6 mile long stream draining into San Pablo Bay east of Marinwood (a)	2 215012001	River or creek outfall	No	Secondary, Disinfected - 23	2,453	2,731	0	0	0
Las Gallinas Valley Sanitary Agency Plant	Miller Creek	7.6 mile long stream draining into San Pablo Bay east of Marinwood (b)	2 215012001	River or creek outfall	No	Tertiary	748	0	748 (c)	0	0
Paradise Cove Facility Sanitary District #5 (Tiburon)	San Francisco Bay	Shallow estuary draining roughly 40% of California's water	2 215021002	Bay or estuary outfall	No	Secondary, Disinfected - 23	18	17	0	0	0

	No wastewater is treated or disposed of within the UWMP service area. The supplier will not complete the table below.										
Wastewater Treatment Plant Name	Discharge Location Name or Identifier	Discharge Location Description	Wastewater Discharge ID Number *(optional)*	Method of Disposal	Does This Plant Treat Wastewater Generated Outside the Service Area?	Treatment Level	2020 volumes				
							Wastewater Treated	Discharged Treated Wastewater	Recycled Within Service Area	Recycled Outside of Service Area	Instream Flow Permit Requirement
Main Plant Sanitary District #5 (Tiburon)	San Francisco Bay	Shallow estuary draining roughly 40% of California's water	2 215021001	Bay or estuary outfall	No	Secondary, Disinfected - 23	657	635	0	0	0
Sausalito Marin City Sanitary District Plant	San Francisco Bay	Shallow estuary draining roughly 40% of California's water	2 215023001	Bay or estuary outfall	No	Secondary, Disinfected - 23	1,106	1,106	0	0	0
Sewerage Agency of Southern Marin Plant	Raccoon Straits	A part of the San Francisco Bay located between Angel Island and Tiburon Peninsula	2 215015001	River or creek outfall	No	Secondary, Disinfected - 23	2,280	2,403	0	0	0
Sewerage Agency of Southern Marin Plant	Raccoon Straits	A part of the San Francisco Bay located between Angela Island and Tiburon Peninsula (b)	2 215015001	River or creek outfall	No	Tertiary	18	0	0	0	18

	No wastewater is treated or disposed of within the UWMP service area. The supplier will not complete the table below.										
Wastewater Treatment Plant Name	Discharge Location Name or Identifier	Discharge Location Description	Wastewater Discharge ID Number *(optional)*	Method of Disposal	Does This Plant Treat Wastewater Generated Outside the Service Area?	Treatment Level	2020 volumes				
							Wastewater Treated	Discharged Treated Wastewater	Recycled Within Service Area	Recycled Outside of Service Area	Instream Flow Permit Requirement
						Total	17,959	16,368	748	1,203	18

NOTES:
(a) The discharged volume differs from the treated volume due to recirculation of flow within the plant and flow meter discrepancies.
(b) The actual wastewater treated by these plants were assumed to equal to the sum of the discharged and recycled water.
(c) Volumes are in units of AF.
(d) Data reported on a calendar year basis.
(e) Volume for LGVSD shown is reported on a fiscal year (FY) basis and may include an unknown amount of recycled water served outside of District service area.

6.5.3 Recycled Water System and Potential, Current, and Projected Uses of Recycled Water

☑ ***CWC § 10633 (c-g)***

(c) A description of the recycled water currently being used in the supplier's service area, including, but not limited to, the type, place, and quantity of use.

(d) A description and quantification of the potential uses of recycled water, including, but not limited to, agricultural irrigation, landscape irrigation, wildlife habitat enhancement, wetlands, industrial reuse, groundwater recharge, indirect potable reuse, and other appropriate uses, and a determination with regard to the technical and economic feasibility of serving those uses.

(e) The projected use of recycled water within the supplier's service area at the end of 5, 10, 15, and 20 years and a description of the actual use of recycled water in comparison to uses previously projected pursuant to this subdivision.

(f) A description of actions, including financial incentives, which may be taken to encourage the use of recycled water, and the projected results of these actions in terms of acre-feet of recycled water used per year.

(g) A plan for optimizing the use of recycled water in the supplier's service area, including actions to facilitate the installation of dual distribution systems, to promote recirculating uses, to facilitate the increased use of treated wastewater that meets recycled water standards, and to overcome any obstacles to achieving that increased use.

The District started water recycling during the drought of 1976-77 when a pilot plant was commissioned for drought relief. The pilot plant demonstrated that recycled water was available when other sources were not. Increased concern about limited potable supplies led to a joint effort with the LGVSD to build a permanent facility. In 1981, a 1.0 mgd direct filtration plant was completed and served 60 AFY to nearby McInnis Park and to highway landscaping. Plans for further expansion were set back when the state water reclamation regulations (Title 22) were made more stringent. The water quality that the plant was capable of producing was no longer adequate for irrigating parks, playgrounds, and greenbelts.

In 1989, the District upgraded the recycled water facility from direct filtration to full conventional treatment and increased capacity to 2.0 mgd. With improved water quality, the District was able to expand its recycled water market. From 1990 through 1994, the distribution system was enlarged using District funds plus a $5 million low-interest loan from the State Revolving Fund. Today, the District's recycled water system serves about 748 AF of recycled water per year through 333 service connections.

Over the past 25 years, the District has consistently strived to expand the use of recycled water, number of sites served, and the total amount of recycled water put to use. The system is located in the northern part of the District's service area from the Marin County Civic Center through Marinwood. All customers on the system are served recycled water from the District's Las Gallinas Valley RWTF, operated in conjunction with the LGVSD.

Marin County experiences a relatively wet rainy season which decreases the demand season for landscape irrigation to about seven months of the year (April through October). Historically, the RWTF has not operated during the winter months when water demand is low, however the newly expanded RWTF is expected to produce water all year even when demand is low.

Although irrigation remains the primary use (95%) for recycled water in the District's service area, there are virtually no large-scale irrigation accounts and no major industrial water users in the area. Therefore, the District has turned to alternative uses of recycled water to optimize the efficiency of the system, including the following.

- **Flushing Toilets with Recycled Water** – As a result of efforts launched in 1991, there are now 38 buildings in the District's service area that use recycled water to flush toilets and urinals. This includes the 330-bed Marin County Jail, which was the first indoor use of recycled water in a penal institution. All new buildings in the recycled water service area are now required to be constructed with dual plumbing to use recycled water indoors as well as for landscape irrigation. In September 2011, the District began providing recycled water to 33 San Pedro, the first residential condominium complex in California to be dual plumbed to use recycled water for toilet flushing.
- **Car Washes with Recycled Water** – In 1995, the District was the first in California to use recycled water in a car wash. Building on that success, two new car washes were constructed to use recycled water. All new car washes in the recycled water service area are now required to use recycled water.
- **Heating, ventilation, and air conditioning (HVAC) Cooling Towers with Recycled Water** – The District successfully pioneered the first use of recycled water in a HVAC cooling tower in 1995. Since then, two more buildings have had the HVAC system converted to recycled water.
- **Commercial Laundries with Recycled Water** – In 1998, the District was the first water District in California to convert a commercial laundry to use tertiary-treated recycled water.

Table 6-5 below provides the anticipated future recycled water within the District. As discussed in further detail in **Appendix C**, total recycled water use is projected to be 750 AFY by 2045.[15] Due to infrastructure upgrades at the Las Gallinas Valley RWTF, all demands by the recycled water system were met by potable water in 2020. The volume of potable water makeup used to supplement the recycled water system from 2016 through 2020 is provided in Section 4.1. Potable water is not anticipated to be needed to supplement the recycled water system going forward, following plant upgrades that were completed in April 2021.

[15] Recycled water demands were rounded from the totals shown in Appendix C.

Table 6-5 Current and Projected Recycled Water Direct Beneficial Uses Within Service Area (DWR Table 6-4)

	Recycled water is not used and is not planned for use within the service area of the supplier. The supplier will not complete the table below.
Name of Supplier Producing (Treating) the Recycled Water:	Marin Municipal Water District
Name of Supplier Operating the Recycled Water Distribution System:	Marin Municipal Water District
Supplemental Water Added in 2020 (volume)	748 AF
Source of 2020 Supplemental Water	Potable Water

Beneficial Use Type	**Potential** Beneficial Uses of Recycled Water (Describe)	Amount of **Potential** Uses of Recycled Water (Quantity)	General Description of 2020 Uses	Level of Treatment	2020	2025	2030	2035	2040	2045
Landscape irrigation (excludes golf courses)				Tertiary	441	443	443	443	443	443
Golf course irrigation				Tertiary	88	88	88	88	88	88
Commercial use				Tertiary	162	163	163	163	163	163
Industrial use				Tertiary	33	33	33	33	33	33
Other (Provide General Description)			Toilet/urinal flushing in commercial and residential settings	Tertiary	23	23	23	23	23	23
				Total:	748	750	750	750	750	750
				2020 Internal Reuse						

NOTES:
(a) Volumes are in units of AF.

6.5.4 Comparison of Previously Projected Use and Actual Use

☑ *CWC § 10633 (e)*

A description of the actual use of recycled water in comparison to uses previously projected pursuant to this subdivision.

The District's 2015 UWMP projected recycled water demand and production in 2020 to be 520 AF. Actual water use by the recycled water system in 2020 was 748 AF,[16] which is 228 AF more than the total demand projected in the 2015 UWMP. **Table** 6-6 provides a comparison of the 2015 UWMP projection for 2020 demand to actual 2020 use by the system.

Table 6-6 2015 UWMP Recycled Water Use Projection Compared to 2020 Actual (DWR Table 6-5)

	Recycled water was not used in 2015 nor projected for use in 2020. The supplier will not complete the table below.	
Beneficial Use Type	2015 Projection for 2020	2020 Actual Use
Landscape irrigation (excludes golf courses)	307	441
Golf course irrigation	61	88
Commercial use	113	162
Industrial use	23	33
Other (a)	16	23
Total	520	748

NOTES:
(a) The "other" use type represents toilet/urinal flushing in commercial and residential settings.
(b) Volumes are in units of AF.
(c) Given that Las Gallinas RWTF was shut down during 2020 due to infrastructure upgrades, all demands by the recycled water system in 2020 was met by potable water. Plant upgrades were completed in April 2021.

[16] During 2020, the Las Gallinas RWTF was offline due to infrastructure upgrades and all demands by the recycled water system were met by potable water. Potable water is not anticipated to be needed to supplement the recycled water system going forward, following plant upgrades that were completed in April 2021.

6.5.5 Actions to Encourage and Optimize Future Recycled Water Use

☑ ***CWC § 10633 (e-g)***

(e) The projected use of recycled water within the supplier's service area at the end of 5, 10, 15, and 20 years and a description of the actual use of recycled water in comparison to uses previously projected pursuant to this subdivision.

(f) A description of actions, including financial incentives, which may be taken to encourage the use of recycled water, and the projected results of these actions in terms of acre-feet of recycled water used per year.

(g) A plan for optimizing the use of recycled water in the supplier's service area, including actions to facilitate the installation of dual distribution systems, to promote recirculating uses, to facilitate the increased use of treated wastewater that meets recycled water standards, and to overcome any obstacles to achieving that increased use.

The District uses a variety of incentives to encourage recycled water use. One of the more positive marketing aspects of recycled water is reliability. The droughts of 1976-77 and 1987-92 necessitated severe rationing with resultant damage to customers' landscape plantings. With recycled water used for landscaping during droughts, customers' investments in landscaping are protected.

Several District policies also encourage the use of recycled water. The rates for recycled water were originally established at half of the Tier 1 potable rate and, based on the rate structure changes that were put into effect during May 2016, are at 69% of the Tier 1 potable rate. The District also requires use of recycled water, where it is available, as a condition of potable water service. For existing potable water customers, the conversion to recycled water is provided without a charge or fee from the District. Board Policy No. 2, included in **Appendix G**, contains the District policy on recycled water.

Table 6-7 provides a summary of estimated recycled water use that are expected to be realized by implementing these methods to encourage recycled water use.

Table 6-7 Methods to Expand Future Recycled Water Use (DWR Table 6-6)

	Supplier does not plan to expand recycled water use in the future. Supplier will not complete the table below but will provide narrative explanation.		
70 (Section 6.5.5)	Provide page location of narrative in UWMP		
Name of Action	Description	Planned Implementation Year	Expected Increase in Recycled Water Use
Expand recycled water use	Explore opportunities to expand use of recycled water, pending grant funding opportunities	Unknown	Unknown
		Total	
NOTES: (a) Volumes are in units of AF.			

The District has thoroughly explored ways to expand water recycling. However, with few large users of non-potable water (such as golf courses and heavy industry) within the District's service area, the District's remaining water recycling options are more expensive and less feasible than continuing to use potable infrastructure. As more customers improve irrigation efficiency, reduce turf areas, switch to native and drought-tolerant landscapes, and convert parks and athletic fields to artificial turf, there are fewer opportunities and lower demand for recycled water. For example, the total water entitlement of all recycled water customers connected to the recycled water system is 956 AF.

Another obstacle to increased water recycling in the District's service area is severe saltwater intrusion into the sewer collection systems of most of the local sanitation agencies, including that of the community's largest wastewater agency, CMSA. Rehabilitation of the sewer collection system was explored, but intrusion is so widespread that the cost to repair the sewers is much more than the cost of the water recycling project. Reducing salt in wastewater using membrane processes has also been explored, but the high cost and increased concentration of contaminants remaining in the wastewater discharge render that alternative infeasible from both a cost and regulatory perspective.

Satellite recycling plants, which can intercept sewage above the zones of saltwater intrusion and process the sewage to tertiary recycled water, appeared to be a promising avenue for enlarging the District's recycled water program. In 2001, the District conducted a study, partially funded through a grant from the DWR, to investigate the viability and cost of incorporating satellite water recycling plants into the District's distribution system. However, while the study concluded that this approach was technically feasible, it would cost over $3,000 per AF, making it prohibitively expensive. Recent feasibility studies

have also considered satellite treatment plants and the estimated costs are far greater than $3,000 per AF.

The District continues to investigate the potential for expansion of recycled water, which, along with conservation, is a high priority in the District's vision of sustainable water resource management. As part of its 2040 Water Resources Plan, the District evaluated recycled water and potable reuse opportunities for its various treatment plants. At this time, the District is exploring opportunities for grant funding to offset the cost of recycled water projects.

6.6 Desalinated Water

☑ ***CWC § 10631 (g)*** *A plan shall be adopted in accordance with this chapter and shall do all of the following:*

Describe the opportunities for development of desalinated water, including, but not limited to, ocean water, brackish water, and groundwater, as a long-term supply.

During August of 2010, the District adopted Ordinance 420, which states that the District shall not approve construction, or financing for construction, of a desalination facility unless such construction is approved by a majority of District voters voting in an election held within the District's service area for that purpose. While the District has, in the past, explored desalination as a potential supply option, the District does not intend to pursue desalination to augment water supplies at this time.

6.7 Water Exchanges and Transfers

☑ ***CWC § 10631 (c)*** *A plan shall be adopted in accordance with this chapter and shall do all of the following:*

Describe the opportunities for exchanges or transfers of water on a short-term or long-term basis.

The District's service area is entirely within Marin County. Marin County is a peninsula surrounded on three sides by water. The physical barriers imposed by these water bodies severely limit the water transfer opportunities available to the District.

However, during the drought of the 1970s, the District made use of water transfers to augment its supplies. Emergency pipeline connections were made to SCWA, north of the District, and to the East Bay Municipal Utility District (EBMUD) water system to the east. Water was delivered to the District from the State Water Project through the EBMUD system and from the Russian River via the SCWA and NMWD water systems.

The temporary connection with EBMUD was installed in the emergency pull-out lane of the Richmond-San Rafael Bridge. It was removed from the bridge in the early 1980s when traffic increased making the pipeline a safety hazard. However, the connection to the NMWD and SCWA was improved into a permanent connection and contracts allowing delivery of water during non-emergency periods have been implemented as described in Section 6.1.

MMWD assessed, as one of many resiliency options, the feasibility of transfers with EBMUD and other local water suppliers as part of its 2040 Water Resources Plan, and as part of its involvement in the Bay Area Regional Reliability Drought Contingency Plan. The 2040 Water Resources Plan recommended that

the District explore groundwater partnering opportunities with a partner that uses groundwater supplies to implement an in-lieu groundwater recharge program. The conjunctive groundwater use is part of the SCWA's resiliency planning efforts and the District hopes to participate in a future project.

6.8 Future Water Projects

☑ ***CWC § 10631*** *A plan shall be adopted in accordance with this chapter and shall do all of the following:*

(b) (3) For any planned sources of water supply, a description of the measures that are being undertaken to acquire and develop those water supplies.

(f) Include a description of all water supply projects and water supply programs that may be undertaken by the urban water supplier to meet the total projected water use, as established pursuant to subdivision (a) of Section 10635. The urban water supplier shall include a detailed description of expected future projects and programs that the urban water supplier may implement to increase the amount of the water supply available to the urban water supplier in normal and single-dry water years and for a period of drought lasting five consecutive water years. The description shall identify specific projects and include a description of the increase in water supply that is expected to be available from each project. The description shall include an estimate with regard to the implementation timeline for each project or program.

The District's 2040 Water Resources Plan evaluated various potential projects to increase supply reliability in the future. Future projects that may contribute to the District's water supply are summarized in **Table** 6-8.

Table 6-8 Expected Future Water Supply Projects or Programs (DWR Table 6-7)

	No expected future water supply projects or programs that provide a quantifiable increase to the agency's water supply. Supplier will not complete the table below.
	Some or all of the supplier's future water supply projects or programs are not compatible with this table and are described in a narrative format.
Page 73 (Section 6.8)	Provide page location of narrative in the UWMP

Name of Future Projects or Programs	Joint Project with other suppliers?		Description (if needed)	Planned Implementation Year	Planned for Use in Year Type	Expected Increase in Water Supply to Supplier
	Y/N	*If Yes, Supplier Name*				
Expand recycled water use	N		Pipeline to Peacock Gap Golf Course	2022	All types	166 AF
Rehabilitation of Kastania Pump Station	N		Pump station renewal	2022	All	0
Change to environmental releases	Y	Temporary Urgency Change Petition (TUCP) to State Water Board	TUCP	2021	Critically Dry	Unknown
Rental of generator for Soulajule Reservoir	N		Generator to power pump station	2021	Dry	0
Phoenix Lake	N		Pump water from lake to treatment plant	2021	Dry	0

NOTES:
(a) Volumes are in units of AF.

6.9 Summary of Existing and Planned Sources of Water

☑ ***CWC § 10631 (b)*** *Identify and quantify, to the extent practicable, the existing and planned sources of water available to the supplier over the same five-year increments described in subdivision (a).*

☑ ***CWC § 10631 (b) (4) (D)*** *A detailed description and analysis of the amount and location of groundwater that is projected to be pumped by the urban water supplier. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.*

Table 6-9 summarizes the actual source and water supply volume for 2020. **Table** 6-10 summarizes the projected source and water supply volume in five-year increments over the next 25 years.

Projected water supplies from SCWA reflect the anticipated purchases from SCWA. The District's contract with SCWA allows for purchases of up to 14,300 AFY. Projected surface water supplies are based on modelling performed by Woodard and Curran. Recycled and raw water projections were developed as part of the 2020 Urban Water Management Plan Water Demand Analysis and Water Conservation Measures Update and are discussed in more detail in **Appendix C**.

Table 6-9 Water Supplies - Actual (DWR Table 6-8)

Water Supply	Additional Detail on Water Supply	Actual Volume 2020	Water Quality	Total Right or Safe Yield *(optional)*
Purchased or Imported Water	Sonoma County Water Agency	6,822	Drinking Water	
Surface water (not desalinated)		20,449	Drinking Water	
Surface water (not desalinated)	Environmental Releases from Kent and Soulajule Lakes	12,699	Other Non-Potable Water	
Other	Water sold to the Meadow Club	180	Other Non-Potable Water	
	Total	40,149		

NOTES:
(a) Potable water was used to supplement the recycled water system. Thus, the 748 AF of recycled water shown in **Table** 6-5 and **Table** 6-6 was actually potable water from a combination of the potable water sources above.
(b) Volumes are in units of AF.

Table 6-10 Water Supplies – Projected (DWR Table 6-9)

Water Supply	Additional Detail on Water Supply	Projected Water Supply									
		2025		2030		2035		2040		2045	
		Reasonably Available Volume	Total Right or Safe Yield (optional)	Reasonably Available Volume	Total Right or Safe Yield (optional)	Reasonably Available Volume	Total Right or Safe Yield (optional)	Reasonably Available Volume	Total Right or Safe Yield (optional)	Reasonably Available Volume	Total Right or Safe Yield (optional)
Purchased or Imported Water	Sonoma County Water Agency (b)	5,300		5,300		5,300		5,300		5,300	
Surface water (not desalinated)		78,540		78,793		78,525		78,558		78,626	
Recycled Water		750		750		750		750		750	
Other	Raw Water	171		174		176		176		176	
Total		84,761		85,017		84,751		84,784		84,852	

NOTES:
(a) Volumes are in units of AF.
(b) Reasonably available volume for SCWA reflects the minimum contractual allotment from SCWA. MMWD's contract with SCWA allows for purchases of up to 14,300 AFY but includes a minimum supply of 5,300 AFY.
(c) Surface water volumes are estimated based on modeling performed by Woodard and Curran.

6.10 Special Conditions

6.10.1 Climate Change Effects

As discussed in SCWA's Draft 2020 Urban Water Management Plan (SCWA, 2021), SCWA has been evaluating the effects of climate change. As stated by SCWA:

> *Sonoma Water has investigated whether existing downscaled climate models can be used or modified to provide reliable estimates of the effects of increased concentrations of carbon dioxide and other greenhouse gases on temperatures and precipitation patterns within Sonoma Water's service area and within the watersheds from which Sonoma Water obtains its water supply during the 25-year planning horizon. As of this time, no detailed analysis exists of potential climate change impacts that takes into consideration the influence of marine layers, whose effects on the region are difficult to model. Given the uncertainties between various downscaled models, Sonoma Water evaluates ensembles of downscaled models for general water supply planning purposes. However, there is not one model that can be selected with any confidence to be analyzed for the required format of this Plan. For these reasons, this Plan assumes that the climatic patterns and associated hydrology experienced over the past 108 years of record (1910 – 2017) provide a reasonable basis for the 25-year planning horizon that would impact the water supply and water demand analysis set forth in the Plan.*
>
> *As discussed in Section 5.9, however, the United States Geological Survey (USGS) conducted a study for Sonoma Water on the potential effects of climate change on Sonoma Water's water supply, which has provided additional information on the potential impacts of climate change on Sonoma Water's service area. Furthermore, Sonoma Water has embarked on development of a Climate Adaptation Plan which studies the potential impacts of climate change in regards to both water supply reliability and Sonoma Water's transmission system facilities. This planning process analyzes the results of multiple climate models to determine a range of potential climate related impacts. A risk based analysis of the potential impacts to the watershed and Sonoma Water facilities will be used to identify courses of action that can be pursued to mitigate the effects of climate change. The work plan was developed in 2015 and a robust planning process began in 2016. Sonoma Water expects to bring the Climate Adaptation Plan to its Board for approval in summer 2021.*

Additionally, SGMA requires that GSPs include basin-wide water budget models under various climate change scenarios, including future conditions that account for the effects of estimated climate change. The water budget sections have not yet been developed by the Sonoma Valley GSA but are expected to include consideration of the effects of climate change for groundwater sustainability planning purposes.

Coping with inter-annual variability has always been a challenge for long-term water supply planning in the Bay Area, and climate change may intensify variability in coming decades. With potential additional changes imposed by climate change, there will be a heightened need to evaluate and respond to increased water supply variability.

The District's water supply comes from local runoff and the Russian River, which is dependent on local rainfall. Precipitation is stored in local reservoirs and released during the drier summer months. The District is currently storage-limited; existing storage capacity represents only about two years of demand. There are no remaining economically feasible sites for new surface water storage facilities, and the underlying groundwater basins are not considered feasible as a municipal supply source.

Historically, MMWD has been able to meet demands during prior periods of extreme drought with rationing, conservation, and increased purchases from SCWA. Given that the District is storage-limited, it can and has experienced changes in storage very quickly. For example, from December 2012 to January 2014, MMWD experienced a period of very low precipitation, and its reservoirs reached significantly low storage conditions that nearly triggered significant mandatory reductions. Water supply circumstances then changed in early February 2014 when the District received 15 inches of rain, more than the total rain during the prior 400 days combined.

Over the last 30 years, mean sea level around the San Francisco Bay area has been observed to change between 0 and 3 millimeters per year (NOAA, 2021). Sea level rise associated with climate change also has the potential to negatively impact the District's service area. There are a number of developed low-lying areas within the District's service area that could become inundated with sea level rise. Other areas may see an increase in the regularity of flood events. This could result in reduced overall water use in the service area, or shifts in the location of uses, as customers are either forced or opt to move elsewhere.

As climate change advances, there is also a potential for increased ecological vulnerability to currently identified invasive species as well as to new invasive species. According to Cal WeedMapper, Marin County has over 150 invasive flora species, including water hyacinth (*elchhornia crassipes*), European beachgrass (*ammophilia arenaria*), and red brome (*bromus madritensus* ssp. *rubens*). There are also 19 invasive flora species that, while not yet in Marin County, have been identified within 50 miles of the County. These include spotted knapweed (*centaurea maculosa*), alligator weed (*alternanthera philoxeroides*), and the South American spongeplant (*limnobium laevigatum*). There are also 11 invasive fauna species within Marin County, including the Asian estuarine mudsnail (*batillaria attramentaria*), the amethyst gem clam (*gemma gemma*), and the American oyster drill (*urosalpinx cinerea*). Invasive species could impact the District's water supply by negatively affecting water quality and infrastructure systems.

Climate change is expected to affect the District's supply as follows:

- Total precipitation is not projected to change significantly, although there may be less precipitation in the spring.
- Timing of runoff is expected to shift to earlier in the year, affecting reservoir storage, especially in the spring and summer months.
- Variability in annual precipitation is expected to continue, with vulnerability to droughts and dry periods.
- More intense storms anticipated that may affect surface water runoff and storage and stored water quality.
- Sea level rise could inundate some of the developed low-lying areas and increase flooding regularity in other areas.

The District's Water Resources Plan considered the impact of climate change on the District's supply. As part of the Water Resources Plan, climate change scenarios were developed and modeled using Marin

WaterSim, a dynamic systems model built within the commercial software GoldSim, to evaluate the District's water supply resiliency. The modeling used precipitation and inflow data for 2010 through 2099 for each of the District's lakes under four climate change models. Based on the modeling performed in 2017, there were no predicted shortages through 2040 under the modeled climate change scenarios, although overall reservoir levels were projected to significantly decrease under the modeled climate change conditions. These findings were incorporated into the recommendations in the Water Resources Plan.

6.10.2 Regulatory Conditions and Project Development

Emerging regulatory conditions may affect planned future projects and the characterization of future water supply availability and analysis. As the District moves forward with plans to develop supply projects, emerging regulatory conditions will be considered, and the associated water supply reliability impacts will be assessed in future UWMP updates.

6.10.3 Other Locally Applicable Criteria

Other locally applicable criteria may affect characterization and availability of an identified water supply (e.g., changes in regional water transfer rules may alter the availability of a water supply that had historically been readily available). The District does not have any current plans to develop additional supply sources. If the District does move forward ahead with any plans to develop supply projects, locally applicable criteria will be considered, and the associated water supply reliability impacts will be assessed in future UWMP updates.

6.11 Energy Intensity

☑ ***CWC § 10631.2***

(a) In addition to the requirements of Section 10631, an urban water management plan shall include any of the following information that the urban water supplier can readily obtain:
(1) An estimate of the amount of energy used to extract or divert water supplies.
(2) An estimate of the amount of energy used to convey water supplies to the water treatment plants or distribution systems.
(3) An estimate of the amount of energy used to treat water supplies.
(4) An estimate of the amount of energy used to distribute water supplies through its distribution systems.
(5) An estimate of the amount of energy used for treated water supplies in comparison to the amount used for nontreated water supplies.
(6) An estimate of the amount of energy used to place water into or withdraw from storage.
(7) Any other energy-related information the urban water supplier deems appropriate.
(b) The department shall include in its guidance for the preparation of urban water management plans a methodology for the voluntary calculation or estimation of the energy intensity of urban water systems. The department may consider studies and calculations conducted by the Public Utilities Commission in developing the methodology.
(c) The Legislature finds and declares that energy use is only one factor in water supply planning and shall not be considered independently of other factors.

Within the service area, the District uses energy to distribute water supplies through its distribution systems. The energy used by the distribution systems is metered and documented in monthly PG&E bills. From January 2019 to December 2019, the District used 12,726,330 kilowatt hours (kWh) of energy to operate the water supply system and delivered 25,688 AFY of potable and non-potable water (excluding environmental releases) to customers in the service area, for a total energy intensity of 495 kWh/AF (**Table** 6-11). SCWA uses energy to treat and distribute water before delivery to the District. However, the energy is used outside of the District's service area, and the energy consumption information is not typically shared with the District.

Table 6-11 Recommended Energy Intensity – Total Utility Approach (DWR Table O-1B)

Urban Water Supplier: *Marin Municipal Water District*

Water Delivery Product

Multiple Products (unable to use table O-1C)

Enter Start Date for Reporting Period	1/1/2019	Urban Water Supplier Operational Control		
End Date	12/31/2019			
Is upstream embedded in the values reported?	No	Sum of All Water Management Processes	Non-Consequential Hydropower	
Water Volume Units Used	AF	Total Utility	Hydropower	Net Utility
Volume of Water Entering Process (volume unit)		*25,688*	*0*	*25,688*
Energy Consumed (kWh)		*12,726,330*	*0*	*12,726,330*
Energy Intensity (kWh/volume)		*495.4*	*0.0*	*495.4*

Quantity of Self-Generated Renewable Energy

0 kWh

Data Quality

Metered Data

Data Quality Narrative:

Utility bills for the associated time period are used as the source for energy consumption data.

Narrative:

Total energy consumption represents the energy consumed during pumping, treatment, conveyance, and distribution.

7. WATER SUPPLY RELIABILITY

☑ ***CWC § 10620 (f)***

An urban water supplier shall describe in the plan water management tools and options used by that entity that will maximize resources and minimize the need to import water from other regions.

☑ ***CWC § 10630.5***

Each plan shall include a simple lay description of how much water the agency has on a reliable basis, how much it needs for the foreseeable future, what the agency's strategy is for meeting its water needs, the challenges facing the agency, and any other information necessary to provide a general understanding of the agency's plan.

This chapter describes the reliability of the Marin Municipal Water District's (MMWD's or District's) water supplies. Assessment of water supply reliability is complex and dependent upon a number of factors, such as the number of water sources, regulatory and legal constraints, hydrological and environmental conditions, climate change, and expected growth, among others. Based on available historical information and projections of future water uses, regulatory and legal constraints, and hydrological and environmental conditions, including climate change, the District has made its best determination of future water supply reliability of for the District, as described below.

7.1 Constraints on Water Sources

Purchased water from Sonoma County Water Agency (SCWA or Sonoma Water) and local surface water are the primary supply sources for the District. Several factors pose potential constraints on the District's water supply, including limits on the amount available, water quality, climatic conditions, or a combination of these. **Table** 7-1 lists the District's sources of water supply and the potential factors that could impact the District's supply. These constraints, along with associated management strategies, are summary in the following sections.

Table 7-1 Potential Supply Constraints

Factors	Sonoma County Water Agency (Imported Water)	District Produced Surface Water	Recycled Water
Limitation Quantification	Quantity limited by contractual limits and available pipeline capacity. When pipeline capacity impacts deliveries, the District/SCWA will have to construct new conveyance facilities to supplement capacity.	Climatic variation could result in limited storage carryover.	None
Legal	Supplies could potentially be reduced subject to unanticipated regulatory requirements.	None	None
Environmental	Fish habitat protection could result in summertime diversion curtailments on the Russian River. Future supply increases may not be consistent due to delays in construction, approval of water rights applications, or environmental documentation.	Future increases in instream flow requirements could decrease supply.	None
Water Quality	None	None	Salt-water intrusion in low-lying areas of sewer collection system, in some parts of the District, could impact recycled water quality.
Climatic	Drought could reduce available surface water supply.	Drought could reduce available surface water supply.	None

7.1.1 Supply Availability

7.1.1.1 *Purchased Water*

The water available to SCWA's customers is constrained by both physical and legal constraints. The capacity of SCWA's transmission system is a physical constraint that can limit the District's water supply from SCWA. The District receives the SCWA supply through the District's 8-mile-long aqueduct, which is a 30, 36, and 42-inch diameter steel transmission main that runs from the SCWA's Petaluma Aqueduct near Kastania Tank in south Petaluma to a connection located at the northern end of the District's pipeline facilities in Novato.

Legal constraints include the Agreement, SCWA Water Rights, and the Russian River Biological Opinion. These legal constraints are described below.

- The Agreement includes specific maximum amounts of water that SCWA is obligated to supply to its Water Contractors, including the District. The Agreement states that SCWA is not obligated to provide the District with more than 14,300 acre-feet per year (AFY). The Agreement also places seasonal limitations on water delivery rates, with deliveries limited to 23.1 million gallons per day (mgd) from December to March, 12.8 mgd from May to September, 20.1 mgd in April and November, and 17.1 mgd in October.
- Four State Water Resources Control Board (SWRCB) permits (SWRCB Permit Numbers 12947A, 12949, 12950, and 1596) currently authorize SCWA to store water in Lake Mendocino (122,500 AFY) on the East Fork Russian River and Lake Sonoma (245,000 AFY) on Dry Creek, and to divert and redivert 180 cfs of water from the Russian River, up to 75,000 AFY. SCWA estimates the existing annual diversion and rediversion limit of 75,000 AFY will be exceeded by 2035 (NMWD, 2016). Consequently, SCWA will need to file an application to SWRCB by around 2030 to increase its annual diversion and rediversion limit (NMWD, 2016). The permits also establish minimum instream flow requirements for fish and wildlife protection as well as for recreational considerations. These minimum instream flow requirements vary according to the hydrologic cycle as defined by SWRCB Decision 1610. SCWA meets the Decision 1610 flow requirements by making releases from Coyote Valley Dam at Lake Mendocino and Warm Springs Dam at Lake Sonoma (NMWD, 2016).
- On 24 September 2008, the National Marine Fisheries Service (NMFS) issued a 15-year biological opinion for water supply, flood control operations, and channel maintenance conducted by the United States Army Corps of Engineers (USACE), SCWA, and Mendocino County Russian River Flood Control and Water Conservation Improvement District in the Russian River watershed. The Russian River Biological Opinion (Biological Opinion) concluded that the elevated river flows required by Decision 1610 were adversely affecting fish habitat and listed alternatives to reduce the effects. The alternatives included:
    - Reducing summertime flows in the Russian River and Dry Creek;
    - Enhancing six miles of habitat in Dry Creek;
    - Creating a freshwater lagoon in the estuary during summer months;
    - Monitoring both habitat and fish in the Dry Creek, the estuary, and the Russian River; and
    - Eliminating impediments to fish spawning or improving habitat in several streams.
- The Biological Opinion requires that summertime flows be permanently reduced to replicate river conditions in dry years. Since the biological opinion was released, SCWA has submitted a petition to the SWRCB requesting permanent changes to Decision 1610 minimum flow requirements in line with the Biological Opinion and is preparing an Environmental Impact Report (EIR) required by the California Environmental Quality Act (CEQA). Since 2010, SCWA has requested temporary changes to the Decision 1610 minimum flows annually based on the Biological Opinion recommendations.

In addition to these projects, SCWA is currently evaluating the feasibility of groundwater banking as a method of increasing water supply reliability. A Groundwater Banking Feasibility Study was completed in 2012. SCWA worked with the City of Sonoma to implement a pilot study using one of the City of Sonoma's municipal supply wells (SCWA, 2016).

In its 2020 UWMP, SCWA describes its reliability as follows:

> "The overall conclusion is that Sonoma Water has adequate water supply through the 2045 planning horizon of this Plan, except for single-dry years, starting after 2025. For single-dry years, the model simulations predict that storage levels in Lake Sonoma will drop below 100,000 AF prior to July 15th, thus requiring demand curtailments by Sonoma Water customers per Decision 1610 (Section 5.1.6.1 [of SCWA's 2020 UWMP]) for some portion of the year. In these circumstances, Sonoma Water will work with its Customers to reduce water demands as described in the Water Shortage Contingency Plan described in Section 7 [of SCWA's 2020 UWMP], or to utilize additional local sources, or both. Based on efforts over the last five years during dry conditions, Sonoma Water does not anticipate any difficulty in maintaining an adequate water supply during the single-dry year. The magnitude of these single-dry year potential shortfalls is estimated to be about 19% of average annual demand by 2045."

On the basis of this, and the associated tables provided by SCWA, projected availability of SCWA supplies to the District over the planning horizon are presented in Section 7.2.

Similar to the imported supply, the District's local surface water supply could also be impacted by future supply conditions and/or climate change. The reliability of the local surface water, as well as recycled water quality concerns are described later in this chapter (Sections 7.1.2 and 7.2.3).

7.1.2 Water Quality Impacts on Reliability

☑ ***CWC § 10634***

The plan shall include information, to the extent practicable, relating to the quality of existing sources of water available to the supplier over the same five-year increments as described in subdivision (a) of Section 10631, and the manner in which water quality affects water management strategies and supply reliability.

7.1.2.1 *Potable Water*

The District is fortunate to have water of exceptionally high quality and has never exceeded a water quality regulatory limit or received a regulatory violation. All drinking water standards are set by the U.S. Environmental Protection Agency (USEPA) under the authorization of the Federal Safe Drinking Water Act of 1974. In California, the State Water Resources Control Board (SWRCB), Division of Drinking Water (DDW) can either adopt the USEPA standards or set more stringent standards, which are then codified in Title 22 of the California Code of Regulations. There are two general types of drinking water standards:

- **Primary Maximum Contaminant Levels (MCLs)** are health protective standards and are established using a very conservative risk-based approach for each constituent that takes into potential health effects, detectability and treatability, and costs of treatment. Public water systems may not serve water that exceeds Primary MCLs for any constituent.
- **Secondary MCLs** are based on the aesthetic qualities of the water such as taste, odor, color, and certain mineral content, and are considered limits for constituents that may affect consumer acceptance of the water.

The District routinely monitors the water that is treated and served to customers to ensure that water delivered to customers meets these drinking water standards. The results of this testing are reported to

the SWRCB DDW following each test and are summarized annually in Water Quality Reports (also known as "Consumer Confidence Reports"), which are provided to customers by mail and made available on the District's website at https://www.marinwater.org/water-quality#button-1.

Five of the seven local surface water reservoirs are located in a District-owned and protected watershed that substantially reduces the potential for contamination. The two reservoirs outside the protected watershed are located in rural areas with low population densities that are maintained by strict zoning requirements. In addition, the District has established Watershed Protection Agreements with landowners in these watersheds. Accordingly, the excellent water quality that the District has historically enjoyed is expected to continue into the future. There have been no instances when water quality issues have limited water supply or affected reliability.

Given the District's proactive monitoring and management of water quality in its source water supplies, water quality is not expected to impact the reliability of the District's available potable water supplies within the planning horizon (i.e., through 2045).

7.1.2.2 *Recycled Water*

As described in Section 6.5, the District has developed an extensive recycled water program in the Las Gallinas area. The District has jointly investigated the feasibility of building water recycling systems in other areas as well, none of which were found to be economically feasible. An additional constraint to water recycling is saltwater intrusion into low-lying areas of the sewer collection systems that renders the water too salty to use for landscape irrigation, the primary market for recycled water in the District's service area. The District's existing recycled water system would also be vulnerable to saltwater intrusion in the event of a severe earthquake. Most of the low-lying areas subject to saltwater intrusion have soil conditions that would experience differential settlement in an earthquake and allow further saltwater inflow into the sewage collection system.

7.1.3 Climate Change Impacts to Supply

☑ ***CWC § 10635(b)***

(4) Considerations of the historical drought hydrology, plausible changes on projected supplies and demands under climate change conditions, anticipated regulatory changes, and other locally applicable criteria.

Section 4.4 of this Urban Water Management Plan (UWMP or Plan) presents information on how the impacts of climate change are considered in projected demands in the District, and Section 6.10.1 provides a summary of potential climate change impacts on supplies.

7.2 Reliability by Type of Year

☑ ***CWC § 10631 (b)***

Identify and quantify, to the extent practicable, the existing and planned sources of water available to the supplier over the same five-year increments described in subdivision (a), providing supporting and related information, including all of the following:

☑ ***CWC § 10631 (b)(1)***

A detailed discussion of anticipated supply availability under a normal water year, single dry year, and droughts lasting at least five years, as well as more frequent and severe periods of drought, as described in the drought risk assessment. For each source of water supply, consider any information pertinent to the reliability analysis conducted pursuant to Section 10635, including changes in supply due to climate change.

☑ ***CWC § 10635 (a)***

Every urban water supplier shall include, as part of its urban water management plan, an assessment of the reliability of its water service to its customers during normal, dry, and multiple dry water years. This water supply and demand assessment shall compare the total water supply sources available to the water supplier with the long-term total projected water use over the next 20 years, in five-year increments, for a normal water year, a single dry water year, and a drought lasting five consecutive water years. The water service reliability assessment shall be based upon the information compiled pursuant to Section 10631, including available data from state, regional, or local agency population projections within the service area of the urban water supplier.

Per the UWMP Guidebook 2020, the water service reliability assessment includes three unique year types:

- A normal hydrologic year represents the water supplies available under normal conditions, this could be an averaged range of years or a single representative year,
- A single dry year represents the lowest available water supply, and
- A five-consecutive year drought represents the driest five-year period in the historical record.

Identification of these dry year periods consistent with the UWMP Guidebook 2020 methodology is provided below.

SCWA reviewed historical hydrologic data for its system, and as indicated in **Table** 7-2 below, has identified 2004 as the basis for its average year supply, 1977 as the basis for single-dry year supply, and the period of 1987-1991 as the basis for a five-year drought supply. The methodology used by SCWA is further discussed in SCWA's 2020 UWMP.

Table 7-2 Basis of Water Year Data (Reliability Assessment) (DWR Table 7-1)

Year Type	Base Year	Available Supplies if Year Type Repeats		
		X	Quantification of available supplies is not compatible with this table and is provided elsewhere in the UWMP. Location: **Tables 7-3** through **7-6**	
			Quantification of available supplies is provided in this table as either volume only, percent only, or both.	
		Volume Available		% of Average Supply
Average Year				100%
Single-Dry Year				
Consecutive Dry Years 1st Year				
Consecutive Dry Years 2nd Year				
Consecutive Dry Years 3rd Year				
Consecutive Dry Years 4th Year				
Consecutive Dry Years 5th Year				
NOTES:				

7.2.1 Purchased Water

Purchases from SCWA are assumed to increase in dry years, in order to supplement available local surface water supplies. In normal years, SCWA purchases are assumed to be 5,300 AF, but could increase during single and the early dry years of a drought, as long as MMWD's full allocation is available from SCWA. MMWD's current contract with SCWA allows for the District to purchase up to 14,300 AF; however, the District's ability to accept this volume is currently limited by infrastructure constraints. Capital improvements will be needed to increase conveyance capacity beyond 10,000 AFY.

Based on the reliability information provided by SCWA, SCWA expects that its supply will be sufficient to meet all of its customers projected demands except for in the single-dry year scenario beginning in 2030. The projected shortfall under a single-dry year hydrology ranges from 16% to 19% of the total demands of SCWA's customers. For planning purposes, it is assumed that in the single-dry year and multiple dry-year scenarios, 7,200 AFY would be supplied in future years through 2045, which is within the projected supply with the projected cutbacks. This 7,200 AFY value is based on MMWD's estimates of reasonable hydraulic limits. The assumed purchases from SCWA are provided in **Table** 7-3**,** below, and are consistent with the reliability estimates provided by SCWA.

Table 7-3 Projected Availability of SCWA Supply (Responds to DWR Table 7-1)

Year Type		2025	2030	2035	2040	2045
Normal Year		5,300	5,300	5,300	5,300	5,300
Single-Dry Year		7,200	7,200	7,200	7,200	7,200
Extended Drought	First year	7,200	7,200	7,200	7,200	7,200
	Second year	7,200	7,200	7,200	7,200	7,200
	Third year	4,597	4,597	4,597	4,597	4,597
	Fourth year	4,300	4,300	4,300	4,300	4,300
	Fifth year	4,300	4,300	4,300	4,300	4,300
NOTES: (a) Volumes are in units of AF.						

7.2.2 Surface Water

The projected availability of local surface water supplies by type are provided in **Table** 7-4 below.

Table 7-4 Projected Availability of Local Surface Water Supply (Responds to DWR Table 7-1)

Year Type		2025	2030	2035	2040	2045
Normal Year		78,540	78,793	78,525	78,558	78,626
Single-Dry Year		44,011	44,013	44,009	44,013	44,023
Extended Drought	First year	71,435	71,436	71,434	71,436	71,441
	Second year	76,200	76,189	76,216	76,188	76,136
	Third year	80,912	80,927	80,896	80,930	81,007
	Fourth year	67,479	67,471	67,502	67,470	67,401
	Fifth year	64,220	64,208	64,245	64,206	64,102
NOTES: (a) Volumes are in units of AF. (b) Supplies are estimated based on modeling performed by Woodard and Curran.						

7.2.3 Recycled Water

Supply availability for recycled water is not assumed to be impacted in dry years, as reflected in **Table** 7-5 below, and is consistent with the demand projections identified in **Table** 6-10.

Table 7-5 Projected Availability of Recycled Water Supply (Responds to DWR Table 7-1)

Year Type		2025	2030	2035	2040	2045
Normal Year		750	750	750	750	750
Single-Dry Year		750	750	750	750	750
Extended Drought	First year	750	750	750	750	750
	Second year	750	750	750	750	750
	Third year	750	750	750	750	750
	Fourth year	750	750	750	750	750
	Fifth year	750	750	750	750	750
NOTES: (a) Volumes are in units of AF.						

7.2.4 Raw Water

Supply availability for raw water is not assumed to be impacted in dry years, as reflected in **Table** 7-6 below, and is consistent with the demand projections identified in **Table** 4-4.

Table 7-6 Projected Availability of Raw Water Supply (Responds to DWR Table 7-1)

Year Type		2025	2030	2035	2040	2045
Normal Year		171	174	176	176	176
Single-Dry Year		171	174	176	176	176
Extended Drought	First year	171	174	176	176	176
	Second year	171	174	176	176	176
	Third year	171	174	176	176	176
	Fourth year	171	174	176	176	176
	Fifth year	171	174	176	176	176
NOTES: (a) Volumes are in units of AF.						

7.3 Supply and Demand Assessment

☑ ***CWC § 10635 (a)***

Every urban water supplier shall include, as part of its urban water management plan, an assessment of the reliability of its water service to its customers during normal, dry, and multiple dry water years. This water supply and demand assessment shall compare the total water supply sources available to the water supplier with the long-term total projected water use over the next 20 years, in five-year increments, for a normal water year, a single dry water year, and a drought lasting five consecutive water years. The water service reliability assessment shall be based upon the information compiled pursuant to Section 10631, including available data from state, regional, or local agency population projections within the service area of the urban water supplier.

As identified in Section 7.2 and associated tables, water supply availability differs for the District's supply sources during normal, single dry, and multiple dry years. **Table** 7-7 shows the projected supply and demand totals for a normal year, consistent with those in **Table** 6-10 and **Table** 4-4. **Table** 7-8 shows the projected supply and demand totals for a single dry year, and **Table** 7-9 shows the projected supply and demand totals for multiple dry year periods extending five years. The District is projected to have sufficient supplies to meet projected demands in normal years, single dry years, and multiple dry years through 2045.

Table 7-7 Normal Year Supply and Demand Comparison (DWR Table 7-2)

	2025	2030	2035	2040	2045
Supply totals *From DWR Table 6-9*	84,761	85,017	84,751	84,784	84,852
Demand totals *From DWR Table 4-3*	38,632	40,211	40,369	40,434	40,608
Difference	46,129	44,806	44,381	44,350	44,244
NOTES: (a) Volumes are in units of AF.					

Table 7-8 Single Dry Year Supply and Demand Comparison (DWR Table 7-3)

	2025	2030	2035	2040	2045
Supply totals	52,132	52,137	52,135	52,139	52,149
Demand totals	38,632	40,211	40,369	40,434	40,608
Difference	13,500	11,926	11,766	11,705	11,541
NOTES: (a) Volumes are in units of AF.					

Table 7-9 Multiple Dry Years Supply and Demand Comparison (DWR Table 7-4)

		2025	2030	2035	2040	2045
First year	Supply totals	79,556	79,560	79,560	79,562	79,567
	Demand totals	38,632	40,211	40,369	40,434	40,608
	Difference	40,924	39,349	39,191	39,128	38,959
Second year	Supply totals	84,321	84,313	84,342	84,314	84,262
	Demand totals	38,632	40,211	40,369	40,434	40,608
	Difference	45,689	44,102	43,973	43,880	43,654
Third year	Supply totals	86,430	86,448	86,419	86,453	86,530
	Demand totals	38,632	40,211	40,369	40,434	40,608
	Difference	47,798	46,237	46,050	46,019	45,922
Fourth year	Supply totals	72,700	72,695	72,728	72,696	72,627
	Demand totals	38,632	40,211	40,369	40,434	40,608
	Difference	34,068	32,484	32,359	32,262	32,019
Fifth year	Supply totals	69,441	69,432	69,471	69,432	69,328
	Demand totals	38,632	40,211	40,369	40,434	40,608
	Difference	30,809	29,221	29,102	28,998	28,720

NOTES:
(a) Volumes are in units of AF.

7.4 Water Management Tools and Options

The District's *Water Resources Plan 2040* dated March 2017 (Water Resources Plan; MMWD, 2017) evaluated various options and tools to improve water supply resiliency. A total of 40 resiliency options were developed and grouped into categories, including (1) water use efficiency, (2) reuse, (3) expanded SCWA facilities, (4) expanded storage, (5) water purchases and groundwater, (6) desalination, and (7) groundwater. The alternatives were evaluated based on a number of criteria, including reliability, technical complexity, environmental stewardship, local control, institutional complexity, public support, and project readiness. The resiliency options were then grouped into five alternatives, corresponding with specific themes, which included:

- Expand Existing Programs (consisting of enhanced conservation, Santa Rosa Plain conjunctive use, and watershed management);
- Minimize Infrastructure (consisting of enhanced conservation, SCWA Kastania Pump Station Upgrade, and Santa Rosa Plain Conjunctive Use);
- Dry Year Actions (consisting of enhanced conservation and spot market transfer;
- Maximize Reuse (consisting of regional indirect potable reuse); and
- Maximize Resiliency (consisting of enhanced conservation, regional indirect potable reuse, SCWA Kastania Pump Station upgrade, and watershed management).

Each of these alternatives was analyzed to determine their relative effectiveness and costs. Based on the analysis, the Water Resources Plan recommended the "Expand Existing Programs" alternative, which includes following actions:

- Evaluate Increased Conservation: The Water Resources Plan recommended that the District evaluate implementing an enhanced level of water conservation beyond the current level of commitment referred to internally as Program A.

- Invest in Watershed Management: The Water Resources Plan recommended that the District expand the implementation of a watershed management action to reduce accumulated fuels and brush in the watershed, which was projected to increase yield by approximately 210 AFY.

- Explore Groundwater Partnering Opportunities: The Water Resources Plan recommended that the District explore partnering with a SCWA customer that also uses groundwater supplies to implement an in-lieu groundwater recharge program. Under such a program, the District would allow a portion of its SCWA supply to be used by a partner agency in normal and wet years to offset local groundwater pumping, allowing the basin to recharge and store additional water om those years. The partner agency would then rely on this replenished groundwater supply in dry years, sending some or all of its SCWA supply to the District. This would allow the District to functionally "store" water in the groundwater basin for use during dry years.

The District is pursuing additional actions to optimize water supply during dry years, including ongoing projects to utilize reservoirs that are typically not utilized, including Phoenix Lake.

In addition, the District is a member of the North Bay Water Reuse Authority (NBWRA), which is a regional water recycling organization formed to put recycled water to its broadest and most beneficial use. NBWRA consists of ten local agencies covering 315 square miles in the portions of Marin, Sonoma, and Napa counties that surround the northern rim of the San Francisco Bay. As part of NBWRA, the District has made great strides to expand recycled water use.

In addition, the District continues to work to expand the use of recycled water to include non-irrigation uses. Another option being evaluated includes upgrades to the Kastania Pump Station to increase the capacity of the pipeline from SCWA by installing new variable speed pumps.

7.5 Drought Risk Assessment

☑ ***CWC § 10635(b)***

Every urban water supplier shall include, as part of its urban water management plan, a drought risk assessment for its water service to its customers as part of information considered in developing the demand management measures and water supply projects and programs to be included in the urban water management plan. The urban water supplier may conduct an interim update or updates to this drought risk assessment within the five-year cycle of its urban water management plan update. The drought risk assessment shall include each of the following:

(1) A description of the data, methodology, and basis for one or more supply shortage conditions that are necessary to conduct a drought risk assessment for a drought period that lasts five consecutive water years, starting from the year following when the assessment is conducted.

(2) A determination of the reliability of each source of supply under a variety of water shortage conditions. This may include a determination that a particular source of water supply is fully reliable under most, if not all, conditions.

(3) A comparison of the total water supply sources available to the water supplier with the total projected water use for the drought period.

(4) Considerations of the historical drought hydrology, plausible changes on projected supplies and demands under climate change conditions, anticipated regulatory changes, and other locally applicable criteria.

7.5.1 Characteristic Five-Year Water Use

As a first step to the Drought Risk Assessment, water suppliers are advised to estimate unconstrained water demand for the next five years (2021-2025). Unconstrained water demand is the expected water use in the absence of drought water use restrictions. The forecast of unconstrained demand for the next five-years is shown in **Table** 7-10 below.

Table 7-10 Characteristic Five-Year Water Use

	2021	2022	2023	2024	2025
Total Projected Use During Drought Period	34,329	34,898	35,476	36,064	36,661

7.5.2 Risk Assessment Projections – Multi-Year Drought Scenario

Based on information provided by SCWA, SCWA does not anticipate any supply shortfalls in the 2021 through 2025 period, even under hydrologically dry conditions. Based on the current reservoir levels of MMWD's local supply system, however, supplies are expected to be constrained in the near term. **Table** 7-11 below shows the comparison between projected supplies and demands from 2021 through 2025.

Table 7-11 Five-Year Drought Risk Assessment Tables to Address Water Code 10635(b) (DWR Table 7-5)

2021	Total
Total Water Use	34,329
Total Supplies	79,556
Surplus/Shortfall w/o WSCP Action	45,227
Planned WSCP Actions (use reduction and supply augmentation)	
WSCP - supply augmentation benefit	-
WSCP - use reduction savings benefit	-
Revised Surplus/(shortfall)	-
Resulting % Use Reduction from WSCP action	0%

2022	Total
Total Water Use	34,898
Total Supplies	84,321
Surplus/Shortfall w/o WSCP Action	49,423
Planned WSCP Actions (use reduction and supply augmentation)	
WSCP - supply augmentation benefit	-
WSCP - use reduction savings benefit	-
Revised Surplus/(shortfall)	-
Resulting % Use Reduction from WSCP action	0%

2023	Total
Total Water Use	35,476
Total Supplies	86,430
Surplus/Shortfall w/o WSCP Action	50,954
Planned WSCP Actions (use reduction and supply augmentation)	
WSCP - supply augmentation benefit	-
WSCP - use reduction savings benefit	-
Revised Surplus/(shortfall)	-
Resulting % Use Reduction from WSCP action	0%

Table 7-11 Five-Year Drought Risk Assessment Tables to Address Water Code 10635(b) (DWR Table 7-5)

2024	Total
Total Water Use	36,064
Total Supplies	72,700
Surplus/Shortfall w/o WSCP Action	36,636
Planned WSCP Actions (use reduction and supply augmentation)	
WSCP - supply augmentation benefit	-
WSCP - use reduction savings benefit	-
Revised Surplus/(shortfall)	-
Resulting % Use Reduction from WSCP action	0%

2025	Total
Total Water Use	36,661
Total Supplies	69,441
Surplus/Shortfall w/o WSCP Action	32,780
Planned WSCP Actions (use reduction and supply augmentation)	
WSCP - supply augmentation benefit	-
WSCP - use reduction savings benefit	-
Revised Surplus/(shortfall)	-
Resulting % Use Reduction from WSCP action	0%
NOTES: (a) Volumes are in units of AF.	

7.5.3 Risk Assessment Projections – Extreme Drought Scenario

As part of the District's drought supply projection modelling efforts, an alternative drought risk assessment scenario was also explored. Under this scenario, an extreme drought event was assessed where supplies would drop to below 14,000 AFY by 2025. **Table** 7-12 shows a comparison between projected supplies and demands from 2021 through 2025 under this extreme drought scenario. Under this scenario, supply shortfalls would be met by WSCP water use reduction actions as outlined in **Appendix H,** up through 2024, after which there would be a supply shortfall of approximately 2,700 AFY in 2025.

Table 7-12 Five-Year Drought Risk Assessment Tables - Extreme Drought Scenario

2021	Total
Total Water Use	34,329
Total Supplies	63,528
Surplus/Shortfall w/o WSCP Action	29,199
Planned WSCP Actions (use reduction and supply augmentation)	
WSCP - supply augmentation benefit	-
WSCP - use reduction savings benefit	-
Revised Surplus/(shortfall)	-
Resulting % Use Reduction from WSCP action	0%

2022	Total
Total Water Use	34,898
Total Supplies	46,911
Surplus/Shortfall w/o WSCP Action	12,013
Planned WSCP Actions (use reduction and supply augmentation)	
WSCP - supply augmentation benefit	-
WSCP - use reduction savings benefit	-
Revised Surplus/(shortfall)	-
Resulting % Use Reduction from WSCP action	0%

2023	Total
Total Water Use	35,476
Total Supplies	35,364
Surplus/Shortfall w/o WSCP Action	(112)
Planned WSCP Actions (use reduction and supply augmentation)	
WSCP - supply augmentation benefit	0
WSCP - use reduction savings benefit	112
Revised Surplus/(shortfall)	0
Resulting % Use Reduction from WSCP action	0.32%

Table 7-12 Five-Year Drought Risk Assessment Tables - Extreme Drought Scenario

2024	Total
Total Water Use	36,064
Total Supplies	24,706
Surplus/Shortfall w/o WSCP Action	(11,358)
Planned WSCP Actions (use reduction and supply augmentation)	
WSCP - supply augmentation benefit	0
WSCP - use reduction savings benefit	11,358
Revised Surplus/(shortfall)	0
Resulting % Use Reduction from WSCP action	31%

2025	Total
Total Water Use	36,661
Total Supplies	13,810
Surplus/Shortfall w/o WSCP Action	(22,851)
Planned WSCP Actions (use reduction and supply augmentation)	
WSCP - supply augmentation benefit	0
WSCP - use reduction savings benefit	20,164
Revised Surplus/(shortfall)	(2,687)
Resulting % Use Reduction from WSCP action	55%
NOTES: (a) Volumes are in units of AF.	

8. WATER SHORTAGE CONTINGENCY PLANNING

☑ ***CWC § 10640***

(a) Every urban water supplier required to prepare a plan pursuant to this part shall prepare its plan pursuant to Article 2 (commencing with Section 10630). The supplier shall likewise periodically review the plan as required by Section 10621, and any amendments or changes required as a result of that review shall be adopted pursuant to this article.

(b) Every urban water supplier required to prepare a water shortage contingency plan shall prepare a water shortage contingency plan pursuant to Section 10632. The supplier shall likewise periodically review the water shortage contingency plan as required by paragraph (10) of subdivision (a) of Section 10632 and any amendments or changes required as a result of that review shall be adopted pursuant to this article.

The Water Shortage Contingency Plan (WSCP) for Marin Municipal Water District (MMWD or District) is included in this Urban Water Management Plan (UWMP) as **Appendix H**. The WSCP serves as a standalone document to be engaged in the case of a water shortage event, such as a drought or supply interruption, and defines specific policies and actions that will be implemented at various shortage level scenarios. The primary objective of the WSCP is to ensure that the District has in place the necessary resources and management responses needed to protect health and human safety, minimize economic disruption, and preserve environmental and community assets during water supply shortages and interruptions. Consistent with CWC §10632, the WSCP includes six levels to address shortage conditions ranging from up to 10% to greater than 50% shortage, identifies a suite of demand mitigation measures for the District to implement at each level, and identifies procedures for the District to annually assess whether or not a water shortage is likely to occur in the coming year, among other things.

A summary of the key elements of the WSCP including water shortage levels and demand-reduction actions is shown in **Table** 8-1, **Table** 8-2 and **Table** 8-3. Additional details are provided in **Appendix H.**

The WSCP was updated in February 2023 and is not being updated as part of this UWMP Update. In cases where Executive Order N-722 mandates are more stringent than the WSCP, the more stringent mandates shall supersede the mandates in the WSCP.

Table 8-1 Water Shortage Contingency Plan Levels (DWR Table 8-1)

Shortage Level	Percent Shortage Range	Shortage Response Actions
0	0%	• Includes water waste prohibitions effective at all times.
1	Up to 10%	• Total reservoir storage is at or is projected to be, or is, in the vicinity of 70,000 acre-feet on April 1st. • Includes implementation of mandatory restrictions on end uses (see **Table** 8-2) as well as agency actions (see **Table** 8-3).
2	Up to 20%	• Total reservoir storage is at or is projected to be, or is, in the vicinity of 65,000 acre-feet on April 1st.

Shortage Level	Percent Shortage Range	Shortage Response Actions
		• Includes implementation of mandatory restrictions on end uses (see **Table** 8-2) as well as agency actions (see **Table** 8-3).
3	Up to 30%	• Total reservoir storage is at or is projected to be, or is, in the vicinity of 55,000 acre-feet on April 1st. • Includes implementation of mandatory restrictions on end uses (see **Table** 8-2) as well as agency actions (see **Table** 8-3).
4	Up to 40%	• Total reservoir storage is at or is projected to be, or is, in the vicinity of 45,000 acre-feet on April 1st. • Includes implementation of mandatory restrictions on end uses (see **Table** 8-2) as well as agency actions (see **Table** 8-3).
5	Up to 50%	• Total reservoir storage is at or is projected to be, or is, in the vicinity of 35,000 acre-feet on April 1st • Includes implementation of mandatory restrictions on end uses (see **Table** 8-2) as well as agency actions (see **Table** 8-3).
6	>50%	• Total reservoir storage is at or is projected to be, or is, in the vicinity of 25,000 acre-feet on April 1st. • Includes implementation of mandatory restrictions on end uses (see **Table** 8-2) as well as agency actions (see **Table** 8-3).

Table 8-2 Demand Reduction Actions (DWR Table 8-2)

Shortage Level	Demand Reduction Actions	How much is this going to reduce the shortage gap? (a)	Additional Explanation or Reference *(optional)*	Penalty, Charge, or Other Enforcement?
Landscape Irrigation				
0, 1, 2, 3, 4, 5, 6	Other landscape restriction or prohibition	5%	The application of potable water to outdoor landscapes during and within 48 hours after measurable rainfall is prohibited.	Y
0, 1, 2, 3, 4, 5, 6	Restrict or prohibit runoff from landscape irrigation	5%	Irrigation shall not be conducted in a manner or to an extent that allows water to run off or overspray the areas being watered. Every customer is required to have his or her water distribution lines and facilities under control at all times to avoid water waste.	Y

Table 8-2 Demand Reduction Actions (DWR Table 8-2)

Shortage Level	Demand Reduction Actions	How much is this going to reduce the shortage gap? (a)	Additional Explanation or Reference *(optional)*	Penalty, Charge, or Other Enforcement?
0, 1, 2, 3, 4, 5, 6	Limit landscape irrigation to specific times	5%	Any landscape irrigation between the hours of 9:00 a.m. and 7:00 p.m. is prohibited. Necessary testing and repair of irrigation systems for the purpose of eliminating water waste is permitted during the hours of 9:00 a.m. and 7:00 p.m. Customers shall maintain appropriate documentation of any necessary testing and repairs for these purposes. For example, this documentation may include, but not be limited to, any applicable reports, invoices, photos, videos, and/or receipts for materials and labor related to the testing and repairs.	Y

Table 8-2 Demand Reduction Actions (DWR Table 8-2)

Shortage Level	Demand Reduction Actions	How much is this going to reduce the shortage gap? (a)	Additional Explanation or Reference *(optional)*	Penalty, Charge, or Other Enforcement?
0, 1, 2, 3, 4, 5, 6	Limit landscape irrigation to specific days	5%	Increase restrictions on irrigation. For example, operating outdoor irrigation systems using potable water for the purpose of irrigating with overhead spray more than two days, as assigned by the District, within any calendar week may be prohibited. For the purposes of this section, "calendar week" shall mean a period running from Monday-Sunday.	Y
0, 1, 2, 3, 4, 5, 6	Other landscape restriction or prohibition	5%	Irrigating ornamental turf on public street medians is prohibited.	Y

Table 8-2 Demand Reduction Actions (DWR Table 8-2)

Shortage Level	Demand Reduction Actions	How much is this going to reduce the shortage gap? (a)	Additional Explanation or Reference *(optional)*	Penalty, Charge, or Other Enforcement?
3	Prohibit certain types of landscape irrigation	30%	Golf course irrigation, with potable or raw water, shall be reduced by either 30% compared to the average use of the last three normal years or shall be deficit irrigated by 30% of the sites Maximum Applied Water Allowance per District Water Efficient Landscape Code Appendix A, whichever is more.	Y
4	Limit landscape irrigation to specific days	40%	Limit irrigation to 1 day per week, assigned by the District.	Y
4	Prohibit certain types of landscape irrigation	40%	Golf course irrigation, with potable or raw water, shall be reduced by 40% compared to the average use of the last three normal years or shall be irrigated to 90% of the sites Maximum Applied Water Allowance per District Water Efficient Landscape Code Appendix A, whichever is less.	

Table 8-2 Demand Reduction Actions (DWR Table 8-2)

Shortage Level	Demand Reduction Actions	How much is this going to reduce the shortage gap? (a)	Additional Explanation or Reference *(optional)*	Penalty, Charge, or Other Enforcement?
5	Other landscape restriction or prohibition	50%	Irrigation restricted to maintain tree health for all potable and raw water customers, including golf courses.	Y
5	Other	50%	Establish, or implement, Water Use Limits and associated penalties.	Y
Restrictions on Consumer Products				
0, 1, 2, 3, 4, 5, 6	Other	5%	The installation of reverse osmosis water purifying systems not equipped with an automatic shutoff unit is prohibited.	Y
0, 1, 2, 3, 4, 5, 6	Pools and Spas - Require covers for pools and spas	30%	All recreational pools and spas shall have covers.	Y
Restrictions on New Connections and Landscaping				
0, 1, 2, 3, 4, 5, 6	Other	5%	Single pass cooling systems for air conditioning or other cooling system applications are prohibited, unless required for health or safety reasons.	Y

Table 8-2 Demand Reduction Actions (DWR Table 8-2)

Shortage Level	Demand Reduction Actions	How much is this going to reduce the shortage gap? (a)	Additional Explanation or Reference *(optional)*	Penalty, Charge, or Other Enforcement?
0, 1, 2, 3, 4, 5, 6	Other	5%	New non-recirculating systems for conveyer car wash applications is prohibited.	Y
4, 5, 6	Other	40%	No installation of new landscapes including no expansion of existing landscapes.	Y
5	Moratorium or Net Zero Demand Increase on New Connections	50%	The Board shall consider a moratorium on new water service connections, or no net water use requirements for new connections.	Y
6	Other	55%	New water service applications will not be granted.	Y
6	Other	55%	The use of potable water for any purpose other than human health and sanitation is prohibited.	Y
Restrictions on Commercial Operations				
0, 1, 2, 3, 4, 5, 6	Lodging establishment must offer opt out of linen service	5%	Lodging establishments must provide patrons the option of not having towels and linen laundered daily.	Y

Table 8-2 Demand Reduction Actions (DWR Table 8-2)

Shortage Level	Demand Reduction Actions	How much is this going to reduce the shortage gap? (a)	Additional Explanation or Reference *(optional)*	Penalty, Charge, or Other Enforcement?
0, 1, 2, 3, 4, 5, 6	Restaurants may only serve water upon request	5%	Drinking water served upon request only.	Y
Other				
0, 1, 2, 3, 4, 5, 6	Prohibit use of potable water for washing hard surfaces	5%	The washing of sidewalks, walkways, driveways, parking lots and all other hard surfaced areas by direct hosing, except as may be permitted by current regulations pertaining to urban water runoff pollution prevention as defined by the Marin County Stormwater Pollution Prevention Program and other controlling agencies.	Y

Table 8-2 Demand Reduction Actions (DWR Table 8-2)

Shortage Level	Demand Reduction Actions	How much is this going to reduce the shortage gap? (a)	Additional Explanation or Reference *(optional)*	Penalty, Charge, or Other Enforcement?
0, 1, 2, 3, 4, 5, 6	Customers must repair leaks, breaks, and malfunctions in a timely manner	5%	The escape of water through breaks or leaks within the consumer's plumbing or private distribution system for any substantial period of time within which such break or leak should reasonably have been discovered and corrected. It shall be presumed that a period of 48 hours after the consumer discovers such a leak or break, or receives notice from the district of such leak or break, whichever occurs first, is a reasonable time within which to correct such leak or break.	Y
0, 1, 2, 3, 4, 5, 6	Other	5%	Gutter flooding is prohibited.	Y
3, 4, 5, 6	Other	30%	Use of potable water for refilling or make-up water of any decorative water features, is prohibited.	Y

Table 8-2 Demand Reduction Actions (DWR Table 8-2)

Shortage Level	Demand Reduction Actions	How much is this going to reduce the shortage gap? (a)	Additional Explanation or Reference *(optional)*	Penalty, Charge, or Other Enforcement?
2, 3, 4, 5, 6	Other	20%	Implement drought rates consistent with District-wide targeted water savings.	N
5, 6	Other landscape restriction or prohibition	50%	Refilling a completely drained swimming pool and initial filling of any swimming pool for which application for a building permit was made after District specified date.	Y
0, 1, 2, 3, 4, 5, 6	Require automatic shutoff hoses	5%	Using a garden hose without a shut-off nozzle is prohibited.	N
0, 1, 2, 3, 4, 5, 6	Other	5%	Any excess water runoff flowing onto the public right of-way at a rate of one gallon per minute or greater not caused by storm water or naturally occurring groundwater is prohibited.	Y
0, 1, 2, 3, 4, 5, 6	Other	5%	Use of private fire lines or private fire taps for any purposes other than fire suppression and necessary testing is prohibited.	Y

Table 8-2 Demand Reduction Actions (DWR Table 8-2)

Shortage Level	Demand Reduction Actions	How much is this going to reduce the shortage gap? (a)	Additional Explanation or Reference *(optional)*	Penalty, Charge, or Other Enforcement?
3, 4, 5, 6	Other	30%	Washing vehicles with potable water except at commercial carwash facilities that use recycled water, is prohibited.	Y
3, 4, 5, 6	Other	30%	Power-washing any structure using potable water, unless required for health and safety as required by Marin County Health Department.	Y
3, 4, 5, 6	Limit use of potable water for construction and dust control	30%	Use of potable water for dust control, soil compaction, street cleaning, or any other use, as determined by the District, which can be met with disinfected tertiary recycled water.	Y
0, 1, 2	Other	5%	Sewer cleaning/flushing should be done using recycled water when available without hauling by truck and whenever reasonably possible.	Y
3, 4, 5, 6	Other	30%	Limit sewer cleaning/flushing to only recycled water.	Y

Table 8-2 Demand Reduction Actions (DWR Table 8-2)

Shortage Level	Demand Reduction Actions	How much is this going to reduce the shortage gap? (a)	Additional Explanation or Reference *(optional)*	Penalty, Charge, or Other Enforcement?
4, 5, 6	Other	40%	Request that local fire departments limit training exercises that use potable water and cease hydrant testing.	Y
6	Other	50%	Request that local fire departments cease training exercises that use potable water and cease hydrant testing.	Y
Notes: (a) The reductions shown are the combined reductions for all the actions associated with the particular shortage level.				

Table 8-3 Supply Augmentation and Other Actions (DWR Table 8-3)

Shortage Level	Supply Augmentation Methods and Other Actions by Water Supplier	How much is this going to reduce the shortage gap?	Additional Explanation or Reference *(optional)*
1	Increase supplemental water imports and closely monitor storage levels and weather conditions	Up to 5,000 AF	Range dependent on regional drought conditions and hydraulic capabilities
1	Enact dry year stream release flow reductions	Up to 100 AF	As defined under Water Right Order 95-17 and agreements with NMWD
2	Minimize system flushing	Unknown	Focus on water quality improvements
2	Water waste patrols	Unknown	
3	Restrict line flushing to include only regulatory compliance actions	Unknown	Flush for violations of water quality regulations or required disinfection for new construction and repairs.
3	Increase system leak repair to prioritize class 2 leaks	Unknown	
3	Access Stored Emergency Supply	Unknown	Rental of generator for Soulajule Reservoir to transfer water to Nicasio Reservoir
3	Access Stored Emergency Supply	Unknown	Initiate adjustments to pipe configuration to transfer water from Phoenix Lake to Bon Tempe Lake
4	Consider a Temporary Urgency Change Petition	Up to 2,500 AF	Change to environmental releases – possible reduction of migration flow volumes.
4	Increase water waste patrols	Unknown	
4	Increase system leak repair to prioritize class 1-3 leaks	Unknown	
4	Consider Declaration of Water Shortage Emergency	Unknown	

Shortage Level	Supply Augmentation Methods and Other Actions by Water Supplier	How much is this going to reduce the shortage gap?	Additional Explanation or Reference *(optional)*
4	Initiate development of Emergency Supplemental Supplies	Unknown	
5	Consider a moratorium on new water service connections, or no net water use requirements for new connections	Unknown	
5	Implement Water Use Limits and Penalties	Unknown	Long term
6	Decrease Water Use Limits and implement issuance of Penalties to align with Health and Safety Water Allotments	Unknown	Conducting feasibility analysis

9. DEMAND MANAGEMENT MEASURES

☑ ***CWC § 10631 (e)***

Provide a description of the supplier's water demand management measures. This description shall include all of the following:

(1) (A) For an urban retail water supplier, as defined in Section 10608.12, a narrative description that addresses the nature and extent of each water demand management measure implemented over the past five years. The narrative shall describe the water demand management measures that the supplier plans to implement to achieve its water use targets pursuant to Section 10608.20.

(B) The narrative pursuant to this paragraph shall include descriptions of the following water demand management measures:

(i) Water waste prevention ordinances.

(ii) Metering.

(iii) Conservation pricing.

(iv) Public education and outreach.

(v) Programs to assess and manage distribution system real loss.

(vi) Water conservation program coordination and staffing support.

(vii) Other demand management measures that have a significant impact on water use as measured in gallons per capita per day, including innovative measures, if implemented.

Demand management measures (DMMs) are specific actions a water supplier takes to support its water conservation efforts. Implementation of DMMs over the past a couple decades has helped the Marin Municipal Water District (District) achieve its 2015 Interim and 2020 water use targets under Senate Bill (SB) X7-7 (Section 5). The following sections provide a comprehensive description of the District's water conservation programs, including programs currently being implemented and planned programs.

9.1 Regional Water Conservation

The Sonoma County Water Agency (SCWA), along with the cities of Santa Rosa, Rohnert Park, Sonoma, Cotati, and Petaluma, the Town of Windsor, and North Marin Water District (NMWD), the District and Valley of the Moon Water District (VOMWD) (the Partners), formed the Sonoma-Marin Saving Water Partnership (SMSWP) in 2010. The SMSWP's Memorandum of Understanding was amended in May 2018, extending the term another ten years, and adding language to streamline the addition of members to the SMSWP. Two new Partners have subsequently joined, with California American Water-Larkfield joining in January 2019 and the City of Healdsburg joining in August 2019.

SCWA coordinates the work of the SMSWP in conjunction with the Water Advisory Committee (WAC), which provides input to SCWA and holds certain powers and responsibilities enumerated in the Restructured Agreement for Water Supply between SCWA and SMSWP. The SMSWP is committed to continued water conservation and is in compliance with the final 2020 gallons per capita targets established by SB X7-7.

9.1.1 Funding

SCWA's wholesaler water conservation programs are funded by the Partners annually through a WAC recommended budget that allocates a Water Conservation sub-charge for each acre-foot of water sold. The Partners have agreed to expend $15 million dollars on water conservation implementation from July 2018 through June 2028. They have also agreed to maintain membership in good standing with the California Water Efficiency Partnership (CalWEP) and implement or use best efforts to secure the implementation of any water conservation requirements added as terms or conditions of SCWA's appropriative water rights or other regulation or law.

SCWA pursues grant funding on behalf of the SMSWP to off-set some of the programmatic costs associated with water use efficiency (WUE) programs and to test new technology. In the last five years, the Agency was awarded over $1.46 million dollars for implementing WUE programs in our region.

9.1.2 Annual Report

The Partners are committed to remain as members in good standing of CalWEP and to implement water conservation measures that provide regional benefits and/or that may exceed the targets established from time to time by the Partners or the state. The Partners will implement or use best efforts to secure the implementation of any water conservation requirements and will publish an Annual Report to track progress. The Annual Report will track program implementation, highlight program milestones, and reinforce the importance of protecting and preserving water resources for future generations. The 2019/2020 Annual Report for the SMSWP could be found in the SMSWP's website.[17]

9.1.3 Water Education Program

The Water Education Program is a comprehensive approach to helping educators teach students the "value" of water as an important natural resource. Water and energy conservation and stewardship of our local watersheds is promoted throughout the program. Students are encouraged to use water wisely and make environmentally sustainable choices to help secure a reliable source of freshwater now and in the future. The program includes free curriculum materials aligned with the existing California State Frameworks and the California Science Standards, a lending library of videos, interactive models and printed materials, production of a newsletter for teachers and endorsement, participation and financial sponsorship of events, assemblies, and workshops. All of the education programs and materials are free to teachers in the service area. An online assembly program was launched to support educators during the COVID-19 pandemic.

9.1.4 Public Outreach Program

The SMSWP develops an annual regional outreach campaign that aligns with our current water supply conditions and promotes water use efficiency programs. Over the last few years, the campaigns have included the following:

[17] The 2019/2020 Annual Report for the SMSWP: http://www.savingwaterpartnership.org/wp-content/uploads/SMSWP-Annual-Report-2020-FINAL.pdf.

- Saving Water Ensures Water for What You Love (2020),
- Together Making Water Conservation a California Way of Life (2019),
- There's Never Enough to Waste. (2017 & 2018),
- Thank You for Doing Your Part (2016), and
- Take it From the Tap (2016).

SCWA, in collaboration with the members of the SMSWP, produces collateral material that aligns with the specific campaign. SCWA coordinates an annual media buy that includes outreach in English and Spanish. Each member of the SMSWP can choose to supplement the campaign with their own media buys. The buys generally include the following:

- Radio (streaming and broadcast),
- Newsprint and online digital media placements in 14 various local publications,
- Sonoma County Fair presence,
- Social Media (Facebook, Twitter, Instagram, YouTube, NextDoor),
- Mall banners, and
- Movie theater trailers.

9.1.5 Regional Programs

SCWA on behalf of the SMSWP implements numerous regional programs. This includes offering staff support for interested Partners as a cost-effective way to offer local programs to customers of smaller agencies. Some of these programs are:

- High Efficiency Clothes Washer Water Rebate – a rebate for replacing a top-loading clothes washer with a qualifying front-loading clothes washer.
- Qualified Water Efficient Landscaper Training Program – A low-cost professional certification program that educates landscapers about irrigation system auditing, while providing customers with a trusted source for knowledgeable hired help that can save them water.
- Eco-Friendly Garden Tour – An annual self-guided garden tour in Sonoma County and North Marin that promotes sustainable landscaping practices. This tour transitioned to an online video format in 2020 to adapt to the COVID-19 pandemic.
- Landscape Design Templates – These free, front yard designs are scalable to fit landscaped areas up to 2,500 square feet, ready-to-permit, and in compliance with local Water Efficient Landscape Ordinances.
- Water Smart Plant Label – A free water smart plant labeling program to local nurseries. The water smart plant label highlights low water use plants to nursery customers and promotes sustainable landscaping practices in Sonoma and Marin counties.
- Water-Energy Rebates for Restaurants and Food Service Facilities – a rebate program for replacing inefficient commercial kitchen equipment with new water and energy efficient models.

SCWA supports promoting new and innovative models to increase water use efficiency in our region. Some of the pilot projects we have collaborated with in the past include:

- PAYS Program (Windsor) – An on-bill financing program that allows water customers to fund their own water and energy improvements with a long-term payback on their water bill.

- SmartMarkets Pilot (VOMWD) – A water market that allows for 'eco-shares' to be earned for reducing demand and redeemed for various incentives.
- Water Smart Software (Cotati) – A community based social marketing platform that compares a customer's water use to their neighbors to encourage behavioral change.
- Barnacle Pilot Program (All) – An online platform that provides real-time water use data to the customer outside of the water utilities billing infrastructure.
- Unmetered Flow Reducer (NMWD) – An in-line device that is placed between the meter and the customer connection that allows small leaks to be 'batched' through the meter, thus reducing unaccounted for water from low flow leaks and allowing the customer to be notified that a leak in occurring.

SCWA participates in numerous regional and statewide initiatives to ensure the SMSWP is on the forefront of water use efficiency, legislation, and conservation planning, such as:

- California Water Efficiency Partnership (Programs Subcommittee, Research Subcommittee), successor organization of the former California Urban Water Conservation Council,
- Association of California Water Agencies (Water Management and Water Use Efficiency Subcommittees),
- Russian River Watershed Association, and
- California Landscape Contractors Association.

The SMSWP has received notable recognition for effective collaboration and program implementation. Below are the awards the SMSWP has received.

- EPA Water Sense Excellence Award 2020 and Sustained Excellence Award 2020,
- EPA Water Sense Excellence Award 2019 and Sustained Excellence Award 2019,
- EPA Water Sense Excellence Award 2018 and Sustained Excellence Award 2018,
- EPA Water Sense Excellence Award 2017 and Sustained Excellence Award 2017, and
- EPA Water Sense Partner of the Year 2016.

9.2 Agency Water Conservation

☑ ***CWC § 10631 (e)***

Provide a description of the supplier's water demand management measures. This description shall include all of the following:

(1) (A) For an urban retail water supplier, as defined in Section 10608.12, a narrative description that addresses the nature and extent of each water demand management measure implemented over the past five years.

The district's programs for demand management through water conservation began in 1971 when water conservation literature from the American Water Works Association was inserted into water bills. By the mid-1970s, the district's programs had expanded to include retrofits of water-using fixtures and have continued to expand over the last 45 years.

When the District was embarking on its Integrated Water Resources Management Program in 1991, a review of water demands found that an estimated 11% reduction in water use had occurred during the period from 1970 to 1987 after taking into account the additional services installed during the period. A

similar review in 1999 found that the demand had been reduced by an estimated 25% during the period from 1970 to 1998.

In June 2007, the District adopted its 2007 Water Conservation Master Plan. By reference, the Conservation Master Plan is incorporated herein, and included in **Appendix I**.

In late 2010, the district joined with Sonoma County Water Agency (SCWA or Sonoma Water) and the Water Contractors to form the Sonoma Marin Saving Water Partnership (SMSWP). SMSWP allows the District, SCWA, and the Water Contractors to maximize cost-effective water conservation by identifying projects and programs that can be implemented regionally. SMSWP committed each signatory to remain in good standing with the California Urban Water Conservation Council (CUWCC), to be on track with implementing the best management practices (BMPs), and to budget and spend $15 million over 10 years for implementing water conservation programs. Since SMSWP was formed, a regional water conservation educational campaign was launched, and regional conservation programs are being promoted. The CUWCC has been dissolved since the 2015 UWMP, and thus CUWCC BMP annual reports are no longer prepared. However, the District continues to implement DMMs in general accordance with the CUWCC BMPs.

The district is currently preparing a Water Efficiency Master Plan to assess and identify opportunities for future program implementation. This plan is anticipated to be complete in 2023 and will be used to inform and guide the district's conservation efforts over the planning horizon.

The following sections describe the district's efforts in implementing each of the DMMs as listed in CWC §10631(f). Additional information regarding DMM implementation is provided in the district's 2020 Urban Water Management Plan Water Demand Analysis and Water Conservation Measures Update (**Appendix C**).

9.2.1 DMM 1 – Water Waste Prevention Ordinances

Title 13 of the District's Code, Water Service Conditions and Water Conservation Measures, includes a section on water waste prohibitions (Section 13.04.020). This section was updated in 2021 to explicitly state that the waste of water is to be prohibited. The section prohibits nonessential uses, places restrictions on irrigation watering times, limits days per week of allowed irrigation and reverse-osmosis units, and includes prohibitions on single-pass cooling systems and non-recirculating systems for conveyor carwash applications for new connections. The current Title 13 of the District's Code is included in **Appendix J**.

9.2.2 DMM 2 – Metering

☑ ***CWC § 526 (a)***

Notwithstanding any other provision of law, an urban water supplier that, on or after January 1, 2004, receives water from the federal Central Valley Project under a water service contract or subcontract … shall do both of the following:

(1) On or before January 1, 2013, install water meters on all service connections to residential and nonagricultural commercial buildings constructed prior to January 1, 1992, located within its service area.

(2) On and after March 1, 2013, or according to the terms of the Central Valley Project water contract in operation, charge customers for water based on the actual volume of deliveries, as measured by a water meter.

☑ ***CWC § 527 (a)***

(a) An urban water supplier that is not subject to Section 526 shall do both of the following:

(1) Install water meters on all municipal and industrial service connections located within its service area on or before January 1, 2025.

The district is fully metered and requires that all new connections be metered. The district requires separate landscape meters for qualified customers and has policies about the use of installed meters. For instance, Section 13.02.065 of the District's Code states that "…use of any District water not metered is prohibited." Additionally, Section 13.020.070 states that "it is unlawful […] to remove, replace, alter, or damage any water meter or components thereof." If a violator is found, the district may impose penalties as outlined in the ordinance.

The district continues to replace meters as they age. The continued objective of the meter replacement program is to achieve a 20-year life cycle for all meters. Tests performed indicate that meters older than 20 years run, on average, 6% slower than new meters. By replacing the oldest meters in the system on an ongoing basis, the meter change program improves overall meter accuracy and retains revenue that would otherwise be lost by inaccurate meters.

The district has completed three Advanced Metering Infrastructure (AMI) pilot projects resulting in the installation of over 5,000 AMI meters on all dedicated irrigation accounts and many of the highest water users. An AMI Feasibility Study was completed in October 2020 to evaluate districtwide deployment of AMI technology.

9.2.3 DMM 3 – Conservation Pricing

Conservation pricing sends a signal to customers about their water use and is always in place. MMWD's rate structure encourages conservation by including both a fixed service charge and a per-unit charge, reflecting both fixed costs and costs based on the amount of water used. The per-unit charge includes the cost of water supply, treatment and distribution, and watershed maintenance.

In May 2023, the District Board of Directors approved Ordinance No. 464, which enacts changes to the water rates and rate structure through July 1, 2027. This Ordinance includes (1) an adjustment to the current tiered rate structure to reflect reduced customer demand trends and align cost recovery, specifically it adjusts volumetric unit rates for all customers and reduces Tier 1 and Tier 2 allotments for duplex and single-family residential customers; (2) a modification to Marin Water's fixed fees, which

includes converting the Watershed Management Fee to a uniform volumetric rate, incorporating recent customer demand metrics into the fixed fee calculation methodology, and aims to help promote customer water conservation and allow customers greater control over their monthly bills; and (3) drought surcharges that would go into effect only during declared water shortages and will ensure Marin Water can recover lost revenue and offset increased costs during future droughts. (MMWD, 2023).

To determine the per unit charge, the District uses a system of three or four billing tiers, depending on the customer class. The current rates went into effect on 1 July 2023 and are available on the District's website: https://www.marinwater.org/understanding-your-bill#button-1

For residential customers, the District uses four tiers and for non-residential potable water, single-family residential irrigation, recycled, and raw water customers, the District uses three tiers.

For non-residential customers, the breakpoints of the three tiers are determined using a more site-specific method. Each non-residential customer has a water entitlement and a water budget, and the tiers are scaled relative to the baseline water budget. The water entitlement is the maximum amount of water the District is committed to supply any individual customer on an annual basis. The District has unique methods for determining the water entitlement for accounts that were in service prior to 1991, for new accounts, and for new dedicated irrigation accounts. The water budget is the District's determination of the actual consumption requirement of the customer.

9.2.4 DMM 4 – Public Education and Outreach

The District offers free water audits to residential and non-residential customers. During these water use surveys, a District representative evaluates the existing water-using fixtures, landscape irrigation system, and water use patterns to identify water savings opportunities. After the visit, the customer receives a written report of the existing water use patterns and a list of recommendations to increase efficiency. For large irrigation systems, the District offers a specialized large landscape water use survey.

For all schools located within the District's service area, MMWD offers several free programs, including watershed field trips, classroom presentations, and various materials intended to guide curriculum for various ages. All school programs are designed to support education standards while fostering water conservation and environmental stewardship. Between 2007 and 2020, 111,024 students have been reached (MMWD, 2020). The District also has a list of resources with links on their website that customers can access. For residential customers, the District has a Do-It-Yourself home water survey that customers can print and work through the activities.

In addition to water use audits and school education, the District offers a number of rebates and discounts to its customers for water-saving fixtures and systems, which also serve to educate and inform customers of conservation opportunities. Table 9-1 below shows the current conservation programs offered by the District.

Table 9-1 Current Conservation Programs

Program	Description	Eligible Customer Class	Program Run Dates
CII Water Use Evaluation Program	CII customers are provided on site water use evaluations, recommendations to improve efficiency, and pre-qualified for applicable rebates.	CII	1995 - Current
AMI Leak Notifications Program	Customers with AMI meters receive notifications of water use patterns indicative of leaks. Rather than having to wait until their next water bill, customers are able to receive timely information and stop leaks much faster. Water Efficiency staff runs automated reports to monitor water use of AMI customers. AMI meters record water use in 15-minute intervals as compared to every other month as is typical for most residential meter reads.	SFR, CII, Ag. & Irr.	2018 - Current
HET Rebate Program	2013-Current: Up to $100 rebate to replace a 3.5 gpf or more per flush or a 1.6 gpf model year 2001 or older with an HET.	SFR	2013 - Current
Landscape Plan Review Program	MMWD has developed water conservation requirements for landscape professionals and homeowners when designing and installing landscapes and irrigation systems. Plan review requirements apply to all new construction and rehabilitated (renovations or changes made to sites with an existing irrigation system) landscape projects requiring a building permit, plan check, or design review.	SFR, CII	1986 - Current
Rain Barrel Rebate Program	2020: Residential and commercial customers with active potable water service can apply for a rebate up to $0.50 per gallon of storage when they install rain barrels and/or cisterns at their sites. Total rebates for rain barrels and cisterns may not exceed $1,000 per site.	SFR	2020 - Current

Program	Description	Eligible Customer Class	Program Run Dates
Residential HECW Rebate Program	MMWD customers can apply for a rebate towards the cost of installing a qualifying residential high-efficiency clothes washer that meets current water and energy efficiency requirements.	SFR	2013 – Current
SFR Water Use Surveys/Audits Program	A free service for SFR customers that involves a visit to their property to review water use and identify ways to save water indoors and outside.	SFR	1995 - Current
WaterSense Smart Controller Rebate	Residential and commercial customers can apply for a rebate up to $100 towards the cost of a qualifying EPA WaterSense weather-based irrigation controller.	SFR, CII	2020-Current
Water Use Surveys/Audits Program (Excluding SFR Participants)	Consultation activities include a review, evaluation and report of indoor plumbing devices and/or a review and report of the landscape irrigation system.	MFR, CII, Ag. & Irr.	1995 - Current
Water Waste Report Program	The general public can report water waste situations to MMWD online or over the phone. These contacts are logged into a database and followed up on by field staff to research and notify properties about water waste situations.	SFR, CII	1998, 2000 - Current

Abbreviations:

Ag. = agricultural
AMI = Advanced Metering Infrastructure
CII = commercial, industrial and institutional
EPA = Environmental Protection Agency
gpf = gallons per flush
HECW = high efficiency clothes washer
HET = high-efficiency toilet
Irr. = irrigation
MFR = multi-family residential
MMWD = Marin Municipal Water District
SFR = single family residential

During the period of 2016-2019, the conservation department:

- completed a total of 2,800 audits/surveys;
- provided program activities for 31,000 students;
- interacted with over 59,000 customers at public outreach events;
- incentivized installation of 990 high efficiency clothes washers, 3,900 high efficiency toilets, and 1,100 irrigation-related devices including high efficiency spray nozzles, rain sensors, drip system components, weather-based irrigation controllers, mulch, rain barrels, greywater system components at residential and commercial sites;

- conducted 800 water waste investigations; and
- responded to over 10,000 customer phone and email inquiries.

The District's 2020 Urban Water Management Plan Water Demand Analysis and Water Conservation Measures Update (**Appendix C**) provides additional detail on implementation of these conservation programs.

9.2.5 DMM 5 – Programs to Assess and Manage Distribution System Real Loss

The District performs annual water loss audits in accordance with CWC §10608.34. These audits are prepared using the AWWA Free Water Audit Software version 5.0 and validated by an AWWA California-Nevada Section-Certified California Water Audit validator prior to submission to DWR. The results of the last five years of water audit data are summarized in Section 4.1.4, and copies of the audit reports are provided in **Appendix K**. The District has an active water loss control program, including primary and secondary response. Primary response is by Utility Systems Specialists on an incident-by-incident basis. Utility Systems Specialists are first responders to all reported leaks, mainline shutdowns for the crews and contractors, consumer calls, and meter turn-on/offs. Secondary to any reported problem, the District has implemented a program to assess and manage system loss through leak survey. Leak survey is handled by Utility System Technicians. Leak survey is accomplished by canvassing the entire water distribution system. Using sonic leak detection equipment, technicians are able to locate leaks that may be hidden from view because they have not yet surfaced. Utility System Technicians also assist in pinpointing water leaks. The process of pinpointing water leaks involves the narrowing of a specific leak location. This process assists staff in completing repairs with a minimal amount of excavation.

From 2015 through 2020, the District surveyed 503 miles of pipeline. As a result, the team detected 791 customer service leaks and 214 District service leaks. In addition, the District has an ongoing program (as part of its Capital Improvement Program) to replace aging distribution pipeline; on average, the District replaced 4 miles of pipeline per year over the last five years. Including fire flow improvements, the District replaced approximately 8 miles per year over the last 5 years.

9.2.6 DMM 6 – Water Conservation Program Coordination and Staffing Support

The District has full-time staff members within the Water Conservation Department dedicated to implementing and overseeing the conservation program. The primary responsibilities of the Conservation Department include designing, developing, and implementing conservation programs for all MMWD customers. The Conservation Department also provides support to customers, including completing water use surveys and reports, answering any questions about conservation programs, and providing printed materials related to the District's conservation programs. The Conservation Department and its activities are funded by the general fund, which is supported by revenue from water sales.

Contact information for the District's Water Efficiency Manager is listed below:

Name: Carrie Pollard

Phone: (415) 945-1522

Email: capollard@marinwater.org

9.2.7 DMM 7 – Other DMMs

9.2.7.1 *Landscape Plan Review Services*

Water conservation staff provide landscape plan review services for all municipal jurisdictions in MMWD's service area at no cost. Title 13 of the District's Code includes a section on water efficient landscaping that requires projects needing a building or landscape permit, plan check or design review. The plan review process consists of reviewing construction documents to verify compliance with efficiency standards, calculating a maximum applied water allowance (MAWA) and estimated total water use (ETWU), conducting a site inspection, and issuing a final letter of approval. On 15 December 2015, the District's Board of Directors approved changes to the landscape plan review requirements to be consistent with the Governor's executive order revising the State of California's Model Water Efficient Landscape ordinance (MMWD, 2015). Over the last five years, conservation staff have conducted 523 landscape plan reviews.

9.2.7.2 *Other Water Efficiency Codes*

Title 13 of the District's Code documents all adopted codes related to water efficiency and conservation, codes. Current versions of these codes can be viewed here: http://www.qcode.us/codes/marin-water/view.php?topic=13.

9.3 Implementation to Achieve Water Use Targets

☑ ***CWC § 10631 (e)***

Provide a description of the supplier's water demand management measures. This description shall include all of the following:

(1) (A) … The narrative shall describe the water demand management measures that the supplier plans to implement to achieve its water use targets pursuant to Section 10608.20.

Beginning in 2024, urban water retailers will be required to report on "annual water use objective" by 1 January of each year and to achieve these objectives by 1 January 2027 (per CWC § 10609). The Objective is calculated as the sum of the following components: (1) residential indoor water use standard, (2) residential outdoor water use standard, (3) large commercial, industrial, and institutional (CII) landscape outdoor water use standard, (4) water loss standard, (5) bonus, and (6) variance. Per the latest guidelines released by DWR and the California State Water Resources Control Board (SWRCB), agencies will need to assess whether they meet their Objective collectively, (i.e., they will not necessarily be required to comply with the individual standards as long as they collectively meet the Objective). Additionally, guidelines and recommendations for the performance-based standards for the CII sectors, separate from the annual water use objectives, were developed by DWR and submitted to SWRCB for approval on 29 September 2022. Those guidelines and recommendations were released on 28 October 2022, and could be accessed

on the DWR website[18]. The District intends to continue implementing DMMs both locally and through the SMSWP and will evaluate potential adjustments needed to these programs to comply with the Objective and the CII Water Use Performance Measures. The District's 2020 Urban Water Management Plan Water Demand Analysis and Water Conservation Measures Update, provided in **Appendix C**, evaluates several options for future conservation program implementation.

[18] The complete documents are available on the DWR website: https://water.ca.gov/Programs/Water-Use-And-Efficiency/2018-Water-Conservation-Legislation/Urban-Water-Use-Efficiency-Standards-Variances-and-Performance-Measures.

10. PLAN ADOPTION AND SUBMITTAL

This chapter provides information on a public hearing, the adoption process for the Urban Water Management Plan (UWMP) and Water Shortage Contingency Plan (WSCP), the adopted UWMP and WSCP submittal process, plan implementation, and the process for amending the adopted UWMP or WSCP.

10.1 Notification of UWMP Preparation

☑ ***CWC § 10621 (b)***

Every urban water supplier required to prepare a plan pursuant to this part shall, at least 60 days before the public hearing on the plan required by Section 10642, notify any city or county within which the supplier provides water supplies that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan. The urban water supplier may consult with, and obtain comments from, any city or county that receives notice pursuant to this subdivision.

Marin Municipal Water District (MMWD or District) sent a letter to relevant entities including Marin County and other local agencies informing them that the District was in the process of updating its UWMP and WSCP and soliciting their input in the update process. A listing of the entities contacted is provided in **Table** 2-4; the notices are included in **Appendix D** for reference. The letter was sent more than 60 days before the public hearing as required by code.

10.2 Notification of Public Hearing

☑ ***CWC § 10642***

Each urban water supplier shall encourage the active involvement of diverse social, cultural, and economic elements of the population within the service area prior to and during the preparation of both the plan and the water shortage contingency plan. Prior to adopting either, the urban water supplier shall make both the plan and the water shortage contingency plan available for public inspection and shall hold a public hearing or hearings thereon. Prior to any of these hearings, notice of the time and place of the hearing shall be published within the jurisdiction of the publicly owned water supplier pursuant to Section 6066 of the Government Code. The urban water supplier shall provide notice of the time and place of a hearing to any city or county within which the supplier provides water supplies. Notices by a local public agency pursuant to this section shall be provided pursuant to Chapter 17.5 (commencing with Section 7290) of Division 7 of Title 1 of the Government Code. A privately owned water supplier shall provide an equivalent notice within its service area. After the hearing or hearings, the plan or water shortage contingency plan shall be adopted as prepared or as modified after the hearing or hearings.

10.2.1 Notice to Cities and Counties

At least two weeks prior to the public hearing, the entities listed in **Table** 2-4 were notified that the UWMP and WSCP public hearing would be occurring on 19 December 2023 at 6:30 pm. The letter informed them of the locations the Public Review Draft Updated 2020 UWMP and the updated WSCP would be available for review and welcoming their input and comments on the document. The Public Review Draft Updated 2020 UWMP and the WSCP were available for public review on the District's website. **Table** 2-4 lists the

cities, counties, and other agencies that were notified. Copies of these letters are provided in **Appendix D.**

10.2.2 Notice to the Public

The District issued public notifications soliciting public input during the preparation of Updated 2020 UWMP and the WSCP. On 5 December 2023 and 12 December 2023, the District published a notice in the *Marin Independent Journal* informing the public that the Updated 2020 UWMP and WSCP would be available for public review on the District's website, consistent with requirements of California Government Code 6066. The notice also informed the public that the Updated 2020 UWMP and WSCP public hearing would be held virtually and in-person on 19 December 2023. Copies of these notices are included in **Appendix E**.

10.3 Public Hearing and Adoption

☑ ***CWC § 10608.26***

(a) In complying with this part, an urban retail water supplier shall conduct at least one public hearing to accomplish all of the following:

(1) Allow community input regarding the urban retail water supplier's implementation plan for complying with this part.

(2) Consider the economic impacts of the urban retail water supplier's implementation plan for complying with this part.

(3) Adopt a method, pursuant to subdivision (b) of Section 10608.20, for determining its urban water use target.

Prior to adopting the Plan, the District held a formal public hearing to present information on the Updated 2020 UWMP and WSCP on 19 December 2023 at 7:30 pm, in a virtual and in-person meeting.

This Updated 2020 UWMP and WSCP was adopted by Resolution No. XXX by the District Board during its 19 December 2023 board meeting. Copies of the resolution are included in **Appendix L**.

10.4 Plan Submittal

☑ ***CWC § 10621***

(f) (1) Each urban water supplier shall update and submit its 2020 plan to the department by July 1, 2021.

☑ ***CWC § 10635 (c)***

The urban water supplier shall provide that portion of its urban water management plan prepared pursuant to this article to any city or county within which it provides water supplies no later than 60 days after the submission of its urban water management plan.

☑ ***CWC § 10644***

(a) (1) An urban water supplier shall submit to the department, the California State Library, and any city or county within which the supplier provides water supplies a copy of its plan no later than 30 days after adoption. Copies of amendments or changes to the plans shall be submitted to the department, the California State Library, and any city or county within which the supplier provides water supplies within 30 days after adoption.

(2) The plan, or amendments to the plan, submitted to the department pursuant to paragraph (1) shall be submitted electronically and shall include any standardized forms, tables, or displays specified by the department.

(b) If an urban water supplier revises its water shortage contingency plan, the supplier shall submit to the department a copy of its water shortage contingency plan prepared pursuant to subdivision (a) of Section 10632 no later than 30 days after adoption, in accordance with protocols for submission and using electronic reporting tools developed by the department.

This UWMP and WSCP were submitted to DWR within 30 days of adoption. The submittal was done electronically through Water Use Efficiency Data Portal, an online submittal tool. The adopted Plan was also sent to the California State Library and Marin County.

10.5 Public Availability

☑ ***CWC § 10645***

(a) Not later than 30 days after filing a copy of its plan with the department, the urban water supplier and the department shall make the plan available for public review during normal business hours.

(b) Not later than 30 days after filing a copy of its water shortage contingency plan with the department, the urban water supplier and the department shall make the plan available for public review during normal business hours.

On or about 27 November 2023, printed hard copies of the draft Updated 2020 UWMP and WSCP were made available for review during normal business hours at the District's office. Electronic versions were also made available by visiting the District's website (https://www.marinwater.org/UrbanWaterManagementPlan).

10.6 Amending an Adopted UWMP or Water Shortage Contingency Plan

☑ ***CWC § 10644 (b)***

If an urban water supplier revises its water shortage contingency plan, the supplier shall submit to the department a copy of its water shortage contingency plan prepared pursuant to subdivision (a) of Section 10632 no later than 30 days after adoption, in accordance with protocols for submission and using electronic reporting tools developed by the department.

If the Plan is amended, each of the steps for notification, public hearing, adoption and submittal will also be followed for the amended document.

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Appendix A

Completed UWMP Checklist

Retail	Wholesale	2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location
x	x	Chapter 1	10615	A plan shall describe and evaluate sources of supply, reasonable and practical efficient uses, reclamation and demand management activities.	Introduction and Overview	Chapter 1
x	x	Chapter 1	10630.5	Each plan shall include a simple description of the supplier's plan including water availability, future requirements, a strategy for meeting needs, and other pertinent information. Additionally, a supplier may also choose to include a simple description at the beginning of each chapter.	Summary	Section 1.6
x	x	Section 2.2	10620(b)	Every person that becomes an urban water supplier shall adopt an urban water management plan within one year after it has become an urban water supplier.	Plan Preparation	Section 2.1
x	x	Section 2.6	10620(d)(2)	Coordinate the preparation of its plan with other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practicable.	Plan Preparation	Section 2.2.2 and Table 2-4
x	x	Section 2.6.2	10642	Provide supporting documentation that the water supplier has encouraged active involvement of diverse social, cultural, and economic elements of the population within the service area prior to and during the preparation of the plan and contingency plan.	Plan Preparation	Section 1.3 Section 2.2.3

Retail	Wholesale	2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location
x		Section 2.6, Section 6.1	10631(h)	Retail suppliers will include documentation that they have provided their wholesale supplier(s) - if any - with water use projections from that source.	System Supplies	Section 2.2.1
	x	Section 2.6	10631(h)	Wholesale suppliers will include documentation that they have provided their urban water suppliers with identification and quantification of the existing and planned sources of water available from the wholesale to the urban supplier during various water year types.	System Supplies	N/A
x	x	Section 3.1	10631(a)	Describe the water supplier service area.	System Description	Chapter 3
x	x	Section 3.3	10631(a)	Describe the climate of the service area of the supplier.	System Description	Section 3.4
x	x	Section 3.4	10631(a)	Provide population projections for 2025, 2030, 2035, 2040 and optionally 2045.	System Description	Section 3.1.1 and Table 3-1
x	x	Section 3.4.2	10631(a)	Describe other social, economic, and demographic factors affecting the supplier's water management planning.	System Description	Section 3.3 and Table 3-3
x	x	Sections 3.4 and 5.4	10631(a)	Indicate the current population of the service area.	System Description and Baselines and Targets	Sections 3.1 and 5.1, Table 3-1
x	x	Section 3.5	10631(a)	Describe the land uses within the service area.	System Description	Section 3.2

Retail	Wholesale	2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location
x	x	Section 4.2	10631(d)(1)	Quantify past, current, and projected water use, identifying the uses among water use sectors.	System Water Use	Chapter 4, Tables 4-1 to 4-4
x	x	Section 4.2.4	10631(d)(3)(C)	Retail suppliers shall provide data to show the distribution loss standards were met.	System Water Use	Section 4.1.4, Table 4-3
x	x	Section 4.2.6	10631(d)(4)(A)	In projected water use, include estimates of water savings from adopted codes, plans, and other policies or laws.	System Water Use	Section 4.2.1, Table 4-4
x	x	Section 4.2.6	10631(d)(4)(B)	Provide citations of codes, standards, ordinances, or plans used to make water use projections.	System Water Use	Section 4.2.4, Table 4-7
x	optional	Section 4.3.2.4	10631(d)(3)(A)	Report the distribution system water loss for each of the 5 years preceding the plan update.	System Water Use	Section 4.1.4, Table 4-3
x	optional	Section 4.4	10631.1(a)	Include projected water use needed for lower income housing projected in the service area of the supplier.	System Water Use	Section 4.2.3, Table 4-6
x	x	Section 4.5	10635(b)	Demands under climate change considerations must be included as part of the drought risk assessment.	System Water Use	Section 4.4
x		Chapter 5	10608.20(e)	Retail suppliers shall provide baseline daily per capita water use, urban water use target, interim urban water use target, and compliance daily per capita water use, along with the bases for determining those estimates, including references to supporting data.	Baselines and Targets	Chapter 5

Retail	Wholesale	2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location
x		Chapter 5	10608.24(a)	Retail suppliers shall meet their water use target by December 31, 2020.	Baselines and Targets	Section 5.4, Table 5-5
	x	Section 5.1	10608.36	Wholesale suppliers shall include an assessment of present and proposed future measures, programs, and policies to help their retail water suppliers achieve targeted water use reductions.	Baselines and Targets	N/A
x		Section 5.2	10608.24(d)(2)	If the retail supplier adjusts its compliance GPCD using weather normalization, economic adjustment, or extraordinary events, it shall provide the basis for, and data supporting the adjustment.	Baselines and Targets	Section 5.4, Table 5-5
x		Section 5.5	10608.22	Retail suppliers' per capita daily water use reduction shall be no less than 5 percent of base daily per capita water use of the 5-year baseline. This does not apply if the suppliers base GPCD is at or below 100.	Baselines and Targets	Section 5.3
x		Section 5.5 and Appendix E	10608.4	Retail suppliers shall report on their compliance in meeting their water use targets. The data shall be reported using a standardized form in the SBX7-7 2020 Compliance Form.	Baselines and Targets	Appendix F
x	x	Sections 6.1 and 6.2	10631(b)(1)	Provide a discussion of anticipated supply availability under a normal, single dry year, and a drought lasting five years, as well as more frequent and severe periods of drought.	System Supplies	Section 7.2

Retail	Wholesale	2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location
x	x	Sections 6.1	10631(b)(1)	Provide a discussion of anticipated supply availability under a normal, single dry year, and a drought lasting five years, as well as more frequent and severe periods of drought, *including changes in supply due to climate change*.	System Supplies	Section 6.10.1, Section 7.1.3
x	x	Section 6.1	10631(b)(2)	When multiple sources of water supply are identified, describe the management of each supply in relationship to other identified supplies.	System Supplies	Chapter 6
x	x	Section 6.1.1	10631(b)(3)	Describe measures taken to acquire and develop planned sources of water.	System Supplies	Sections 6.6 to 6.9
x	x	Section 6.2.8	10631(b)	Identify and quantify the existing and planned sources of water available for 2020, 2025, 2030, 2035, 2040 and optionally 2045.	System Supplies	Section 6.9 and Table 6-9
x	x	Section 6.2	10631(b)	Indicate whether groundwater is an existing or planned source of water available to the supplier.	System Supplies	Section 6.2
x	x	Section 6.2.2	10631(b)(4)(A)	Indicate whether a groundwater sustainability plan or groundwater management plan has been adopted by the water supplier or if there is any other specific authorization for groundwater management. Include a copy of the plan or authorization.	System Supplies	Section 6.2.3
x	x	Section 6.2.2	10631(b)(4)(B)	Describe the groundwater basin.	System Supplies	Section 6.2.1

Retail	Wholesale	2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location
x	x	Section 6.2.2	10631(b)(4)(B)	Indicate if the basin has been adjudicated and include a copy of the court order or decree and a description of the amount of water the supplier has the legal right to pump.	System Supplies	Section 6.2.1
x	x	Section 6.2.2.1	10631(b)(4)(B)	For unadjudicated basins, indicate whether or not the department has identified the basin as a high or medium priority. Describe efforts by the supplier to coordinate with sustainability or groundwater agencies to achieve sustainable groundwater conditions.	System Supplies	Section 6.2.4
x	x	Section 6.2.2.4	10631(b)(4)(C)	Provide a detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water supplier for the past five years	System Supplies	Section 6.2.5 and Table 6-1
x	x	Section 6.2.2	10631(b)(4)(D)	Provide a detailed description and analysis of the amount and location of groundwater that is projected to be pumped.	System Supplies	Section 6.2
x	x	Section 6.2.7	10631(c)	Describe the opportunities for exchanges or transfers of water on a short-term or long-term basis.	System Supplies	Section 6.7
x	x	Section 6.2.5	10633(b)	Describe the quantity of treated wastewater that meets recycled water standards, is being discharged, and is otherwise available for use in a recycled water project.	System Supplies (Recycled Water)	Section 6.5.3 and Tables 6-4 and 6-5

Retail	Wholesale	2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location
x	x	Section 6.2.5	10633(c)	Describe the recycled water currently being used in the supplier's service area.	System Supplies (Recycled Water)	Section 6.5.3 and Table 6-4
x	x	Section 6.2.5	10633(d)	Describe and quantify the potential uses of recycled water and provide a determination of the technical and economic feasibility of those uses.	System Supplies (Recycled Water)	Section 6.5.3 and Table 6-4
x	x	Section 6.2.5	10633(e)	Describe the projected use of recycled water within the supplier's service area at the end of 5, 10, 15, and 20 years, and a description of the actual use of recycled water in comparison to uses previously projected.	System Supplies (Recycled Water)	Section 6.5.3 and Table 6-5
x	x	Section 6.2.5	10633(f)	Describe the actions which may be taken to encourage the use of recycled water and the projected results of these actions in terms of acre-feet of recycled water used per year.	System Supplies (Recycled Water)	Section 6.5.5
x	x	Section 6.2.5	10633(g)	Provide a plan for optimizing the use of recycled water in the supplier's service area.	System Supplies (Recycled Water)	Section 6.5.5 and Table 6-7
x	x	Section 6.2.6	10631(g)	Describe desalinated water project opportunities for long-term supply.	System Supplies	Section 6.6
x	x	Section 6.2.5	10633(a)	Describe the wastewater collection and treatment systems in the supplier's service area with quantified amount of collection and treatment and the disposal methods.	System Supplies (Recycled Water)	Section 6.5.2 and Table 6-3

Retail	Wholesale	2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location
x	x	Section 6.2.8, Section 6.3.7	10631(f)	Describe the expected future water supply projects and programs that may be undertaken by the water supplier to address water supply reliability in average, single-dry, and for a period of drought lasting 5 consecutive water years.	System Supplies	Sections 6.9 and 6.10 and Table 6-10
x	x	Section 6.4 and Appendix O	10631.2(a)	The UWMP must include energy information, as stated in the code, that a supplier can readily obtain.	System Suppliers, Energy Intensity	Section 6.11 and Table 6-11
x	x	Section 7.2	10634	Provide information on the quality of existing sources of water available to the supplier and the manner in which water quality affects water management strategies and supply reliability	Water Supply Reliability Assessment	Chapter 7
x	x	Section 7.2.4	10620(f)	Describe water management tools and options to maximize resources and minimize the need to import water from other regions.	Water Supply Reliability Assessment	Section 7.4
x	x	Section 7.3	10635(a)	Service Reliability Assessment: Assess the water supply reliability during normal, dry, and a drought lasting five consecutive water years by comparing the total water supply sources available to the water supplier with the total projected water use over the next 20 years.	Water Supply Reliability Assessment	Section 7.2

Retail	Wholesale	2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location
x	x	Section 7.3	10635(b)	Provide a drought risk assessment as part of information considered in developing the demand management measures and water supply projects.	Water Supply Reliability Assessment	Section 7.5
x	x	Section 7.3	10635(b)(1)	Include a description of the data, methodology, and basis for one or more supply shortage conditions that are necessary to conduct a drought risk assessment for a drought period that lasts 5 consecutive years.	Water Supply Reliability Assessment	Section 7.5.1
x	x	Section 7.3	10635(b)(2)	Include a determination of the reliability of each source of supply under a variety of water shortage conditions.	Water Supply Reliability Assessment	Section 7.5.2 and Table 7-9
x	x	Section 7.3	10635(b)(3)	Include a comparison of the total water supply sources available to the water supplier with the total projected water use for the drought period.	Water Supply Reliability Assessment	Section 7.3 and Tables 7-5 to 7-7
x	x	Section 7.3	10635(b)(4)	Include considerations of the historical drought hydrology, plausible changes on projected supplies and demands under climate change conditions, anticipated regulatory changes, and other locally applicable criteria.	Water Supply Reliability Assessment	Sections 6.10.1, and 7.1.3
x	x	Chapter 8	10632(a)	Provide a water shortage contingency plan (WSCP) with specified elements below.	Water Shortage Contingency Planning	Chapter 8 and Appendix H
x	x	Chapter 8	10632(a)(1)	Provide the analysis of water supply reliability (from Chapter 7 of Guidebook) in the WSCP	Water Shortage Contingency Planning	Appendix H, Chapter 2

Retail	Wholesale	2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location
x	x	Section 8.10	10632(a)(10)	Describe reevaluation and improvement procedures for monitoring and evaluation the water shortage contingency plan to ensure risk tolerance is adequate and appropriate water shortage mitigation strategies are implemented.	Water Shortage Contingency Planning	Appendix H, Chapter 13
x	x	Section 8.2	10632(a)(2)(A)	Provide the written decision- making process and other methods that the supplier will use each year to determine its water reliability.	Water Shortage Contingency Planning	Appendix H, Chapter 4
x	x	Section 8.2	10632(a)(2)(B)	Provide data and methodology to evaluate the supplier's water reliability for the current year and one dry year pursuant to factors in the code.	Water Shortage Contingency Planning	Appendix H, Chapter 4
x	x	Section 8.3	10632(a)(3)(A)	Define six standard water shortage levels of 10, 20, 30, 40, 50 percent shortage and greater than 50 percent shortage. These levels shall be based on supply conditions, including percent reductions in supply, changes in groundwater levels, changes in surface elevation, or other conditions. The shortage levels shall also apply to a catastrophic interruption of supply.	Water Shortage Contingency Planning	Appendix H, Chapter 5
x	x	Section 8.3	10632(a)(3)(B)	Suppliers with an existing water shortage contingency plan that uses different water shortage levels must cross reference their categories with the six standard categories.	Water Shortage Contingency Planning	Appendix H, Chapter 5

Retail	Wholesale	2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location
x	x	Section 8.4	10632(a)(4)(A)	Suppliers with water shortage contingency plans that align with the defined shortage levels must specify locally appropriate supply augmentation actions.	Water Shortage Contingency Planning	Appendix H, Section 6.6 and Table 5-2
x	x	Section 8.4	10632(a)(4)(B)	Specify locally appropriate demand reduction actions to adequately respond to shortages.	Water Shortage Contingency Planning	Appendix H, Section 6.1 and Table 5-1
x	x	Section 8.4	10632(a)(4)(C)	Specify locally appropriate operational changes.	Water Shortage Contingency Planning	Appendix H, Section 6.1
x	x	Section 8.4	10632(a)(4)(D)	Specify additional mandatory prohibitions against specific water use practices that are in addition to state-mandated prohibitions are appropriate to local conditions.	Water Shortage Contingency Planning	Appendix H, Section 6.3
x	x	Section 8.4	10632(a)(4)(E)	Estimate the extent to which the gap between supplies and demand will be reduced by implementation of the action.	Water Shortage Contingency Planning	Appendix H, Section 6.1 and Table 5-1
x	x	Section 8.4.6	10632.5	The plan shall include a seismic risk assessment and mitigation plan.	Water Shortage Contingency Plan	Appendix H, Chapter 7
x	x	Section 8.5	10632(a)(5)(A)	Suppliers must describe that they will inform customers, the public and others regarding any current or predicted water shortages.	Water Shortage Contingency Planning	Appendix H, Chapter 8

Retail	Wholesale	2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location
x	x	Section 8.5 and 8.6	10632(a)(5)(B) 10632(a)(5)(C)	Suppliers must describe that they will inform customers, the public and others regarding any shortage response actions triggered or anticipated to be triggered and other relevant communications.	Water Shortage Contingency Planning	Appendix H, Chapter 8
x		Section 8.6	10632(a)(6)	Retail supplier must describe how it will ensure compliance with and enforce provisions of the WSCP.	Water Shortage Contingency Planning	Appendix H, Chapter 9
x	x	Section 8.7	10632(a)(7)(A)	Describe the legal authority that empowers the supplier to enforce shortage response actions.	Water Shortage Contingency Planning	Appendix H, Chapter 10
x	x	Section 8.7	10632(a)(7)(B)	Provide a statement that the supplier will declare a water shortage emergency Water Code Chapter 3.	Water Shortage Contingency Planning	Appendix H, Chapter 10
x	x	Section 8.7	10632(a)(7)(C)	Provide a statement that the supplier will coordinate with any city or county within which it provides water for the possible proclamation of a local emergency.	Water Shortage Contingency Planning	Appendix H, Chapter 10
x	x	Section 8.8	10632(a)(8)(A)	Describe the potential revenue reductions and expense increases associated with activated shortage response actions.	Water Shortage Contingency Planning	Appendix H, Chapter 11
x	x	Section 8.8	10632(a)(8)(B)	Provide a description of mitigation actions needed to address revenue reductions and expense increases associated with activated shortage response actions.	Water Shortage Contingency Planning	Appendix H, Chapter 11

Retail	Wholesale	2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location
x		Section 8.8	10632(a)(8)(C)	Retail suppliers must describe the cost of compliance with Water Code Chapter 3.3: Excessive Residential Water Use During Drought	Water Shortage Contingency Planning	Appendix H, Chapter 11
x		Section 8.9	10632(a)(9)	Retail suppliers must describe the monitoring and reporting requirements and procedures that ensure appropriate data is collected, tracked, and analyzed for purposes of monitoring customer compliance.	Water Shortage Contingency Planning	Appendix H, Chapter 12
x		Section 8.11	10632(b)	Analyze and define water features that are artificially supplied with water, including ponds, lakes, waterfalls, and fountains, separately from swimming pools and spas.	Water Shortage Contingency Planning	Appendix H, Section 6.5
x	x	Sections 8.12 and 10.4	10635(c)	Provide supporting documentation that Water Shortage Contingency Plan has been, or will be, provided to any city or county within which it provides water, no later than 30 days after the submission of the plan to DWR.	Plan Adoption, Submittal, and Implementation	Appendix H, Chapter 14
x	x	Section 8.14	10632(c)	Make available the Water Shortage Contingency Plan to customers and any city or county where it provides water within 30 after adopted the plan.	Water Shortage Contingency Planning	Appendix H, Chapter 14
	x	Sections 9.1 and 9.3	10631(e)(2)	Wholesale suppliers shall describe specific demand management measures listed in code, their distribution system asset management program, and supplier assistance program.	Demand Management Measures	N/A

Retail	Wholesale	2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location
x		Sections 9.2 and 9.3	10631(e)(1)	Retail suppliers shall provide a description of the nature and extent of each demand management measure implemented over the past five years. The description will address specific measures listed in code.	Demand Management Measures	Chapter 9
x		Chapter 10	10608.26(a)	Retail suppliers shall conduct a public hearing to discuss adoption, implementation, and economic impact of water use targets (recommended to discuss compliance).	Plan Adoption, Submittal, and Implementation	Section 10.3
x	x	Section 10.2.1	10621(b)	Notify, at least 60 days prior to the public hearing, any city or county within which the supplier provides water that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan. Reported in Table 10-1.	Plan Adoption, Submittal, and Implementation	Section 10.1
x	x	Section 10.4	10621(f)	Each urban water supplier shall update and submit its 2020 plan to the department by July 1, 2021.	Plan Adoption, Submittal, and Implementation	Section 10.4
x	x	Sections 10.2.2, 10.3, and 10.5	10642	Provide supporting documentation that the urban water supplier made the plan and contingency plan available for public inspection, published notice of the public hearing, and held a public hearing about the plan and contingency plan.	Plan Adoption, Submittal, and Implementation	Section 10.5
x	x	Section 10.2.2	10642	The water supplier is to provide the time and place of the hearing to any city or county within which the supplier provides water.	Plan Adoption, Submittal, and Implementation	Section 10.2.1

Retail	Wholesale	2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location
x	x	Section 10.3.2	10642	Provide supporting documentation that the plan and contingency plan has been adopted as prepared or modified.	Plan Adoption, Submittal, and Implementation	Section 10.3
x	x	Section 10.4	10644(a)	Provide supporting documentation that the urban water supplier has submitted this UWMP to the California State Library.	Plan Adoption, Submittal, and Implementation	Section 10.4
x	x	Section 10.4	10644(a)(1)	Provide supporting documentation that the urban water supplier has submitted this UWMP to any city or county within which the supplier provides water no later than 30 days after adoption.	Plan Adoption, Submittal, and Implementation	Section 10.4
x	x	Sections 10.4.1 and 10.4.2	10644(a)(2)	The plan, or amendments to the plan, submitted to the department shall be submitted electronically.	Plan Adoption, Submittal, and Implementation	Section 10.6
x	x	Section 10.5	10645(a)	Provide supporting documentation that, not later than 30 days after filing a copy of its plan with the department, the supplier has or will make the plan available for public review during normal business hours.	Plan Adoption, Submittal, and Implementation	Section 10.5
x	x	Section 10.5	10645(b)	Provide supporting documentation that, not later than 30 days after filing a copy of its water shortage contingency plan with the department, the supplier has or will make the plan available for public review during normal business hours.	Plan Adoption, Submittal, and Implementation	Section 10.5
x	x	Section 10.6	10621(c)	If supplier is regulated by the Public Utilities Commission, include its plan and contingency plan as part of its general rate case filings.	Plan Adoption, Submittal, and Implementation	N/A

Retail	Wholesale	2020 Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location
x	x	Section 10.7.2	10644(b)	If revised, submit a copy of the water shortage contingency plan to DWR within 30 days of adoption.	Plan Adoption, Submittal, and Implementation	Section 10.4

Appendix B

Renewal of the Third Amended Offpeak Water Supply Agreement and the Amended Agreement for the Sale of Water Between the Sonoma County Water Agency and Marin Municipal Water District

MA-5375

Renewal of the Third Amended Offpeak Water Supply Agreement and the Amended Agreement for the Sale of Water between the Sonoma County Water Agency and Marin Municipal Water District

This Renewal of the Third Amended Offpeak Water Supply Agreement and the Amended Agreement for the Sale of Water between the Sonoma County Water Agency and Marin Municipal Water District ("Renewal Agreement") is made by and between the Marin Municipal Water District ("MMWD") and the Sonoma County Water Agency ("Agency") and is effective as of July 1, 2015.

Recitals

A. Agency and MMWD are parties to a Supplemental Water Supply Agreement dated January 25, 1996, which incorporates two agreements between the Agency and MMWD that are attached as exhibits to the Supplemental Water Supply Agreement, the Third Amended Offpeak Water Supply Agreement (Exhibit A, referred to herein as the "Offpeak Agreement") and the Amended Agreement for the Sale of Water between the Sonoma County Water Agency and Marin Municipal Water District (Exhibit B, referred to herein as the "Water Sale Agreement").

B. The Offpeak Agreement and the Water Sale Agreement by their terms remain in effect until June 30, 2015 as provided in the Amendment To and Temporary Extension of the Supplemental Water Supply Agreement between MMWD and the Agency dated June 27, 2014.

C. MMWD has requested that the Offpeak Agreement and the Water Sale Agreement be renewed pursuant to Section 7 of the Offpeak Agreement and Section 18 of the Water Supply Agreement.

D. In September 2008, the National Marine Fisheries Service issued its *Russian River Biological Opinion*, which requires the Agency to implement certain activities and projects in the Russian River watershed to improve habitat for listed salmonid species as a condition to receiving "incidental take" authorization in connection with its operation of the Russian River Project and the Water transmission system. MMWD also has listed salmonid species present in streams within its water service area. The protection and recovery of listed salmonid species is a high priority for the Agency and for MMWD.

E. The Supplemental Water Supply Agreement recognized that one of the reasons for that agreement was "to accommodate the Agency's efforts to attempt to ensure a continuation of Pacific Gas and Electric Company's historic diversions of Eel

River water to the Russian River and to increase the reliability of the water supply deliverable to [MMWD]." The need to ensure the continuation of such flows was heightened by the amendments made by the Federal Energy Regulatory Commission in 2004 to Pacific Gas & Electric Company's license for the Potter Valley Project, which reduced such flows. By entering into this Renewal Agreement, the parties recognize the ongoing importance of the continuation of such flows.

Agreement

Wherefore, in consideration of the foregoing and the mutual promises set forth herein, Agency and MMWD agree as follows:

1. This Renewal Agreement shall be effective on July 1, 2015. On the effective date of this Renewal Agreement, the Offpeak Agreement shall be amended as indicated in the attached Exhibit A and the Water Sale Agreement shall be amended as indicated in the attached Exhibit B.

2. Pursuant to section 15051(d) of the CEQA Guidelines, MMWD is designated as the lead agency under the California Environmental Quality Act for the execution of this Renewal Agreement, and for any projects south of Kastania Reservoir that MMWD may construct to implement this Renewal Agreement. Agency is designated as the lead agency for any projects north of Kastania Reservoir that Agency may construct to implement this Renewal Agreement.

3. MMWD shall indemnify Agency and its officers, agents and employees for any and all liabilities, claims, demands, damages, losses, disabilities and expenses (including attorney fees and litigation costs) of every nature arising out of, or in connection with, any legal proceeding that is commenced against the Agency and that alleges that Agency's execution of this Renewal Agreement violates the California Environmental Quality Act or the CEQA Guidelines. MMWD shall provide such indemnification whether or not such liabilities, claims, demands, damages, losses, disabilities or expenses are based on Agency's negligence, unless such liabilities, claims, demands, damages, losses, disabilities or expenses are based on Agency's sole negligence, willful misconduct or violation of law. The provisions in this section regarding attorney fees shall not apply to any other section of this Renewal Agreement.

4. This writing is intended both as the final expression of the agreement between the parties hereto with respect to the included terms and conditions and as a complete and exclusive statement of the terms of the Renewal Agreement. Pursuant to Code of Civil Procedure section 1856, no modification of the Renewal Agreement shall be effective unless and until such modification is evidenced by a writing signed by all parties.

5. No third party beneficiaries are intended or established by this Renewal Agreement.

6. Agency and District each was represented by independent counsel in the negotiation and execution of this Renewal Agreement. For the purposes of interpretation of this Renewal Agreement, neither party shall be deemed to have been the drafter of this Renewal Agreement.

ATTEST:

Board Secretary

MARIN MUNICIPAL WATER DISTRICT

By: _____
John C. Gibson, President
Board of Directors

Reviewed As To Substance By
Marin Municipal Water District

Krishna Kumar
General Manager

Reviewed As To Form:

Mary R. Casey
General Counsel

ATTEST:

Deputy Clerk of the
Board of Directors

SONOMA COUNTY WATER AGENCY

By: _____
Chair, Board of Directors

DATE: 6/16/15

Reviewed As To Substance By
Sonoma County Water Agency:

Grant Davis, General Manager

Reviewed As To Form:

Steven S. Shupe
Deputy County Counsel

Exhibit A

Amendments To Third Amended Offpeak Water Supply Agreement

FOURTH AMENDED
OFFPEAK WATER SUPPLY AGREEMENT

This Fourth Amended Offpeak Water Supply Agreement ("Offpeak Agreement") is made and entered into effective this July 1, 2015, by and between the Marin Municipal Water District, a public body, hereinafter called "Marin" and the Sonoma County Water Agency, a public body, hereinafter called "Agency".

WITNESSETH:

WHEREAS, Agency entered into contracts with the United States Government to secure the construction of Coyote Valley Dam on the East Fork Russian River and Warm Springs Dam on Dry Creek (hereinafter "Russian River Project"); and

WHEREAS, Agency entered into a contract with the cities of Cotati, Petaluma, Rohnert Park, Santa Rosa, and Sonoma, the Forestville County Water District, the Valley of the Moon Water District, and the North Marin Water District (hereinafter "North Marin") entitled, Agreement for Water Supply and Construction of Russian River-Cotati Intertie Project, dated October 25, 1974, and last amended June 23, 2006 (hereinafter "Restructured Agreement for Water Supply").

WHEREAS, said Restructured Agreement for Water Supply authorizes the use of certain water transmission facilities (hereinafter

"Transmission System") for the purpose of delivering to Marin, under prescribed terms and conditions, water which is available in the Russian River; and

WHEREAS, Agency entered into a contract with Marin entitled Second Amended Offpeak Water Supply Agreement, dated May 3, 1988, which provides for the delivery to Marin by Agency, under prescribed terms and conditions, of not to exceed 4,300 acre feet of Russian River water per fiscal year; and

WHEREAS, parts of the property taxes paid since 1971 by the taxpayers of Sonoma County have been paid into a sinking fund that was established to fund Agency's payment obligations to the United States Government for the Warm Springs Dam Project and parts of the property taxes that will be paid in the future by the taxpayers of Sonoma County will likewise be paid into this sinking fund; and WHEREAS pursuant to the Second Amended Offpeak Water Supply Agreement Marin has paid Agency a Russian River Conservation Charge, the proceeds of which were in the past paid into the sinking fund described in the previous recital; and

WHEREAS Agency entered into a contract with Marin dated October 22, 1991 and entitled Agreement for the Sale of Water between the Sonoma County Water Agency and the Marin Municipal Water District (now referred to as the "Water Sale Agreement"), which provides for the delivery to Marin by Agency, under prescribed terms and conditions, of up to 10,000 acre-feet of water per fiscal year; and

WHEREAS, Agency and Marin entered into a Supplemental Water Supply Agreement dated January 25, 1996, which amended and

incorporated two agreements between the Agency and Marin that are attached as exhibits to the Supplemental Water Supply Agreement, those agreements being known as the Third Amended Offpeak Water Supply Agreement and the Amended Agreement for the Sale of Water between the Sonoma County Water Agency and Marin Municipal Water District, to accommodate the Agency's efforts to attempt to ensure a continuation of the Pacific Gas and Electric Company's historic diversions of Eel River water to the Russian River and to increase the reliability of the water supply deliverable to Marin; and

WHEREAS, the Third Amended Offpeak Water Supply Agreement by its terms remain in effect until June 30, 2015 as provided in the Amendment To and Temporary Extension of the Supplemental Water Supply Agreement between Marin and the Agency dated June 27, 2014; and

WHEREAS, Marin has requested that the Third Amended Offpeak Water Supply Agreement be renewed.

NOW, THEREFORE, the parties hereto agree as follows:

1. Subject to all the terms and conditions of this Offpeak Agreement and the relevant provisions of the Restructured Agreement for Water Supply, Agency shall deliver water to Marin either through separately metered turnout at Agency's Kastania Reservoir or through North Marin's meter(s) at Marin's option. Should Marin desire a separate metered turnout, it shall pay to Agency the actual cost of installation of such metered turnout. Such water shall be made available to Marin in an amount not to exceed 4,300 acre feet per fiscal year and at delivery rates as requested by Marin but not to exceed 760 acre feet per calendar month. During the five

month period May 1 through September 30 the delivery rate shall not exceed 360 acre feet per calendar month without the prior written consent of the Agency and the total quantity of water delivered shall not exceed 1,800 acre feet. "Fiscal year" means the year beginning on July 1 and ending on the following June 30.

2. Marin shall pay for water delivered pursuant to this Offpeak Agreement at a rate equal to the highest rate per acre-foot then charged by the Agency to any party to the Restructured Agreement for Water Supply (or pursuant to any amendment or successor agreement to the Restructured Agreement for Water Supply) for water taken from either the Petaluma Aqueduct or the Santa Rosa Aqueduct, multiplied by 1.11; provided, however, that the 20% surcharge imposed on the Town of Windsor under Section 4.17(a) of the Restructured Agreement shall not be included in determining the highest rate per acre-foot for water taken from the Santa Rosa Aqueduct or Petaluma Aqueduct. Seven and four hundred thirty-two one-thousandths percent (7.432%) of this per-acre-foot charge shall be placed in the Russian River Projects Fund; two and four hundred seventy-seven thousandths percent (2.477%) of this per-acre-foot charge shall be used, at the discretion of the Agency, to pay for the costs of Common Facilities, to pay the Capital Costs of Aqueduct Facilities relating to the Santa Rosa or Petaluma Aqueducts, or to pay operations and maintenance costs; and the remainder shall be applied pursuant to the Restructured Agreement for Water Supply (or pursuant to any amendment or successor agreement to the Restructured Agreement for Water Supply), with the water delivered to Marin considered to be delivered from the Petaluma Aqueduct. Agency shall bill Marin monthly for the quantity of water

measured from Marin's metered turnout or from the accounting provided by North Marin and Marin shall pay the amount of such billing within 30 days after receipt of the bill. Notwithstanding any dispute between Agency and Marin, Marin shall pay all its bills when due and shall not withhold all or any part of any payment pending the final resolution of such dispute. In the event of a dispute, Marin may pay its bills under protest and if the resolution of the dispute results in a refund to Marin, Agency shall make refund plus any interest earned by investment of the disputed funds.

3. If the total amount of water delivered to Marin pursuant to this Offpeak Agreement is less than 4,300 acre-feet in any fiscal year, then Agency shall include in the bill for the month of July the difference between the actual amount of water delivered during the previous fiscal year and 4,300 acre-feet, and Marin shall pay for such amount at the same rate as though such water had been delivered, if and to the extent that such water was available to Marin. Water shall be deemed to have been available to Marin during the previous fiscal year if Marin could have taken delivery of such water at any time during such fiscal year at delivery rates not exceeding the rates specified in Section 1 of this Offpeak Agreement. Agency shall keep and make available for review by Marin operating records indicating the availability of water to Marin.

4. Except as otherwise provided herein, Agency shall release water from storage in Lake Mendocino or Lake Sonoma when necessary to make available in the Russian River sufficient water to make the deliveries provided for herein. If by reason of drought or other physical cause or legal impediment beyond the control of the Agency, a shortage in the water

available from the Russian River or the Russian River Project occurs, then Agency shall not be liable to Marin for any damage resulting therefrom.
In the event of shortage of water in the Russian River or the Russian River Project that requires the Agency to apportion available water, Agency shall apportion the available water so that it may make deliveries as follows:

First, Agency shall deliver to each of its regular customers, not in excess of the respective entitlements set forth in Sections 3.1, 3.2 and 3.3 of the Restructured Agreement for Water Supply or any amendments or successor agreements thereto, authorize Agency's Russian River customers to divert or redivert not in excess of the amounts for which those customers have contracted to purchase from the Agency, and deliver to Marin not in excess of the amounts set forth in Section 1 of this Offpeak Agreement and paragraph (f) of Section 8 of the Water Sale Agreement, the quantities of water required by each for human consumption, sanitation and fire protection, as determined by the Agency after taking into consideration all other sources of potable water then available to said customer;

Second, to the extent additional water is available to the Agency, Agency shall deliver such water to Agency's regular customers, authorize Agency's Russian River customers, to divert or redivert such water and deliver such water to Marin in proportion to the respective entitlements set forth in Sections 3.1, 3.2 and 3.3 of the Restructured Agreement for Water Supply, or any amendments or successor agreements, thereto, the agreements between the Agency and its Russian River customers, and Section 1 of this Offpeak Agreement and paragraph (f) of Section 8 of the Water Sale Agreement, provided, however, that no customer shall receive under subdivisions "First" and "Second" hereof a total quantity of water in

excess of its reasonable requirements or its said entitlement or contracted amount, whichever is less.

Agency shall make all reasonable efforts to deliver water to Marin at Kastania Reservoir or at North Marin's meter, as specified in Section 1 of this Offpeak Agreement, using all facilities available to Agency. However, Marin acknowledges that priorities of use of delivery capacity in Agency's facilities have been allocated to others who are not parties to this Offpeak Agreement, and that capacity to make deliveries of water to Marin at the rates in Section 1 of this Offpeak Agreement may not always be available to Agency. Agency shall keep, and make available to Marin on an annual basis in July of each year, records indicating the availability of capacity to deliver water to Marin, up to the limits set forth in Section 1 of this Offpeak Agreement and in Section 2 of the Water Sale Agreement, for each month of the previous fiscal year. During July of each year, Agency also shall provide Marin with an estimate of the capacity that will be available to deliver water to Marin pursuant to this Offpeak Agreement and the Water Sale Agreement during each remaining month of the then present fiscal year. If these reports indicate that delivery capacity is insufficient, or soon will be insufficient, to provide deliveries at the rates specified in Section 1 of this Offpeak Agreement, then Agency shall use its best efforts to secure an alternative means, solely at Marin's expense, to accomplish the purposes of this Offpeak Agreement.

In the event of an impairment of or limitation on the use or capacity of the Transmission System, or other facility that affects the Agency's ability to deliver water to Marin pursuant to this Offpeak Agreement, by reason of natural disaster, sabotage, legal impediment or other cause beyond the control of the Agency, the Agency shall not be liable to Marin for any damage

arising therefrom. In such event, the Agency shall use the available Transmission System capacity to make deliveries as follows:

First, deliver to each of its regular customers the quantity of water, not in excess of its respective entitlement set forth in Sections 3.1 and 3.2 of the Restructured Agreement for Water Supply, or any amendments or successor agreements thereto, required by it for human consumption, sanitation and fire protection as determined by the Agency after taking into consideration all other sources of potable water then available to said customer;

Second, to the extent additional Transmission System capacity is available to the Agency, deliver a quantity of water to the regular customers in proportion to their respective entitlements set forth in Section 3.1 and 3.2 of the Restructured Agreement for Water Supply, or any amendments or successor agreements thereto, provided, however, that no regular customer shall receive under the paragraphs "first" and "second" a total quantity of water in excess of its reasonable requirements or its said entitlement, whichever is less;

Third, to the extent additional Transmission System capacity is available, deliver water to regular customers in excess of their entitlements, pursuant to section 3.3 of the Restructured Agreement for Water Supply;

Fourth, to the extent additional Transmission System capacity is available, deliver water to Marin Municipal Water District, not in excess of the delivery limitations in Section 1 of this Offpeak Agreement;

Fifth, to the extent additional Transmission System capacity is available, deliver surplus water to the water contractors;

Sixth, to the extent additional Transmission System capacity is available, delivery surplus water to other Agency customers;

The terms "regular customers", "Russian River customers" and "water contractors" in this Offpeak Agreement shall have the same meanings that they have in the Restructured Agreement for Water Supply.

5. In addition to the rates and charges required to be paid by Marin pursuant to Section 2 hereof, Marin shall pay the following additional charges on or before each September 30 during the term of this Offpeak Agreement.

a. Marin shall pay a Russian River Conservation Charge in lieu of the property taxes levied by the Agency on property in Sonoma County, to pay the capital, operation and maintenance costs associated with the Warm Springs Dam Project. The Russian River Conservation Charge shall be a charge per acre foot which shall be applied to Marin's total 4,300 acre feet per annum entitlement under this Offpeak Agreement. The charge shall be determined annually on or before April 30 preceding each September 30. The Russian River Conservation Charge shall be determined by multiplying the tax rate levied by the Agency in the then current fiscal year to pay the costs associated with the Warm Springs Dam Project times the total assessed value of secured and unsecured property situated within the cities of Cotati, Petaluma, Rohnert Park, Santa Rosa and Sonoma, the Forestville County Water District, and the Valley of the Moon Water District, and dividing the product by the total number of acre feet of water delivered to said public agencies pursuant to Section 3.1 and 3.3 of the Restructured Agreement for Water Supply, or any amendments or successor agreements thereto, during the twelve month period ending on March 31.

b. Marin shall pay a Russian River Projects Charge in lieu of the property taxes levied on property in Sonoma County and other Agency

general fund monies which are transferred by the Agency to the Agency's Russian River Projects Fund and expended to pay for or partially pay for: (1) carrying out the Agency's Coyote Valley Dam Project and Warm Springs Dam Project channel-stabilization works obligations to the United States Government and the State of California under Agency Board of Directors Resolutions No. 6847 adopted May 24, 1955, No. 7798 adopted September 27, 1955, No. DR00793-1 adopted September 25, 1961 and Resolution No DR68485 adopted December 23, 1980; (2) securing and defending appropriative water rights which are necessary for the realization of the full benefits of the Coyote Valley Dam and Warm Springs Dam Projects; (3) the Agency's share of the United States Government's investment, operation and maintenance costs associated with the Coyote Valley Dam and Warm Springs Dam Projects; (4) the acquisition of all or part of the Potter Valley Project, or contributions made to the Project owner to insure the continued operation of all or part of the Project; and (5) fishery mitigation and enhancement projects undertaken by the Agency in the Russian River and Eel River and their tributaries. The Russian River Projects Charge shall be determined by dividing the total amount of Agency monies expended from the Agency's Russian River Projects Fund in the preceding ten fiscal years, exclusive of the funds contributed to the Fund by Marin and North Marin Water Districts and interest earnings attributable to funds contributed by Marin and North Marin Water District, by the sum of the total acre-feet of water delivered by the Agency to the cities of Cotati, Petaluma, Rohnert Park, Santa Rosa, and Sonoma, the Forestville County Water District, and the Valley of the Moon Water District pursuant to Section 3.1 and 3.3 of the Restructured Agreement for Water Supply, or any amendments or successor agreements thereto, during the preceding ten

fiscal years and multiplying the quotient by the ratio that the assessed value of secured and unsecured property situated within the cities of Cotati, Petaluma, Rohnert Park, Santa Rosa and Sonoma, the Forestville County Water District, and the Valley of the Moon Water District bears to the assessed value of all secured and unsecured property within Sonoma County, provided, however, in no event shall the Russian River Projects Charge exceed $20.00 per acre-foot. Agency shall keep proper books, records and accounts in which complete and accurate entries shall be made of all Agency general fund monies transferred to the Agency's Russian River Projects Fund and all expenditures made from the fund for the purposes described in this paragraph. The Agency shall maintain a separate account within the Russian River Projects Fund for monies contributed by Marin and North Marin Water District. Monies expended from the Russian River Projects Fund shall be deemed to have been expended from the Marin and North Marin Water District account in the proportion that the balance of the account bears to the total Russian River Projects Fund balance at the end of the fiscal year quarter preceding the expenditure.

c. All money received by the Agency from the Russian River Conservation Charge and the Russian River Projects Charge on water sold to Marin shall be credited to the Agency's Russian River Projects Fund and shall be used only for the purposes set forth in Paragraph (b) of this section.

6. The annual quantity of water provided to Marin by Agency pursuant to this Offpeak Agreement shall be in addition to the annual quantity of water provided to Marin by Agency pursuant to the Sale of Water Agreement.

7. This Offpeak Agreement supersedes the Third Amended Offpeak Water Supply Agreement between Marin and Agency. This Offpeak Agreement shall be effective on July 1, 2015 and shall remain in effect until June 30, 2025. Upon the request of Marin, Agency agrees to enter into renewal agreements for periods not to exceed the then-existing term of the Restructured Agreement for Water Supply or any renewals, amendments or replacement agreements to the Restructured Agreement for Water Supply upon the same terms and conditions contained in this Offpeak Agreement, except that the Agency may make reasonable adjustments to the charges under Section 5 of this Offpeak Agreement, and any such reasonable adjustments then shall be included in any renewal agreement. If the Restructured Agreement for Water Supply has been terminated or has expired without being renewed, amended or replaced by another agreement pertaining to water supply, then upon the request of Marin, the Agency shall enter into renewal agreements for periods not to exceed forty (40) years upon the same terms and conditions contained in this Offpeak Agreement, except that the Agency may make reasonable adjustments to the charges under Section 5 of this Offpeak Agreement and any such reasonable adjustment then shall be included in any renewal agreement.

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be executed as of the date hereinabove first written.

ATTEST:

Board Secretary

MARIN MUNICIPAL WATER DISTRICT

By:

John C. Gibson, President
Board of Directors

Reviewed As To Substance By
Marin Municipal Water District

Krishna Kumar
General Manager

Reviewed As To Form:

Mary R. Casey
General Counsel

ATTEST:

Deputy Clerk of the
Board of Directors

SONOMA COUNTY WATER AGENCY

By: _____
Chair, Board of Directors

DATE: 6/16/15

Reviewed As To Substance By
Sonoma County Water Agency:

Grant Davis, General Manager

Reviewed As To Form:

Steven S. Shupe
Deputy County Counsel

Exhibit B

Amendments to Amended Agreement for the Sale of Water between the Sonoma County Water Agency and Marin Municipal Water District

SECOND AMENDED AGREEMENT FOR THE SALE OF WATER BETWEEN THE SONOMA COUNTY WATER AGENCY AND THE MARIN MUNICIPAL WATER DISTRICT

This agreement is made this 22nd day of October, 1991, and is amended and effective this July 1, 2015, by and between the Sonoma County Water Agency, hereinafter called "Agency," and the Marin Municipal Water District, hereinafter called "District" hereinafter ("Water Sale Agreement.")

RECITALS

A. District operates a municipal water system to supply water to customers within its boundaries. District's water system is supplied by water from reservoirs owned and operated by District, and by water purchased from Agency pursuant to Fourth Amended Offpeak Water Supply Agreement ("Offpeak Agreement") and this Water Sale Agreement.

B. District and Agency now wish to revise this Water Sale Agreement to accommodate the Agency's effort to attempt to ensure a continuation of the Pacific Gas and Electric Company's historic diversions of Eel River water to the Russian River and to increase the reliability of the water supply deliverable to District.

C. The Coyote Valley Project was authorized by the Flood Control Act of 1950 (Pub. L. No. 81-516), and was completed by the U. S. Army Corps of Engineers in 1958. This project includes Lake Mendocino, which has a capacity of 122,500 acre-feet, of which 70,000 acre-feet is allocated to storage for water supply.

D. In 1955, Agency (then called the "Sonoma County Flood Control and Water Conservation District") sold general obligation bonds to raise $5,650,000, which it then paid to the United States for the reimbursable costs of the water-storage element of the Coyote Valley Project. Parts of the property taxes paid since 1955 by the taxpayers of Sonoma County have been used to make payments on these bonds.

E. The Warm Springs Dam Project was authorized by the Flood Control Act of 1962 (Pub. L. No. 87-874), and was completed by the United States Army Corps of Engineers in 1984. This project includes Lake Sonoma, which has a capacity of 381,000 acre-feet, of which 212,000 acre-feet is allocated to storage for water supply.

F. Agency contracted with the United States to make annual payments to the United States for portions of the construction, operation, maintenance, major-replacement and major-rehabilitation costs of the Warm Springs Dam Project. Parts of the property taxes paid since 1971 by the taxpayers of Sonoma County have been paid into a sinking fund that was established to fund Agency's payment obligations to the United States for this project. Parts of the property taxes that will be paid in the future by the taxpayers of Sonoma County will likewise be paid into this sinking fund.

G. Pursuant to the Restructured Agreement for Water Supply, the North Marin Water District has paid Agency a Russian River Conservation Charge. Pursuant to the Offpeak Water Supply Agreement and its two amendments, District also has paid Agency a Russian River Conservation Charge. The proceeds of these payments were in the past paid into the sinking fund described in the preceding paragraph.

H. Agency currently utilizes the Transmission System to supply water to the Water Contractors and some of Agency's Other Customers and Contractors pursuant to the Restructured Agreement for Water Supply and other agreements. Payments made by the Water Contractors pursuant to the Restructured Agreement for Water Supply were and are being used to fund payments on the bonds sold to finance the construction of parts of the Transmission System and to fund directly the construction of other parts of the Transmission System.

I. Some of Agency's Other Customers and Contractors divert water purchased from Agency directly from the Russian River.

J. Agency holds Permits 12947A, 12949, 12950 and 16596, which were issued by the State Water Resources Control Board and its predecessors pursuant to Applications 12919A, 12920A, 15736, 15737 and 19351. These permits authorize Agency to divert Russian River water, and to redivert water previously stored in Lake Mendocino and Lake Sonoma, subject to specified terms and conditions.

K. On July 3, 1975, Agency and District entered into an agreement entitled, "Offpeak Water Supply Agreement." Agency and

District amended that agreement on August 28, 1984, May 3, 1988, January 25, 1995, and June 27, 2014. That agreement, now entitled "Fourth - Amended Offpeak Water Supply Agreement" and referred to herein as the "Offpeak Agreement" provides for Agency to deliver up to 4,300 acre-feet of water per year pursuant to Permits 12947A, 12949, 12950 and 16596, subject to specified terms and conditions.

L. In June 1980, Agency certified its final environmental impact report on Proposed Amendments of Permits on Applications 12919A, 15736, 15737 and 19351. In July 1984, Agency certified its supplemental environmental impact report covering Proposed Coordinated Use of the Water Supply of Lake Mendocino and Lake Sonoma, Russian River Project. On November 14, 1990, District certified its Water Supply Plan Program Final Environmental Impact Report. On September 24, 1991, District certified its Water Supply Project Final Environmental Impact Report. These reports together satisfy the environmental-impact-report requirements of the California Environmental Quality Act for this Water Sale Agreement.

M. Agency's January 1991 "Urban Water Management Plan" concluded that Agency's direct-diversion rights and its share of the Coyote Valley and Warm Springs Dam Projects together will have yield sufficient to supply District with additional water according to the terms of this Water Sale Agreement.

N. Agency has the capacity to produce water from groundwater wells and intends, if authorized by an amendment to the Restructured Agreement for Water Supply, to develop additional emergency groundwater wells, aquifer storage and recovery wells or other offstream

water-production facilities, to improve the reliability of the delivery capacity of the Transmission System.

O. At the present time and under normal circumstances, the Transmission System has excess capacity that may be used by Agency to supply District with water pursuant to this Water Sale Agreement. In order for the Transmission System in the future to continue to have such excess capacity under normal circumstances, Agency will need to construct elements of a new aqueduct from the Russian River to the Ely Pumping Plant, roughly paralleling portions of the existing Cotati Intertie and Petaluma Aqueduct, at an earlier date than would be necessary absent this Water Sale Agreement, and Agency will need to construct a new aqueduct from the Ely Pumping Plant to Kastania Reservoir, roughly paralleling portions of the existing Petaluma Aqueduct, which would not be necessary absent this Water Sale Agreement.

P. Agency and District entered into a Supplemental Water Supply Agreement dated January 25, 1996, which amended and incorporated two agreements between the Agency and MMWD that are attached as exhibits to the Supplemental Water Supply Agreement, the Third Amended Offpeak Water Supply Agreement and the Amended Agreement for the Sale of Water between the Sonoma County Water Agency and Marin Municipal Water District. The Amended Agreement for the Sale of Water by its terms remain in effect until June 30, 2015 as provided in the Amendment To and Temporary Extension of the Supplemental Water Supply Agreement between MMWD and the Agency dated June 27, 2014.

Q. District has requested that the Third Amended Offpeak Water Supply Agreement be renewed. Agency is willing to sell water to District,

and District is willing to purchase such water from Agency, pursuant to the terms and conditions of this Water Sale Agreement.

NOW, THEREFORE, in consideration of these recitals and the mutual promises made herein, Agency and District agree as follows:

Section 1. Definitions.

When used in this Water Sale Agreement, unless otherwise distinctly expressed or manifestly incompatible with the intent of this Water Sale Agreement, the following terms shall have the following meanings:

a. "Restructured Agreement for Water Supply" means the agreement between Agency and the Water Contractors entitled Restructured Agreement for Water Supply, executed on June 25, 2006.

b. "Fiscal Year" means each year that begins on July 1 and ends on the following June 30.

c. "Maximum Delivery Limit" means the maximum amount of water that Agency is required to deliver and that District may take pursuant to this Water Sale Agreement in any Fiscal Year, and which is described in Section 4 of this Water Sale Agreement.

d. "Other Customers and Contractors" means the North Marin Water District and all present and future Agency customers within Sonoma County, including all entities within Sonoma County that receive or will receive water from the Transmission System or other water conveyance facilities, and all entities within Sonoma County that divert or will divert water purchased from Agency directly from the Russian River or Dry Creek.

e. "Permits 12947A, 12949, 12950 and 16596" mean water rights permits 12947A, 12949, 12950 and 16596, which the State Water Resources Control Board and its predecessors issued to Agency pursuant

to Applications 12919A and 12920A, 15736, 15737 and 19351, as such permits now exist or in the future may exist (including any licenses that may be issued to replace these permits).

f. "Prudent Storage Reserve" means a quantity of water in storage in Lake Sonoma, Lake Mendocino and Lake Pillsbury sufficient to assure both that the level of Lake Sonoma would not drop below 292 feet and the level of Lake Mendocino would not drop below 685 feet, with reference to the National Geodetic Vertical Datum of 1929, during the fall of the calendar year following the calendar year in which the determination of availability is made under Section 7 of this Water Sale Agreement, if the most severe hydrologic period of record were to recur.

g. "Russian River Conservation Charge" means the charge that District pays and will pay Agency in lieu of the property taxes levied by the Agency on property in Sonoma County to pay the capital, operation and maintenance costs associated with the Warm Springs Dam Project, and which is described In Section 10 of this Water Sale Agreement.

h. "Russian River Projects Charge" means the charge which is described in Section 10 of this Water Sale Agreement that the District will pay Agency in lieu of the property taxes levied on property in Sonoma County and other Agency general fund monies which are transferred by the Agency to the Agency's Russian River Projects Fund and expended to pay for or partially pay for: (1) carrying out the Agency's Coyote Valley Dam Project and Warm Springs Dam Project channel-stabilization works obligations to the United States Government and the State of California under Agency Board of Directors Resolutions No. 6847 adopted May 24, 1955, No. 7798 adopted September 27, 1955, No. DR00793-1 adopted September 25, 1961 and Resolution

No. DR68485 adopted December 23, 1980; (2) securing and defending appropriative water rights which are necessary for the realization of the full benefits of the Coyote Valley Dam and Warm Springs Dam Projects; (3) the Agency's share of the United States Government's investment, operation and maintenance costs associated with the Coyote Valley Dam and Warm Springs Dam Projects; (4) the acquisition of all or part of the Potter Valley Project, or contributions made to the Project owner to insure the continued operation of all or part of the Project; and (5) fishery mitigation and enhancement projects undertaken by the Agency in the Russian River and Eel River and their tributaries.

i. "Offpeak Agreement" means the July 1, 2015 agreement between Agency and District that is described in recital K of this Water Sale Agreement.

j. "Transmission System" means the water-supply facilities financed and constructed pursuant to the Restructured Agreement for Water Supply and its predecessor agreements, including the remaining features of the Russian River-Cotati Intertie authorized by the Restructured Agreement for Water Supply but not yet constructed.

k. "Water Contractors" means the Cities of Cotati, Petaluma, Rohnert Park, Santa Rosa and Sonoma, the Town of Windsor, the Valley of the Moon Water District, and the North Marin Water District.

Section 2. Agency Deliveries of Water to District.

Subject to all of the terms and conditions of this Water Sale Agreement, and subject to all relevant present and future provisions of the Restructured Agreement for Water Supply, District may purchase water from Agency pursuant to this Water Sale Agreement in any Fiscal Year in an

amount not to exceed either 10,000 acre-feet or the District's Maximum Delivery Limit for that Fiscal Year. Upon request by District and subject to all of the terms of this Water Sale Agreement, Agency shall make such water available to District at Agency's Kastania Reservoir at delivery rates specified by District, but not to exceed rates calculated by dividing the District's Maximum Delivery Limit by 10,000 acre feet and multiplying this quotient by the following amounts: (a) 9 million gallons per day between May 1 and October 31 of each year; (b) 12 million gallons per day during the months of April and November of each year; and (c) 15 million gallons per day during all other times.

To the extent permissible under the Offpeak Agreement, the first 360 acre-feet of water received by District from Agency in any month shall be accounted for as being received pursuant to that agreement.

District may not receive any water pursuant to this Water Sale Agreement in any month unless or until one of the following two events has occurred: (1) District already has received in that month at least 360 acre-feet pursuant to the Offpeak Agreement; or (2) District already has received in that Fiscal Year the maximum amount of water that it may receive pursuant to that Offpeak Agreement.

Section 3. Meter, Connections and Delivery.

Agency will install a turnout, a meter, and appropriate appurtenances at its Kastania Reservoir so that the water delivered to District pursuant to this Water Sale Agreement may be accurately measured and delivered to District's water system. District shall take delivery of water purchased from Agency pursuant to this Water Sale Agreement immediately after the water has passed through this meter.

After installation of this turnout, meter and appurtenances, Agency shall bill District for their cost. District shall pay Agency the amount of this bill within 30 days after receipt of the bill.

Agency shall keep accurate records of the amounts of water delivered to District at this meter, and shall allow District to inspect these records during regular business hours.

Section 4. Maximum Delivery Limit.

a. In the Fiscal Year commencing July 1, 1995, District's Maximum Delivery Limit shall be 5,000 acre-feet. If District takes delivery of, or makes payments in lieu of delivery pursuant to Section 5 of this Water Sale Agreement for, at least 90 percent of the Maximum Delivery Limit in any Fiscal Year, then its Maximum Delivery Limit for the following Fiscal Year shall be increased by 1,000 acre-feet, but never to exceed 10,000 acre-feet.

b. Beginning with the Fiscal Year immediately following District's completion of transmission facilities sufficient to take delivery of at least 5,000 acre-feet of water pursuant to this Water Sale Agreement, or with the July 1, 1996 to June 30, 1997 Fiscal Year, whichever occurs first, if District does not take delivery pursuant to this Water Sale Agreement of, or make payments in lieu of delivery for, at least 90 percent of its Maximum Delivery Limit in any Fiscal Year, then District's Maximum Delivery Limit for the following Fiscal Year shall be decreased by 1,000 acre-feet, except:

The Maximum Delivery Limit shall not decrease for the Fiscal Year following any Fiscal Year in which District requests delivery of at least 90 percent of the Maximum Delivery Limit and either (1) Agency determines,

pursuant to Section 7 of this Water Sale Agreement, that less than 90 percent of the Maximum Delivery Limit is available; or (2) Agency determines pursuant to Section 9 of this Water Sale Agreement that Transmission System capacity will not be available to deliver District pursuant to this Water Sale Agreement at least 90 percent of the Maximum Delivery Limit.

Section 5. Payments In Lieu of Delivery.

District may elect to make payments to Agency in lieu of delivery to prevent any reduction of District's Maximum Delivery Limit for the following Fiscal Year.

Within 10 days after the end of any month in which District makes such an election, it shall notify Agency in writing of the number of acre-feet for which District elects to make payments in lieu of delivery. The total of this number of acre-feet plus the number of acre-feet of water actually delivered during the month pursuant to this Water Sale Agreement shall not exceed the volume equal to the number of days in the month times the applicable maximum daily delivery limit specified in Section 2 of this Water Sale Agreement. If at the end of May of any fiscal year District has not taken delivery pursuant to this Water Sale Agreement of at least 172 acre-feet of water during the fiscal year, District shall be deemed to have elected to make a payment in lieu of delivery during the month of May for the difference between 172 acre-feet and the amount of water for which delivery already has been taken, or for which payments in lieu of delivery already have been made, pursuant to this Water Sale Agreement. If at the end of June of any fiscal year District has not taken delivery pursuant to this Water Sale Agreement of at least 1000 acre-feet of water during the fiscal year, District

shall be deemed to have elected to make a payment in lieu of delivery during the month of June for the difference between 1000 acre-feet and the amount of water for which delivery already has been taken or payments in lieu of delivery already have been made, pursuant to this Water Sale Agreement.

After receipt of such notice from District, and in instances when District shall be deemed to have elected to make payments in lieu of deliveries, Agency shall bill District for the appropriate number of acre-feet at the rate determined pursuant to Section 10 of this Water Sale Agreement, less Agency's estimated average, system wide per-acre-foot costs (as calculated by Agency) for the energy and chemicals necessary to operate the Transmission system during the preceding month. When the actual average, system wide per-acre-foot costs (as calculated by Agency) for the energy and chemicals necessary to operate the Transmission System during any month in which District has elected to make payments in lieu of delivery are known, Agency shall make an appropriate adjustment to the amount previously billed to District pursuant to this section, and credit or debit the District for the adjustment.

District shall pay the amount of each bill made pursuant to this section within 30 days after receipt of the bill. No such billing or payment shall affect District's obligations to make payments to Agency pursuant to any other section of this Water Sale Agreement.

In calculating District's Maximum Delivery Limit for the following Fiscal Year, Agency shall add to the amount of water that District received pursuant to this Water Sale Agreement during the current Fiscal Year the number of acre-feet for which District made such payments in lieu of delivery during the current Fiscal Year.

Section 6. Annual Request by District.

On or before May 1 of each year, District shall submit a written request to Agency, stating the amount of water that District requests to purchase pursuant to this Water Sale Agreement and the Offpeak Agreement during the following Fiscal Year.

Section 7. Availability.

Except as otherwise provided in Section 8 of this Water Sale Agreement, water shall be deemed to be available for sale by Agency to District pursuant to this Water Sale Agreement if Agency has water in excess of the amounts that it needs to supply all of its Other Customers and Contractors, to meet its obligations under the Offpeak Agreement, to meet its obligations under any contract between Agency and the Mendocino County Russian River Flood Control and Water Conservation Improvement District in existence on October 22, 1991, to meet its obligations to appropriative water rights owners, to meet instream flow requirements, and to maintain a Prudent Storage Reserve, considering hydrologic conditions, Agency's offstream water production capacity, the probable effects of water conservation efforts on water demand and other relevant factors.

On or before March 1 of each year, Agency shall estimate the amount of water that will be available during the next Fiscal Year for sale to District pursuant to this Water Sale Agreement, and advise the District of this estimate. On or before June 1 of each year, Agency shall, to the extent that it can, make a final determination of the amount of water that will be available the next Fiscal Year for sale to District pursuant to this Water Sale Agreement, and advise the District of this amount.

If Agency notifies District pursuant to this section on March 1 of any year that the amount of water that will be available for delivery by Agency to District pursuant to this Water Sale Agreement during the following Fiscal Year will be less than District's Maximum Delivery Limit for that following Fiscal Year, then District may elect in writing to defer until July, August, September or October of the following Fiscal Year delivery of up to one-half of the undelivered water that District otherwise would be entitled to receive pursuant to this Water Sale Agreement during the current Fiscal Year. If District makes such an election, then none of the maximum daily delivery limits specified in Section 2 of this Water Sale Agreement shall be exceeded by the total of all water delivered by Agency to District pursuant to this Water Sale Agreement. If District makes such an election and receives the deferred-delivery water during the following Fiscal Year, then for the purposes of Section 4 of this Water Sale Agreement such water shall be treated as if District had taken delivery of it during the current Fiscal Year.

Section 8. Firm Water Supply.

a. No later than July 31, 1996, District shall pay to the Agency a lump sum representing a share of the Warm Springs Dam sinking fund and principal payments made to the United States Government by Agency for Lake Sonoma water storage space corresponding to 5,000 acre-feet per annum of the 75,000 acre-feet per annum net firm yield of the Warm Springs Dam Project.

b. At any time that is after District has made the payment described in paragraph (a) of this section and prior to July 1, 2005 District shall have the option to pay to the Agency a lump sum representing a share of the Warm Springs Dam sinking fund and principal payments made to the United

States Government by Agency for Lake Sonoma water storage space corresponding to an additional 5,000 acre-feet per annum of the 75,000 acre-feet per annum net firm yield of the Warm Springs Dam Project.

c. The amount of the lump sum payments referred to in paragraphs (a) and (b) of this section shall be determined by the following formula:

$$C = (A + B) \times O / (75{,}000 \text{ acre-feet} - O)$$

In this formula *C* is the lump sum payment representing a share of the Warm Springs sinking fund corresponding to an additional 5,000 acre-feet per annum of the 75,000 acre-feet per annum net firm yield of the Warm Springs Dam Project; *A* is the balance of cash and market value of investments held by the Agency's Warm Springs Dam Sinking fund on the last day of the fiscal year quarter immediately preceding the date of the payment provided for in paragraph (a) or (b) of this section; *B* is the total amount of the principal payments which have been made by the Agency to the United States Government for water storage space in Lake Sonoma as of the date of the payment provided for in paragraph (a) or (b) of this section; and *O* is the 5,000 acre-feet of annual firm water to be made available to MMWD pursuant to paragraphs (a) or (b) of this section.

d. In lieu of the determination of availability provided for in Section 7 of this Water Sale Agreement, Agency shall release water from storage in Lake Mendocino or Lake Sonoma when necessary to make available in the Russian River sufficient water to make deliveries of the first 5,000 acre-feet per annum of water provided for by this Water Sale Agreement, but subject to the provisions of paragraph (f) of this section.

e. If District makes the payment pursuant to paragraph (b) of this section, then in lieu of the determination of availability provided for in Section 7 of this Water Sale Agreement, Agency shall release water from storage in

Lake Mendocino or Lake Sonoma when necessary to make available in the Russian River sufficient water to make the deliveries of all the water provided for by this Water Sale Agreement, but subject to the provisions of paragraph (f) of this section.

f. With respect to the releases provided for in paragraphs (d) and (e) of this section, if by reason of drought or other physical cause or legal impediment beyond the control of the Agency, a shortage in the water available from the Russian River or the Russian River Project occurs, then Agency shall not be liable to District for any damage resulting therefrom. In the event of a shortage of water in the Russian River or the Russian River Project that requires the Agency to apportion available water, Agency shall apportion the available water so that it may make deliveries as follows:

First, Agency shall deliver to each of its regular customers, not in excess of the respective entitlements set forth in Sections 3.1, 3.2 and 3.3 of the Restructured Agreement for Water Supply, or any amendments or successor agreements thereto, authorize Agency's Russian River customers to divert or redivert not in excess of the amounts for which those customers have contracted to purchase from the Agency, and deliver to District not in excess of the amounts set forth in Section 1 of the Offpeak Agreement, paragraph (d) of this section, and (if District makes the payment pursuant to paragraph (b) of this section) paragraph (e) of this section, the quantities of water required by each for human consumption, sanitation and fire protection, as determined by the Agency after taking into consideration all other sources of potable water then available to said customer;

Second, to the extent additional water is available to the Agency, Agency shall deliver such water to Agency's regular customers, authorize

Agency's Russian River customers to divert or redivert such water, and deliver such water to the District, in proportion to the respective entitlements set forth in Sections 3.1, 3.2 and 3.3 of the Restructured Agreement For Water Supply, or any amendments or successor agreements thereto, the agreements between the Agency and its Russian River customers, Section 1 of the Offpeak Agreement, paragraph (d) of this section and (if District makes the payment pursuant to paragraph (b) of this section) paragraph (e) of this section, provided, however, that no customer shall receive under subdivisions "First" and "Second" hereof a total quantity of water in excess of its reasonable requirements or it's said entitlement or contracted amount, whichever is less.

The terms "regular customers", "Russian River customers" and "water contractors" in this Water Sale Agreement shall have the same meanings that they have in the Restructured Agreement for Water Supply.

Section 9. Delivery Schedule.

Notwithstanding a determination of availability of water pursuant to Section 7 or Section 8 of this Water Sale Agreement, Agency shall be obligated to release water from storage or deliver water to District pursuant to this Water Sale Agreement only to the extent that the Transmission System has capacity in excess of that required by Agency to supply all of its Other Customers and Contractors, and District under the Offpeak Agreement. However, Agency shall not curtail deliveries pursuant to this section because of inadequate capacity in any new Ely-to-Kastania Aqueduct constructed pursuant to Section 13 of this Water Sale Agreement.

On or before June 1 of each year, Agency shall submit a written estimate to District of the capacity of the Transmission System that is

expected to be available to deliver water pursuant to this Water Sale Agreement for each month of the following Fiscal Year. Fifteen days before the first day of each month, District shall notify the Agency of its planned rate of delivery for that month pursuant to this Water Sale Agreement and the Offpeak Agreement. Such notice may be by telephone unless written notice is requested by Agency.

Section 10. Water Charges.

On or before April 30 of each year, Agency shall establish a per-acre-foot water rate applicable to all water delivered pursuant to this Water Sale Agreement for the following Fiscal Year. This rate shall be the sum of the following three per-acre-foot charges:

a. A per acre foot charge equal to the highest rate per acre-foot then charged by the Agency to any party to the Restructured Agreement for Water Supply (or pursuant to any amendment or successor agreement to the Restructured Agreement for Water Supply) for water taken from either the Petaluma Aqueduct or the Santa Rosa Aqueduct, multiplied by 1.11; provided, however, that the 20% surcharge imposed on the Town of Windsor under Section 4.17(a) of the Restructured Agreement shall not be included in determining the highest rate per acre-foot for water taken from the Santa Rosa Aqueduct or Petaluma Aqueduct. Seven and four hundred thirty-two one-thousandths percent (7.432%) of this per-acre-foot charge shall be placed in the Russian River Projects Fund; two and four hundred seventy-seven thousandths percent (2.477%) of this per-acre-foot charge shall be used, at the discretion of the Agency, to pay for the costs of Common Facilities, to pay the Capital Costs of Aqueduct Facilities relating to the Santa Rosa or Petaluma Aqueducts, or to pay

operations and maintenance costs; and the remainder shall be applied pursuant to the Restructured Agreement for Water Supply (or pursuant to any amendment or successor agreement to the Restructured Agreement for Water Supply), with the water delivered to Marin considered to be delivered from the Petaluma Aqueduct.

b. A Russian River Conservation charge which shall be paid in lieu of the property taxes levied by the Agency on property in Sonoma County, to pay the capital, operation and maintenance costs associated with the Warm Springs Dam Project. The Russian River Conservation Charge shall be determined by multiplying the tax rate levied by the Agency in the then current fiscal year to pay the costs associated with the Warm Springs Dam Project times the assessed value of secured and unsecured property situated within the cities of Cotati, Petaluma, Rohnert Park, Santa Rosa and Sonoma, the Forestville County Water District, and the Valley of the Moon Water District, and dividing the product by the total number of acre-feet of water delivered to said public agencies pursuant to Section 3.1 and 3.3 of the Restructured Agreement for Water Supply, or any amendments or successor agreements thereto, during the twelve month period ending on March 31.

c. A Russian River Projects Charge which shall be paid in lieu of the property taxes levied on property in Sonoma County and other Agency general fund monies which are transferred to the Agency's Russian River Projects Fund and expended for the purposes enumerated in subsection (h) of Section 1. The Russian River Projects Charge shall be determined by dividing the total amount of Agency monies expended from the Agency's Russian River Projects Fund in the preceding ten fiscal years, exclusive of the funds contributed to the Fund by District and North Marin Water District,

and interest earnings attributable to funds contributed by District and North Marin Water District, by the sum of the total acre-feet of water delivered by the Agency to the cities of Cotati, Petaluma, Rohnert Park, Santa Rosa and Sonoma, the Forestville County Water District, and the Valley of the Moon Water District pursuant to Sections 3.1 and 3.3 of the Restructured Agreement for Water Supply, or any amendments or successor agreements thereto, during the preceding ten fiscal years and multiplying the quotient by the ratio that the assessed value of the secure and unsecured property situated within the cities of Cotati, Petaluma, Rohnert Park, Santa Rosa and Sonoma, the Forestville County Water District and the Valley of the Moon Water District bears to the assessed value of all secured and unsecured property within Sonoma County, provided, however, in no event shall the Russian River Projects Charge exceed $20.00 per acre-foot. Agency shall keep proper books, records and accounts in which complete and accurate entries shall be made of all Agency general fund monies transferred to the Agency's Russian River Projects Fund and all expenditures made from the fund for the purposes described in this paragraph. The Agency shall maintain separate account within the Russian River Projects Fund for monies contributed by District and North Marin Water District. Monies expended from the Russian River Projects Fund shall be deemed to have been expended from the District and North Marin Water District account in the proportion that the balance of that account bears to the total Russian River Projects Fund balance at the end of the fiscal year quarter preceding the expenditure.

Agency shall bill District each month for all of these charges, based on the quantity of water delivered to District pursuant to this Water Sale

Agreement during the preceding month. District shall pay the amount of each such billing within 30 days after receipt of the bill.

If in any fiscal year the sum of the total amount of water delivered under this Water Sale Agreement plus the total amount of water for which payments are made in lieu of delivery pursuant to Section 5 of this Water Sale Agreement is less than the total amount of water for which District has made firm water supply payments pursuant to subsections (a) and (b) of Section 8 of this Water Sale Agreement, District shall pay the following additional payments:

d. An additional lump sum payment which shall be determined by multiplying the Russian River Conservation Charge times the difference between the total acre-feet of water for which District has made firm water supply payments pursuant to subsections (a) and (b) Section 8 of this Water Sale Agreement and the sum of the total acre-feet of water delivered under this Water Sale Agreement during the prior fiscal year plus the total acre-feet of water for which payments have been made in lieu of delivery pursuant to Section 5 of this Water Sale Agreement during the prior fiscal year.

e. An additional lump sum payment which shall be determined by multiplying the Russian River Projects Charge times the difference between the total acre-feet of water for which District has made firm water supply payments pursuant subsection (a) and (b) of Section 8 of this Water Sale Agreement and the sum of the total acre-feet of water delivered under this Water Sale Agreement during the prior fiscal year plus the total acre-feet of water for which payments have been made in lieu of delivery pursuant to Section 5 of this Water Sale Agreement during the prior fiscal year.

Agency shall bill District for these additional lump sum payments within 30 days after the end of each fiscal year. District shall pay the amount of each such billing within 30 days after receipt of the bill.

Section 11. Payment.

Notwithstanding any dispute between Agency and District, District shall pay all bills made by Agency pursuant to this Water Sale Agreement when due and shall not withhold all or any part of any amount billed pending the final resolution of such dispute. In the event of a dispute, District may pay its bills under protest, and if necessary under the ultimate resolution of the dispute, Agency shall make an appropriate refund to District, including interest on the overpaid amount at the rate obtained by Agency as a result of investment of the disputed amount. If District does not pay any bill by the due date for such bill, then, in addition to the principal amount due, District also shall pay Agency interest on this principal amount due, calculated from the due date until the payment date at the legal rate per annum established pursuant to Section 685.010 of the Code of Civil Procedure.

Section 12. Acceleration of Construction of New Aqueduct Elements.

If the financing and construction by Agency of a new aqueduct from the Russian River to the Ely Pumping Plant, roughly paralleling portions of the existing Cotati Intertie and Petaluma Aqueduct, is authorized by an amendment to the Restructured Agreement for Water Supply or successor agreement, then Agency shall annually provide District with a copy of its long-range capital improvement program. District may from time to time make written requests to Agency, requesting Agency to construct one or more elements of this new aqueduct at dates earlier than the dates planned

by Agency. If Agency, after considering the availability of funds and other relevant matters, agrees to accelerate the construction of any element or elements of this new aqueduct, then District shall commit in writing to reimburse Agency for the interest revenue foregone, or interest paid by Agency, as the result of such accelerated construction. Upon receipt of such written commitment acceptable to Agency in form and substance, Agency shall construct such element or elements. Agency shall bill District annually at least 30 days in advance of each bill's due date pursuant to such commitment and District shall pay each bill by its due date.

Construction of the new aqueduct elements shall be financed by Agency. Title to all elements of this new aqueduct shall vest with Agency, which shall operate and maintain this new aqueduct as part of the Transmission System. Construction of this new aqueduct shall not change any of the delivery limits, availability provisions or other terms of this Water Sale Agreement.

Section 13. Construction of New Ely-To-Kastania Aqueduct.

If Agency initiates construction of a new aqueduct roughly paralleling the portion of the existing Petaluma Aqueduct that extends from the junction of that aqueduct and the Cotati Intertie to the Ely Pumping Plant, then District may make a written request to Agency, requesting Agency to construct at District's expense an aqueduct roughly paralleling the portion of the existing Petaluma Aqueduct that extends from the Ely Pumping Plant to Kastania Reservoir, with sufficient capacity to meet the maximum delivery limits specified in Section 2 of this Water Sale Agreement and the maximum delivery limit specified in the Offpeak Agreement, taking into account surplus capacity in that portion of the existing Petaluma Aqueduct.

Construction of this new Ely-To-Kastania aqueduct shall be financed by cash deposits and payments from District. Title to this new aqueduct shall vest with Agency, which shall operate and maintain this new aqueduct as part of the Transmission system. Construction of this new aqueduct shall not change any of the delivery limits, availability provisions or other terms of this Water Sale Agreement.

Upon receipt of such a written request from District, Agency shall prepare and deliver to District design plans and a schedule for the construction of this new aqueduct, and a schedule for payment by District to Agency of appropriate deposits and payments for such plans and construction. If District commits in writing to pay such deposits and payments to Agency according to this payment schedule, then Agency shall construct this new aqueduct, and shall bill District for such deposits and payments according to this payment schedule. Agency shall bill District at least 30 days in advance of each bill's due date and District shall pay each bill by its due date.

Section 14. Place of Use.

Water received by District pursuant to this Water Sale Agreement and the Offpeak Agreement shall only be used within the sphere of influence (as such term is defined in Section 56076 of the Government Code) of the District on [insert effective date].

Section 15. Water Conservation.

District and Agency will comply with all applicable state laws related to water conservation planning and implementation, including the Urban Water Management Planning Act, Water Code Sections 10610-10655 (as such act now exists or in the future may exist). Whenever District files any urban water management plan, or any amendment or change to such a plan, with the Department of Water Resources or any other state agency, District shall, upon request from Agency, at the same time submit a copy of the plan amendment or change to Agency. Whenever Agency files any urban water management plan, or any amendment or change to such a plan, with the Department of Water Resources or any other state agency, Agency shall, upon request from District, at the same time submit a copy of the plan, amendment or change to District.

Section 16. California Environmental Quality Act.

Pursuant to Section 15051(d) of the State CEQA Guidelines, District is designated as the lead agency under the California Environmental Quality Act for the execution of this Water Sale Agreement, and for any projects south of Kastania Reservoir that District may construct to implement this Water Sale Agreement. Agency is designated as the lead agency for any projects north of Kastania Reservoir that Agency may construct to implement this Water Sale Agreement.

Section 17. Future Agency Application to Increase Limit on Diversions and Rediversions in Permit 16596.

District acknowledges that the 75,000 acre foot per year limit on diversions and rediversions in term 5 of Permit 16596 does not allow

Agency to utilize the entire yield of the Warm Springs Dam Project, and that Agency intends to file in the future an application with the State Water Resources Control Board to increase this limit. District recognizes and agrees that it will be in the public interest for the State Board to grant any such application.

Section 18. Effective Date, Term and Termination.

This Water Sale Agreement shall be effective July 1, 2015 and shall remain in effect until June 30, 2025. Upon the request of District, Agency shall enter into renewal agreements for periods not to exceed the then-existing term of the Restructured Agreement for Water Supply or any renewals, amendments or replacement agreements to the Restructured Agreement for Water Supply upon the same terms and conditions contained in this Water Sale Agreement, except that the Agency may make reasonable adjustments to the charges under Section 10 of this Water Sale Agreement, and any such reasonable adjustments then shall be included in any renewal agreement. If the Restructured Agreement for Water Supply has been terminated or has expired without being renewed, amended or replaced by another agreement pertaining to water supply, then upon the request of District, the Agency shall enter into renewal agreements for periods not to exceed forty (40) years upon the same terms and conditions contained in this Water Sale Agreement, except that the Agency may make reasonable adjustments to the charges under Section 10 of this Water Sale Agreement and any such reasonable adjustment then shall be included in any renewal agreement.

Section 19. Merger.

This writing is intended both as the final expression of the agreement between the parties hereto with respect to the included terms and conditions and as a complete and exclusive statement of the terms of the Water Sale Agreement. Pursuant to Code of Civil Procedure Section 1856, no modification of the Water Sale Agreement shall be effective unless and until such modification is evidenced by a writing signed by all parties.

Section 20. Equitable Remedies.

Because water is a scarce and precious resource, District will not have an adequate remedy at law, and thus may request a court of competent jurisdiction to order equitable remedies, to compel Agency to deliver the water that District is entitled to receive pursuant to this Water Sale Agreement. Such equitable remedies shall be District's sole and exclusive remedies in actions brought by District relating to the amounts of water that Agency must deliver to District pursuant to this Water Sale Agreement.

Section 21. Waiver and Indemnification.

District waives, releases and forever discharges Agency, its officers, agents and employees from any and all liabilities, claims, demands, losses and costs relating to any of the following: (1) any property damage or personal injury arising from any non-delivery of water requested by District pursuant to this Water Sale Agreement, or for any property damage or personal injury arising from the quality of water delivered pursuant to this Water Sale Agreement, if such property damage or personal injury is caused by lack of available capacity in the Transmission System, drought, earthquake or other Act of God, strike or other labor dispute, partial or total

dam, gate or tunnel loss, dam, gate or tunnel repairs, water pollution, or any factor beyond the control of Agency (whether or not such factor is listed in this sentence); and (2) any property damage or personal injury arising from any decision of Agency or the Water Contractors regarding:
(a) determinations of the availability of water for sale by Agency to District pursuant to this Water Sale Agreement; (b) allocation of Transmission System capacity; (c) proposed expansions of the Transmission System; or (d) repair (or non-repair) of the Potter Valley Project, Coyote Valley Dam or Warm Springs Dam. District's waiver, release and discharge described in this paragraph shall apply to any of the property damages or personal injuries described in this paragraph, whether or not such property damages or personal injuries were caused by Agency's negligence, unless such property damages or personal injuries resulted from Agency's sole negligence, willful misconduct or violation of law.

District shall indemnify, hold harmless, protect and defend Agency, its officers, agents and employees from and against any and all liabilities, claims, demands, damages, losses, disabilities or expenses (including attorney fees and litigation costs) of every nature arising out of, or in connection with: (1) the lack of quantity of water that has been delivered by Agency to District pursuant to this Water Sale Agreement; or (2) the control, conveyance and disposition of water that has been delivered by Agency to District pursuant to this Water Sale Agreement. For the purposes of this section, the point of delivery shall be as specified in Section 3 of this Water Sale Agreement. District shall provide such indemnification, holding harmless, protection and defense whether or not such liabilities, claims, demands, damages, losses, disabilities or expenses are based on Agency's negligence, unless such liabilities, claims,

demands, damages, losses, disabilities or expenses are based on Agency's sole negligence, willful misconduct or violation of law.

This section shall not apply to any construction activities, or construction contracts, relating to the construction described in Section 13 of this Water Sale Agreement. The provisions in this section regarding attorney fees shall not apply to any other section of this Water Sale Agreement.

Section 22. Water Quality.

Water delivered by Agency to District pursuant to this Water Sale Agreement shall be of the same general quality as water delivered by Agency from the Transmission System to the Water Contractors. Except as expressly stated in the preceding sentence, Agency does not make any express or implied warranty regarding the quality of the water delivered pursuant to this Water Sale Agreement.

Section 23. No Effect on Offpeak Agreement.

Except as stated in Section 14 of this Water Sale Agreement, nothing in this Water Sale Agreement shall be construed as affecting or amending the Offpeak Agreement.

Section 24. Method and Place of Giving Notice and Making Payments.

All notices shall be in writing and notices and payments may be given by personal delivery or by mail. Notices and payments sent by mail shall be addressed as follows;

Agency: General Manager
Sonoma County Water Agency
404 Aviation Boulevard
Santa Rosa, CA 95403

District: General Manager
Marin Municipal Water District
220 Nellen Avenue
Corte Madera, CA 94925

When so addressed, a notice shall be deemed given upon deposit in the United States Mail, postage prepaid. In all other instances, notices and payments shall be deemed given at the time of actual delivery. Changes may be made in the names and addresses of the person to who notices and payments are to be given by giving notice pursuant to this section.

Section 25. Demand for Assurance.

When reasonable grounds for insecurity arise with respect to the performance of either party, the other party may, in writing, demand adequate assurance of due performance and, until it receives such assurance, may, if commercially reasonable, suspend any performance for which the agreed return performance has not been received. "Commercially reasonable" includes not only the conduct of either party with respect to performance under this Water Sale Agreement, but also conduct with respect to other agreements with the other party to this Water Sale Agreement or others. After receipt of a justified demand, the failure to provide within a reasonable time, but not exceeding 30 days, such assurance of due performance as is adequate under the circumstances of the particular case is a repudiation of this Water Sale Agreement. Acceptance of any improper delivery, service, or payment does not

prejudice the aggrieved party's right to demand adequate assurance of future performance.

Section 26. Third Party Beneficiaries.

No third party beneficiaries are intended or established by this Water Sale Agreement.

Section 27. Representation by Counsel.

Agency and District each was represented by independent counsel in the negotiation and execution of this Water Sale Agreement. For the purposes of interpretation of this Water Sale Agreement, neither party shall be deemed to have been the drafter of this Water Sale Agreement.

ATTEST:

Board Secretary

MARIN MUNICIPAL WATER DISTRICT

By: John C. Gibson

John C. Gibson, President
Board of Directors

Reviewed as to Substance
Marin Municipal Water District

Krishna Kumar
General Manager

Reviewed As To Form:

Mary R. Casey
General Counsel

ATTEST:

Deputy Clerk of the
Board of Directors

SONOMA COUNTY WATER AGENCY

By: _____
Chair, Board of Directors

DATE: 6/16/15

Reviewed As To Substance By
Sonoma County Water Agency:

Grant Davis, General Manager

Reviewed As To Form:

Steven S. Shupe
Deputy County Counsel

SONOMA
COUNTY
WATER
AGENCY

CF/60-62-21.5 MARIN MUNICIPAL WATER DISTRICT (NON-PRIME WATER SERVICE AGREE) TW NO (ID 1576)

June 23, 2015

Marin Municipal Water District
Attn: Krishna Kumar, General Manager
220 Nellen Avenue
Corte Madera, CA 94925-1169

Dear Mr. Kumar:

RE: RENEWAL OF WATER SUPPLY AGREEMENTS

On June 16, 2015, the Sonoma County Water Agency Board of Directors approved the water supply agreements that are part of the *Renewal of the Third Offpeak Water Supply Agreement and the Amended Agreement for the Sale of Water between the Sonoma County Water Agency and Marin Municipal Water District.* The agreements are effective July 1, 2015 and shall remain in effect until June 30, 2025. Your copy of the executed agreements is enclosed.

If you have any questions, please contact me at (707) 524-1173.

Sincerely,

Todd J. Schram, P.E.
Senior Water Agency Engineer

Encl

c: G. Davis, P. Jeane, J. Jasperse, D. Seymour —Sonoma County Water Agency
C. O'Donnell, S. Shupe—Sonoma County Counsel
Alan Lilly—Bartkiewicz, Kronick & Shanahan

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Appendix C

2020 Urban Water Management Plan Water Demand Analysis and Water Conservation Measures Update, Marin Municipal Water District

2020 Water Demand Analysis and Water Conservation Measure Update

Marin Municipal Water District

December 2020
(EKI C00004.00)

Prepared by:
EKI Environment & Water, Inc.
2001 Junipero Serra Boulevard, Suite 300
Daly City, California 94014
(650) 292-9100

2020 Water Demand Analysis and
Water Conservation Measure Update
Marin Municipal Water District

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Table of Contents

TABLES

2020 Water Demand Analysis and
Water Conservation Measure Update
Marin Municipal Water District

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ABBREVIATIONS AND ACRONYMS

AB	Assembly Bill
ABAG	Association of Bay Area Governments
AFY	acre-feet per year
Ag.	agricultural
AMI	advanced metering infrastructure
AWE	Alliance for Water Efficiency
CA	California
CEQA	California Environmental Quality Act
CII	commercial, industrial, and institutional
CWC	California Water Code
DMM	demand management measure
DOF	Department of Finance
DRA	drought risk assessment
DSS	Decision Support System
d.u.	dwelling unit
DWR	Department of Water Resources
GPCD	gallons per capita day
GPD	gallons per day
gpf	gallons per flush
HECW	High Efficiency Clothes Washer
HET	High Efficiency Toilet
Irr.	irrigation
MF	multi-family
MFR	multi-family residential
MMWD	Marin Municipal Water District
psi	pounds per square inch
QWEL	Qualified Water Efficient Landscaper
SB	Senate Bill
SFR	single family residential
SMSWP	Sonoma-Marin Saving Water Partnership
Sonoma Water	Sonoma County Water Agency
sq ft	square feet
SWRCB	State Water Resources Control Board
ULFT	ultra low flow toilet
UWMP	Urban Water Management Plan
WBIC	Weather Based Irrigation Controller
WSA	Water Supply Assessment
WSCP	Water Shortage Contingency Plan

1. INTRODUCTION

In preparation for development of their 2020 Urban Water Management Plan (UWMP) updates, nine members of the Sonoma-Marin Saving Water Partnership (SMSWP or Water Contractors) coordinated to conduct a joint update of their water demand projections and water conservation planning efforts (i.e., the *2020 Water Demand and Conservation Project*). The participating SMSWP members include: City of Cotati, City of Petaluma, City of Rohnert Park, City of Santa Rosa, City of Sonoma, Marin Municipal Water District, North Marin Water District, Town of Windsor, and Valley of the Moon Water District. These nine Water Contractors are shown on **Figure 1-1**.

The goals of the *2020 Water Demand and Conservation Project* were to apply a common methodology to conduct the following analysis for each Water Contractor:

- Evaluate and document recent historical water use characteristics and trends, including population and account growth;
- Estimate projected water demands for the years 2025 through 2045 to support both the 2020 UWMP update and coordination and planning efforts with Sonoma County Water Agency (Sonoma Water);
- Update the suite of common regional conservation measures that are being considered for implementation in the future;
- Review and document past participation in water conservation programs; and
- Estimate the potential water savings associated with future water conservation program implementation.

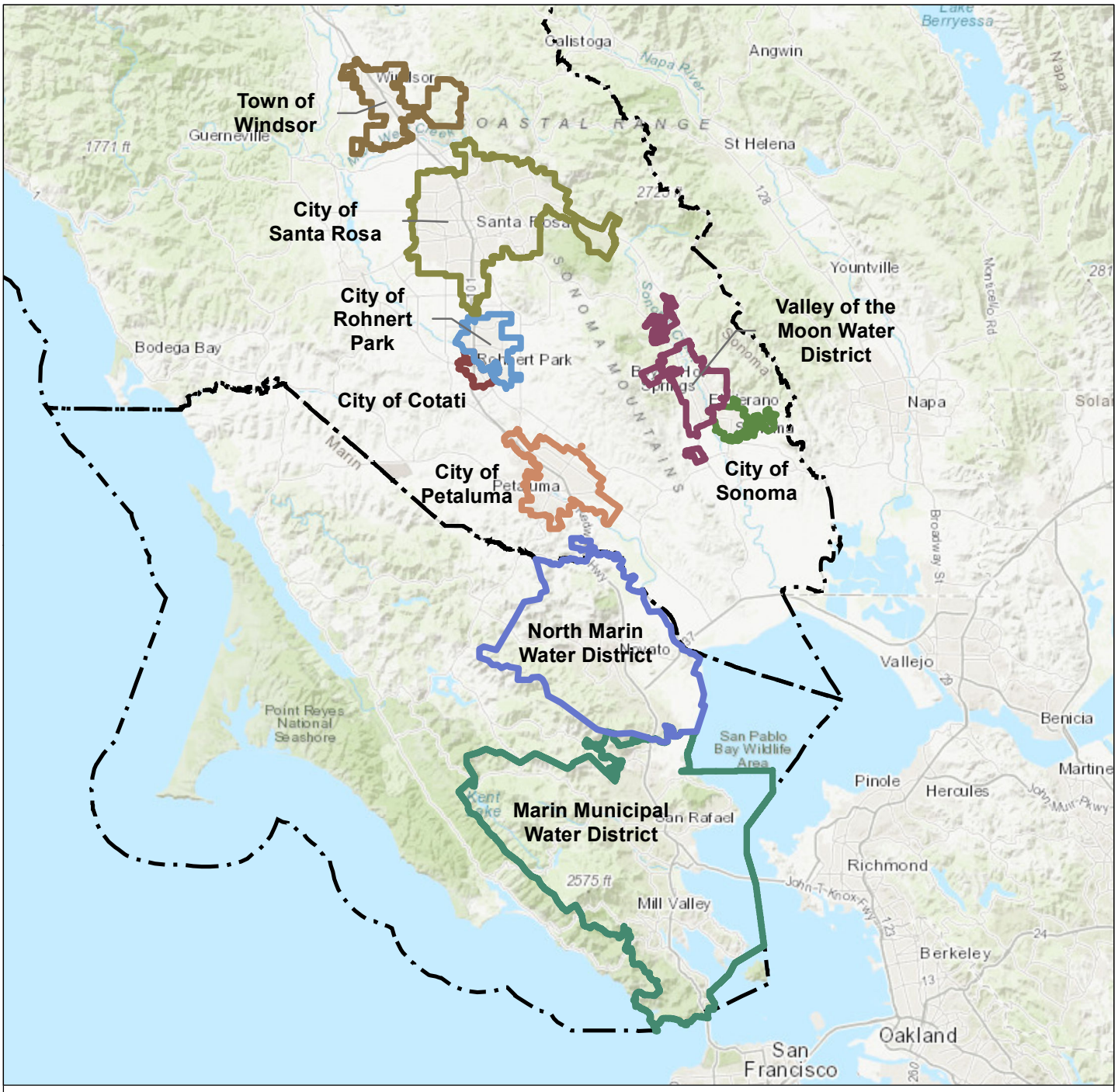
This 2020 Water Demand and Conservation report presents the results for the Marin Municipal Water District (District), which is located in Marin County and serves a population of approximately 192,138 people (**Figure 1-2**). The District's water supplies include surface water purchased from the Sonoma County Water Agency (Sonoma Water), surface water collected from the Mt. Tamalpais watershed, and recycled water produced by the Las Gallinas Sanitary District. Potable water is supplied to District customers, and recycled water is provided to a variety of uses in the Terra Linda area of San Rafael including for irrigation, cooling towers, car washes and toilet flushing. Over the years, the District has worked to increase water efficiency (conservation) in response to both the SB X7-7 UWMP requirements and as part of the regional SMSWP. Demand reductions have been achieved through the implementation of the plumbing code and water conservation programs, including some administered by the District and some administered through the regional SMSWP.

This 2020 Water Demand and Conservation report is organized as follows:

- **Section 1** identifies the goals and objectives of this report;
- **Section 2** provides the regulatory context for the demand projections described in this report as well as new requirements related to UWMPs and long-term demand planning that agencies will need to consider in development of their 2020 UWMPs;
- **Section 3** describes historical water use patterns and characteristics within the District;

- **Section 4** describes the projected water demands through 2045, including the assumptions and methodology used;
- **Section 5** documents past participation in conservation programs and estimated savings associated with program implementation, and presents the results of a detailed analysis of program participation trends for five select conservation programs;
- **Section 6** documents the water conservation measure screening process, identifies individual programs and program scenarios for potential future implementation by the District, and presents the results of a benefit-cost analysis and an estimate of the potential water savings associated with these conservation programs;
- **Section 7** provides conclusions regarding the main findings of the report; and
- **Section 8** provides key references and sources.

Small tables are provided within text throughout the document. Figures and large tables and charts are provided at the end of each section.



Legend

- County Boundary
- City of Cotati
- City of Petaluma
- City of Rohnert Park
- City of Santa Rosa
- City of Sonoma
- Marin Municipal Water District
- North Marin Water District
- Town of Windsor
- Valley of the Moon Water District

Notes

1. All locations are approximate.

Sources

1. Service area boundary provided by respective agencies.
2. Basemap provided by ESRI.

N

0 8 16

Miles

Participating Sonoma-Marin Saving Water Partnership Members

Marin Municipal Water District
December 2020
C00004.00

Figure 1-1

eki environment & water

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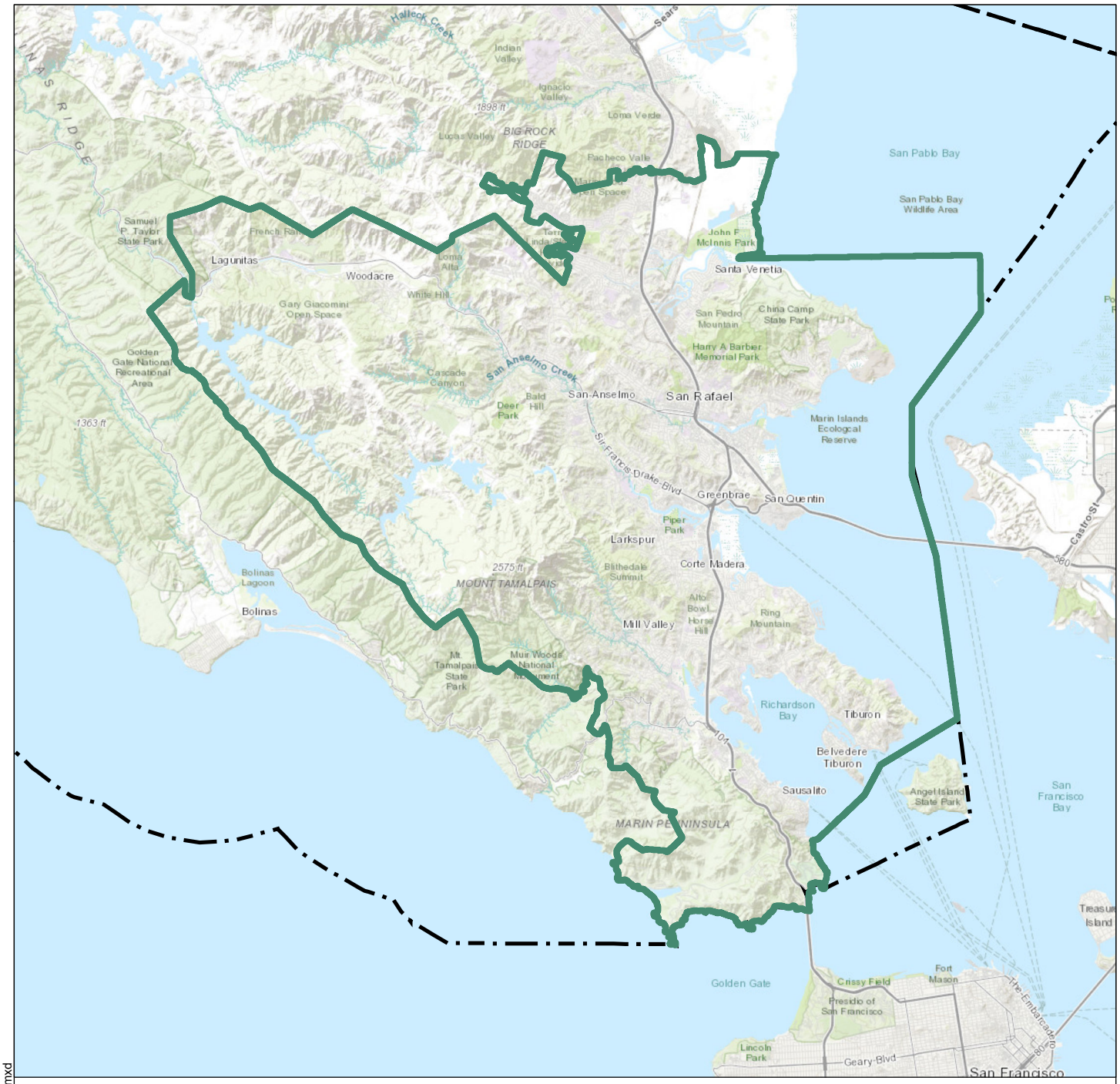

Legend

- County Boundary
- Marin Municipal Water District

N

0 3 6

Miles

Marin Municipal Water District Service Area

Notes

1. All locations are approximate.

Sources

1. Service area boundary provided by Marin Municipal Water District.
2. Basemap provided by ESRI.

eki environment & water

Marin Municipal Water District
December 2020
C00004.00

Figure 1-2

Path: X:\C00004_SonomaMarin\Map\2020\12\AgencyBoundaryMaps_20201204.mxd

2. REGULATORY CONTEXT

This section provides the regulatory background for the requirements to project future demand in the 2020 UWMP. In addition, it outlines requirements for elements of the District's 2020 UWMP that are beyond the scope of the *2020 Water Demand and Conservation Project,* such as consideration of supply reliability, water shortage contingency planning, and the annual urban water use objectives retailers will be required to report on in 2023 and meet by 2027.

2.1. 2020 UWMP Demand Projections Requirements

California Water Code (CWC) § 10631, excerpted below, describes the requirements to develop water demand projections that consider water use by customer sector, incorporate distribution system water loss, and account for anticipated water savings. As described further in Section 4, water demand projections were developed for the District using a land-use based approach that is consistent with these requirements and previous UWMP demand projection methodologies, and can be incorporated into the District's 2020 UWMP.

CWC § 10631

A plan shall be adopted in accordance with this chapter that shall do all of the following:

…

(d) (1) For an urban retail water supplier, quantify, to the extent records are available, past and current water use, over the same five-year increments described in subdivision (a), and projected water use, based upon information developed pursuant to subdivision (a), identifying the uses among water use sectors, including, but not necessarily limited to, all of the following:

(A) Single-family residential.

(B) Multifamily.

(C) Commercial.

(D) Industrial.

(E) Institutional and governmental.

(F) Landscape.

(G) Sales to other agencies.

(H) Saline water intrusion barriers, groundwater recharge, or conjunctive use, or any combination thereof.

(I) Agricultural.

(J) Distribution system water loss.

(2) The water use projections shall be in the same five-year increments described in subdivision (a).

…

(d)(4) (A) Water use projections, where available, shall display and account for the water savings estimated to result from adopted codes, standards, ordinances, or transportation and land use plans identified by the urban water supplier, as applicable to the service area.

(B) To the extent that an urban water supplier reports the information described in subparagraph (A), an urban water supplier shall do both of the following:

(i) Provide citations of the various codes, standards, ordinances, or transportation and land use plans utilized in making the projections.
(ii) Indicate the extent that the water use projections consider savings from codes, standards, ordinances, or transportation and land use plans. Water use projections that do not account for these water savings shall be noted of that fact.

2.2. New Requirements for 2020 UWMPs and Future Demand Planning

Through the recent *Making Water Conservation a California Way of Life* (Assembly Bill [AB]-1668/Senate Bill [SB]-606) and other legislation, the State has made numerous changes to the requirements for UWMPs and related water conservation planning efforts. In many cases, the updated regulations reference details and methodologies to be developed by the California Department of Water Resources (DWR), and/or are somewhat vague and will benefit from the development of guidelines/further clarification by DWR. DWR is currently developing an updated guidebook to support the development of the 2020 UWMPs, which is expected to be complete by late 2020. This new guidebook is anticipated to provide direction to retailers with respect to many elements of the new legislation.

A summary of key changes to various elements of 2020 UWMP and related planning efforts is provided below. Copies of the revisions to relevant sections of the California Water Code per AB-1668, SB-606, and SB-664 are provided in **Appendix A.**

2.2.1. Annual Urban Water Use Objectives

Beginning in 2023,[1] retailers will be required to report on "annual water use objectives" by November 1 of each year, per CWC § 10609. The specific standards that will be used to determine an retailer's annual urban water use objectives are currently under development and are the source of a great deal of uncertainty with respect to the long-term water conservation and demand planning as part of the 2020 UWMP. Although the 2020 UWMP will not identify or calculate these new annual urban water use objectives, the new standards will become effective within the UWMP planning horizon. Per CWC § 10609.25, retailers will be required to "provide a narrative that describes the water demand management measures that the supplier plans to implement to achieve its urban water use objective by January 1, 2027." Details regarding the annual urban water use objectives and other requirements are expected to evolve significantly over the next two years.

- **Residential outdoor water use:** Per CWC § 10609.6, DWR and California State Water Resources Control Board (SWRCB) "shall conduct necessary studies and investigations and recommend, no later than October 1, 2021, standards for outdoor residential use" which "incorporate the principles of the model water efficient landscape" and "apply to irrigable lands." DWR is currently working with a contractor to measure all of the single- and multi-family landscape (irrigable) area within urban water suppliers' service areas across the state based on aerial imagery. The result of these measurements will become the basis for each retailer's residential landscape water use component of the annual water use objectives. In order to accurately calculate and compare

[1] DWR acknowledged publicly on 5 December 2019 that this and other related deadlines are likely to slip. DWR indicated that compliance with these objectives will most likely begin in 2024.

against this metric, retailers will be responsible for identifying dedicated irrigation accounts (water connections) associated with residential water use (including multi-family residential) and dedicated irrigation accounts associated with commercial, industrial and irrigation (CII) use. The landscape area measurement process is being developed through a stakeholder workgroup process with periodic public meetings.

- **Residential indoor water use:** Per CWC § 10609.4.(a), "(1) Until January 1, 2025, the standard for indoor residential water use shall be 55 gallons per capita daily. (2) Beginning January 1, 2025, and until January 1, 2030, the standard for indoor residential water use shall be the greater of 52.5 gallons per capita daily or a standard recommended pursuant to subdivision (b). (3) Beginning January 1, 2030, the standard for indoor residential water use shall be the greater of 50 gallons per capita daily or a standard recommended pursuant to subdivision (b)." While the legislation appears to be clear on the method to calculate the indoor residential water use component, the SWRCB has begun the California Environmental Quality Act (CEQA) process for the new water use objective requirements and has expressed concern that using the 55 gallons per capita per day (GPCD) number in the legislation will constitute "backsliding" and thus will need to be ratcheted down.

- **Water loss:** Per CWC § 10608.34.(i), "No earlier than January 1, 2019, and no later than July 1, 2020, the board shall adopt rules requiring urban retail water suppliers to meet performance standards for the volume of water losses. In adopting these rules, the board shall employ full life-cycle cost accounting to evaluate the costs of meeting the performance standards. The board may consider establishing a minimum allowable water loss threshold that, if reached and maintained by an urban water supplier, would exempt the urban water supplier from further water loss reduction requirements." The SWRCB is developing a complicated cost-benefit analysis methodology that would need to be conducted by retailers in order to determine what water loss controls are deemed cost-effective and thus required to be implemented. Water retailers and the California Municipal Utilities Association are advocating for an alternative methodology. The implementation of these requirements has been delayed beyond the 1 July 2020 deadline.

- **CII:** Rather than developing a water volume-based standard for the CII sector, DWR was tasked with developing a set of performance standards through a workgroup process to increase water efficiency, per CWC § 10609.10, with adoption of these performance measures by 30 June 2022. Based on this process, DWR has determined that it is impossible to set such standards today, but retailers will be required to report on progress towards key actions related to potential future standards, such as conversion of mixed CII meters to dedicated irrigation meters, performance of water audits for CII accounts, development of water management plans for CII accounts, detailed classification of CII accounts by industry, etc. The specific actions that retailers will be required to report are not yet known.

- **Recycled Water Use:** In previous UWMPs, calculations of SB X7-7 baselines, targets, and gross water use for compliance were based only on potable water use, and thus the use of recycled water to offset potable water use was an effective method to help retailers conserve potable water and meet their SB X7-7 targets. However, under CWC § 10609.(b)(2)(F), the benefit of recycled water for compliance with annual water use objectives is much more limited: "Provides a bonus incentive for the amount of potable recycled water used the previous year when comparing the previous year's water use with the urban water use objective, of up to 10 percent of the urban water use objective." Thus, adoption and expansion of recycled water use only provides a compliance benefit if it constitutes direct potable reuse, indirect potable reuse, or reservoir

augmentation (CWC § 10608.12.(o)).

2.2.2. Supply Reliability

- Retailers will be required to develop procedures to conduct annual water supply and demand assessments to determine its water supply reliability for the current year and one dry year and to conduct these assessments annually beginning in 2022 (CWC § 10632(a)(2)). These procedures are required to include the following (emphasis added):

  (A) The **written decision making process** that an urban water supplier will use each year to determine its water supply reliability.
  (B) The key data inputs and assessment methodology used to evaluate the urban water supplier's water supply reliability for the current year and one dry year, including all of the following:

  (i) Current year unconstrained demand, **considering weather, growth, and other influencing factors,** such as policies to manage current supplies to meet demand objectives in future years, as applicable.

  (ii) Current year available supply, considering **hydrological and regulatory conditions in the current year and one dry year.** The annual supply and demand assessment may consider more than one dry year solely at the discretion of the urban water supplier.

  (iii) Existing infrastructure capabilities and plausible constraints.

  (iv) **A defined set of locally applicable evaluation criteria** that are consistently relied upon for each annual water supply and demand assessment.

  (v) A description and **quantification of each source** of water supply.

- In addition, the requirement to analyze supply reliability for a period of multiple consecutive drought years has been extended from a 3-year period to a 5-year period, per CWC §10631(f) and §10635(a). Specifically, retailers are now required to "compare the total water supply sources available to the water supplier with the long-term total projected water use over the next 20 years, in five-year increments, for a normal water year, a single dry water year, and a drought lasting five consecutive water years."

2.2.3. Water Shortage Contingency Plans

The new regulations also add new requirements related to drought planning and Water Shortage Contingency Plans (WSCPs):

- Retailers will now be required to conduct a drought risk assessment (DRA) as part of their UWMPs to assess water supply reliability (or vulnerability) for a period of drought lasting **five consecutive water years** (defined by CWC § 10612 as "the driest five-year historical sequence for the agency's water supply"),[2] starting from the year following that of the UWMP, and to compare water supplies (assessing each source of supply separately) with total projected water use (CWC § 10635(b))

[2] While the corresponding Water Supply Assessment (WSA) regulations have not been updated to require analysis of a five-year period, retailers should consider including a five-year drought period in their supply reliability assessment in any new WSAs.

during that period. The DRA five-year period for this 2020 UWMP is 2021-2025. During the 10 March 2020 workshop, DWR indicated that retailers will be expected to identify supply and demand on a monthly basis for this purpose, although it is noted that this does not appear to be an explicit requirement of the regulations.

- Per CWC § 10632.5 retailers' WSCPs "shall include 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" and a water supplier may submit "a copy of the most recent adopted local hazard mitigation plan or multihazard mitigation plan under the federal Disaster Mitigation Act of 2000 (Public Law 106-390) if the local hazard mitigation plan or multihazard mitigation plan addresses seismic risk."
- WSCPs will be required to use "Six standard water shortage levels corresponding to progressive ranges of up to 10, 20, 30, 40, and 50 percent shortages and greater than 50 percent shortage," or to provide a "cross-reference relating its existing categories to the six standard water shortage levels."

3. WATER USE CHARACTERISTICS

This section describes historical water use by customers within the District, including changes in use observed during and after the historic 2014 - 2016 drought, changes in average per account water use over time, and estimates of indoor and outdoor water use, based on data provided by the District. This information is used to provide context and background to support the projections of future demands (Section 4) and estimates of potential conservation program benefits (Section 6).

3.1. Historical Total and Per Capita Water Use

Table 3-1 summarizes the District's historical water use, service area population, and per capita water use for the years 2010 through 2019 (Marin Municipal Water District, 2020). Water use is described both in terms of total water produced and average per capita water use. It should be noted that the per capita water use for purposes of comparing water use to SB X7-7 water conservation targets may be different, due to the prescriptive methodology DWR has established for determining an agencies compliance population and total water use[3]. SB X7-7 compliance will need to be separately addressed by the District's 2020 UWMP.

Total water use, including potable, raw, and recycled water,[4] ranged from 23,680 acre-feet per year (AFY) to 29,847 AFY over this period. Total per capita water use (i.e., including potable, raw, and recycled water use) ranged from 110 GPCD to 142 GPCD.

Both the total and per capita water use declined from 2013 through 2015, likely influenced by the historic drought conditions, mandatory state-wide restrictions in urban water use imposed by the SWRCB, and local drought response. Total and per capita water use has remained lower than pre-drought conditions, with an increase from 2016 through 2019, indicating a degree of rebound following the drought.

Historical water use by customer sector is provided in **Table 3-2**. The single family residential (SFR) sector comprises the largest proportion of the District's total water use (i.e., 53% in 2019). By comparison, in 2019, multi-family residential (MFR) accounts comprised 12% of total water use; business/industrial accounts comprised 10% of total water use; the combined agricultural/irrigation, raw water, and recycled water accounts comprised 8.5% of total water use; and institutional accounts comprised 5.4% of total water use. In 2019, non-revenue water was estimated to be 11% of potable water demand.

3.2. Historical Average Water Use Per Account

The total number of accounts varies over time due to growth and development within the District and shifts in land use.

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[3] In previous years, DWR has preferred that the DWR population tool be used for purposes of estimating service area population for purposes of SB X7-7 compliance, so that a uniform method is applied across retailers. The updated 2020 DWR population tool has not yet been released. The population reported by this tool may therefore be somewhat different than the population estimates used herein.

[4] Water use data is per District-provided billing data. The recycled water system is supplemented with potable water to meet demands, as necessary. Recycled water use discussed herein reflects all water served through the recycled water system.

The total number of accounts by customer sector for the 2010 to 2019 period is shown in **Table 3-3**, including a pie chart illustrating the relative proportion of accounts (Marin Municipal Water District, 2020). The SFR sector comprised the highest proportion of accounts in 2019 (85%), followed by the MFR sector (6.3%), business/industrial sector (5.3%), agricultural/irrigation sector (1.4%), recycled water sector (0.49%), and institutional sector (0.38%). From 2010 to 2019, most sectors experienced between 0.5% and 0.9% total growth. However, business/industrial accounts decreased by 0.61% over the same time period, while agricultural/irrigation accounts increased by 2.4%.

Average water use per account is presented in **Table 3-4a**. For most sectors, per account water usage has followed the same general trends over time as total water use in the District (per **Table 3-1**).

Table 3-4b presents average water use for the residential sectors normalized by number of dwelling units. SFR accounts, on average, use approximately 100% to 130% more water per dwelling unit than MFR accounts. It should be noted that many larger MFR developments have dedicated irrigation meters.

3.3. Change in Residential Water Use Pre- and Post-Drought

Over time, customer water use becomes more efficient due to participation in conservation programs, passive savings,[5] and other behavioral or cultural changes. The more efficient customers become, the less opportunity there is for customers to save more water, which is referred to as "demand hardening." The SFR sector comprises the largest proportion of the District's total water use (approximately 53% in 2019). Therefore, in order to observe demand hardening over time, histograms illustrating the distribution of water use by SFR customers for three separate years (2010, 2013, and 2019) are shown in **Figure 3-1.**

The median SFR account water use has shifted from 207 GPD to 227 GPD between 2010 and 2013, reflecting a 9.7% increase in median water use. Following the drought, water use was reduced to a median of 193 GPD in 2019, reflecting a 17% reduction from 2013 water use. In 2010, the middle 50% of accounts used 131 GPD to 307 GPD. In 2019, this range has slightly broadened, with the middle 50% of accounts using between 117 GPD and 301 GPD. Based on this (and taken with the **Table 3-5** results discussed below), it appears that customers are continuing to increase their efficiency, which is expected to be a combination of both passive and active savings, as well as effects of the drought. Water savings achieved during drought conditions are typically driven by behavioral changes, rather than device changeouts (AWE, 2015). Given the limited rebound observed since the drought (**Table 3-4a**), it may be that behavioral changes during the drought have resulted in permanent changes in customers' water use.

3.4. Residential Water Use by Dwelling Unit and Age of Construction

It is commonly assumed that new residential construction is inherently more water efficient than older construction due to changes in plumbing codes and the increased efficiency of water using devices available on the market today. However, in some areas it has been observed that newer construction can actually have higher rates of water use, which is an important consideration when evaluating future water

[5] Passive savings refers to the water savings associated with the natural replacement of older toilets, showerheads, clothes washers, and other water using appliances with newer high efficiency devices that are available due to both market shifts and increasing efficiency mandated by the building code, plumbing code, and other regulatory requirements.

demands associated with new development. In order to evaluate water use relative to the age of residential construction within the District, water use by SFR and MFR accounts is summarized in **Table 3-5** by units constructed: (1) prior to 1994, (2) from 1994 through 2009, and (3) 2010 and later.

Water use by SFR units constructed from 1994-2009 had on average 18% higher water use than units constructed 2010 and later and 43% higher water use than units constructed prior to 1994. Water use for buildings constructed 2010 and later had on average 22% higher water use than pre-1994 construction. Given this, as discussed in Section 4.3.1, a water demand factor representative of newer construction (1994 and later) is used as the basis for demand projections for new SFR accounts.

MFR units appear generally more consistent across construction age than SFR units. Newer construction (2010 and later) shows a larger range in water use across the time period but is likely driven by the relatively low number of accounts in that age group. Given this general consistency, the demand projections for new MFR accounts discussed in Section 4.3.1 are based on all MFR units regardless of construction age.

3.5. Estimated Indoor and Outdoor Water Use

When designing and estimating the benefits of potential water conservation programs, it is important to understand the relative proportion of water use that is used indoors versus outdoors.

As shown in the first chart in **Table 3-6**, potable water use within the District varies seasonally, and water use in the summer is two to three times greater than water use during the winter. This seasonality is typically driven by increased irrigation needs in the summer, as compared to the more limited irrigation water use during the wetter and cooler winter months. The second chart in **Table 3-6** shows the seasonality of recycled water use, which is used primarily for irrigation.[6] Based on the recycled water use patterns, irrigation rates appear to be nearly zero during winter months, confirming that it is reasonable and conservative to assume that minimal irrigation with potable water occurs during winter months. This is a high-level estimate of indoor and outdoor water use, which errs on the side of estimating higher indoor water use.

Given the water use patterns presented in **Table 3-6**, the minimum average daily water use during winter months (November – April due to bi-monthly billing data) was used to estimate the indoor water use for all non-irrigation customer sectors. The results of this estimate are shown in **Table 3-7**. Approximately 64% of all potable water use (excluding potable water served through the recycled water system) within the District is estimated to be indoor use, and 36% to be outdoor water use. For SFR users (i.e., the largest water using sector within the District), approximately 59% of water use is estimated to be indoor, and 41% outdoor water use. Total water use (including recycled and raw water) is approximately 61% indoor water use and 39% outdoor use.

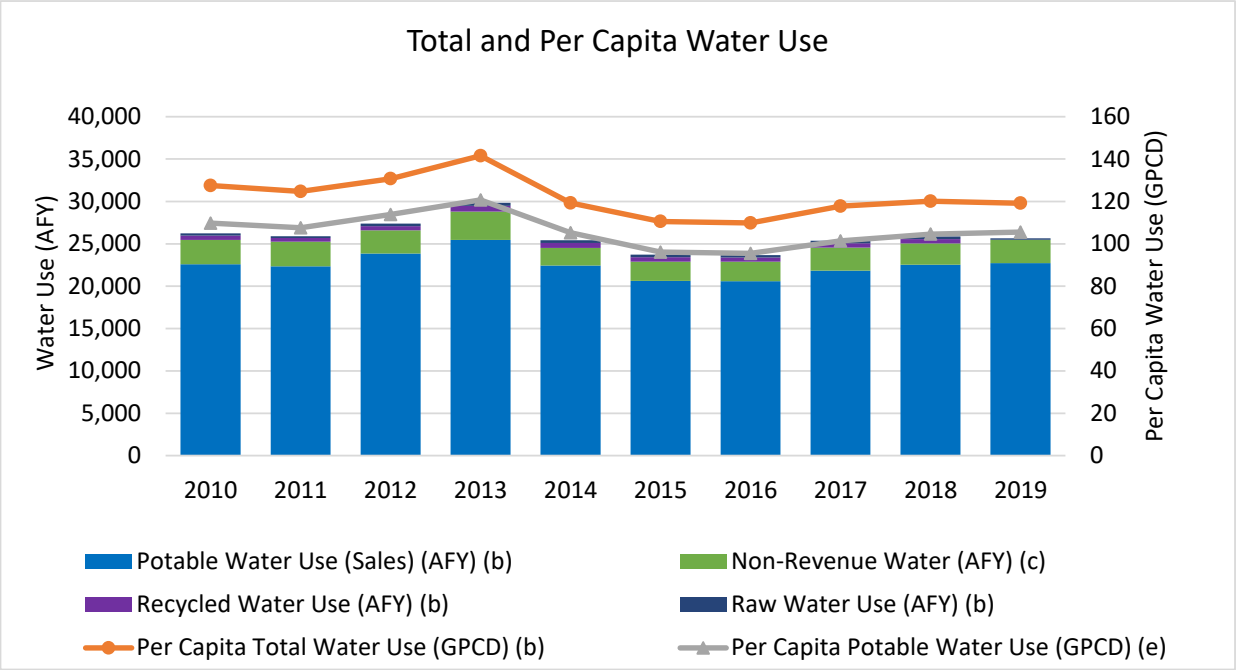
Aside from the "other," raw water, irrigation, and recycled water sectors (presumed 100% outdoor water use), the SFR sector is estimated to have the highest proportion of outdoor water use at 41%, followed by business/industrial at 17%, institutional at 17%, and MFR at 10%. It should be noted that landscape areas

[6] Recycled water is also used for toilet flushing, car washes, cooling towers, and commercial laundry facilities and averages about 100,000 gallons per day of demand during winter months.

for larger multi-family developments tend to have dedicated irrigation accounts. Further, some industries within the CII sector, such as restaurants and manufacturing, may also experience some degree of seasonality in indoor use, with increased business and production during summer months. Thus, these should be considered high-level estimates of indoor and outdoor use proportions.

Table 3-1
Water Use and Population
Marin Municipal Water District

Year (a)	Potable Water Use (Sales) (AFY) (b)	Recycled Water Use (AFY) (b)	Raw Water Use (AFY) (b)	Non-Revenue Water (AFY) (c)	Total Water Use (AFY)	Service Area Population (d)	Per Capita Potable Water Use (GPCD) (e)	Per Capita Total Water Use (GPCD) (e)
2010	22,597	514	258	2,872	26,241	183,716	110	128
2011	22,340	432	220	2,916	25,908	185,389	108	125
2012	23,864	507	301	2,728	27,400	187,089	114	131
2013	25,458	684	351	3,354	29,847	188,218	121	142
2014	22,435	579	323	2,088	25,425	190,267	105	119
2015	20,624	520	304	2,279	23,727	191,575	96	111
2016	20,584	491	301	2,304	23,680	192,402	96	110
2017	21,847	512	310	2,708	25,377	192,328	101	118
2018	22,533	522	309	2,511	25,875	192,277	105	120
2019	22,723	0	164	2,765	25,652	192,138	106	119



Abbreviations:
AFY = acre-feet per year
DOF = Department of Finance
GPCD = gallons per capita per day

Notes:
(a) Data are presented on a calendar year basis.
(b) Water use data based on customer sales, per Reference 2. The recycled water system is supplemented with potable water to meet demands, as necessary. Recycled water use shown here reflects all water served through the recycled water system.
(c) Estimated non-revenue water (potable) per Table 3-2.

Table 3-1
Water Use and Population
Marin Municipal Water District

(d) Population estimates are adjusted from DOF county estimates using a conversion factor provided by the district, per Reference 3. 2016-2019 estimates were updated using 2020 DOF population estimates, per Reference 1.
(e) Per capita water use is calculated by dividing the annual water use by service area population and the number of days in a year.

References:

1. DOF, 2020. California Department of Finance - Demographic Research Unit, Population Estimates for Cities, Counties, and the State, 2011-2020, with 2010 Benchmark, Report E-4, released on 1 May 2020.
2. Marin Municipal Water District, 2020a. 2010-2019 Urban Water Management Plan Water Use Data, provided by Marin Municipal Water District on 9 July 2020.
3. Marin Municipal Water District, 2020b. MMWD Population 2019 Demand Analysis.xls, provided by Marin Municipal Water District on 9 April 2020.

Table 3-2
Water Use by Customer Sector
Marin Municipal Water District

Water Use Sector	Water Use (AFY) (a) (b)									
	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
Single Family Residential (c)	13,747	13,482	14,672	15,525	13,824	12,403	12,419	13,337	13,886	13,579
Multi-Family Residential (d)	3,185	3,244	3,329	3,367	3,128	2,984	2,946	3,004	3,065	3,063
Business/Industrial	2,716	2,651	2,788	2,867	2,655	2,577	2,583	2,628	2,671	2,634
Institutional	1,639	1,571	1,467	1,523	1,406	1,311	1,295	1,374	1,365	1,386
Agricultural/Irrigation	1,185	1,179	1,391	1,612	1,330	1,230	1,248	1,369	1,417	1,348
Other (e)	40	32	45	44	36	34	28	35	38	50
Raw Water	258	220	301	351	323	304	301	310	309	164
Recycled Water System (f)										
Potable Water	86	181	171	81	56	85	65	101	91	661
Recycled Water	514	432	507	684	579	520	491	512	522	0
Non-revenue Water (Potable) (g)	11%	11%	10%	11%	8.2%	9.6%	9.7%	11%	9.7%	11%
	2,872	2,916	2,728	3,354	2,088	2,279	2,304	2,708	2,511	2,765
Total Water Use	**26,241**	**25,908**	**27,400**	**29,409**	**25,425**	**23,727**	**23,680**	**25,377**	**25,875**	**25,652**
Total Potable Water Use	**25,469**	**25,256**	**26,592**	**28,374**	**24,523**	**22,903**	**22,888**	**24,555**	**25,044**	**25,488**

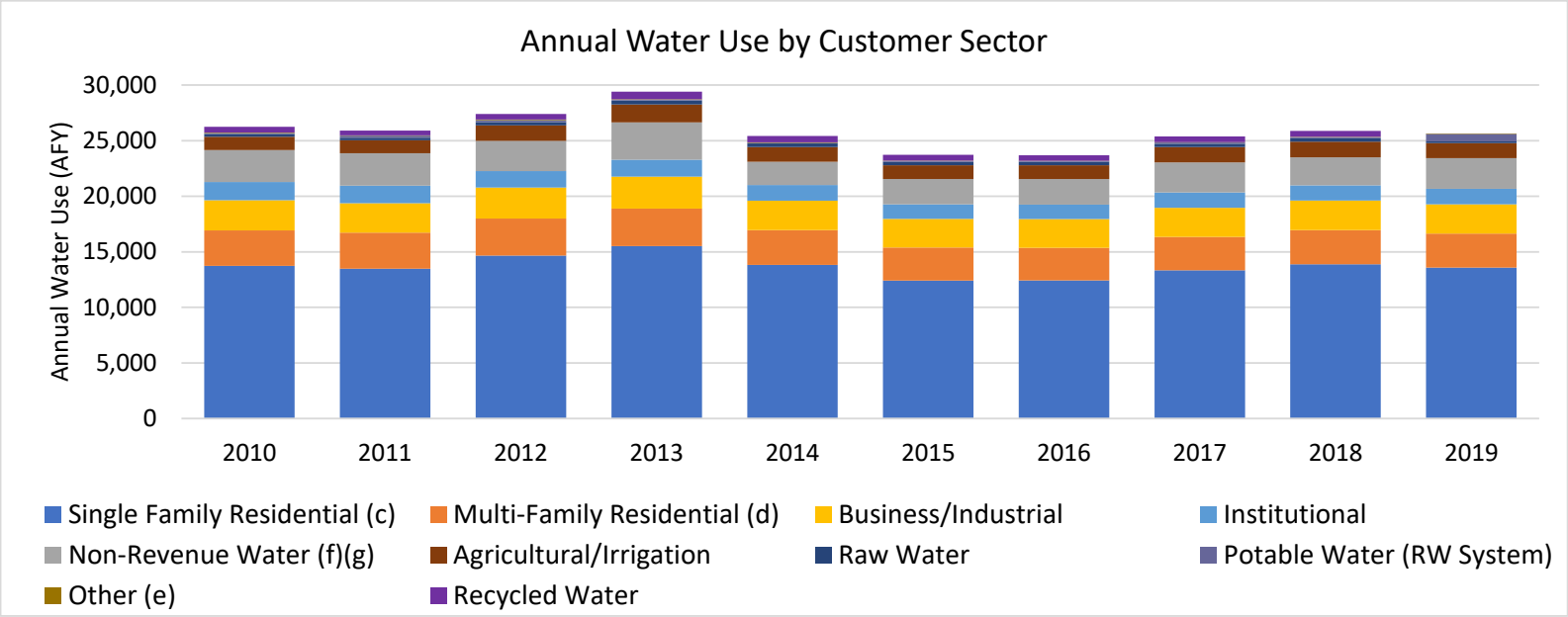


Table 3-2
Water Use by Customer Sector
Marin Municipal Water District

Abbreviations:
AFY = acre-feet per year

Notes:
(a) Data are presented on a calendar year basis.
(b) Water use by sector per Reference 1.
(c) Single-family residential water use includes dedicated single-family irrigation accounts.
(d) Multi-family residential includes duplexes and 3-10+ unit apartments.
(e) "Other" includes fireline and hydrant sectors.
(f) The recycled water system is supplemented with potable water to meet demands, as necessary. The recycled water plant was non-operational in 2019 to allow for infrastructure upgrades.
(g) Non-revenue water was calculated by subtracting total potable water use (including recycled water system makeup water) from total potable water production,

References:
1. Marin Municipal Water District, 2020a. 2010-2019 Urban Water Management Plan Water Use Data, provided by Marin Municipal Water District on 9 July 2020.
2. Marin Municipal Water District, 2020b. Production data provided by Marin Municipal Water District via email on 14 September 2020.

Table 3-3
Number of Accounts by Customer Sector
Marin Municipal Water District

Water Use Sector	Number of Accounts (a) (b)									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Single Family Residential (c)	51,241	51,242	51,286	51,327	51,421	51,474	51,511	51,518	51,558	51,593
Multi-Family Residential (d)	3,778	3,771	3,773	3,779	3,788	3,801	3,802	3,798	3,797	3,797
Business/Industrial	3,254	3,246	3,247	3,257	3,249	3,246	3,247	3,245	3,249	3,234
Institutional	225	225	226	227	227	230	228	227	228	227
Agricultural/Irrigation	838	833	825	842	857	850	845	852	853	858
Other (e)	479	472	456	447	466	442	460	491	495	490
Raw Water	2	2	2	2	2	2	2	2	2	1
Recycled Water	300	302	301	303	302	303	302	297	297	294
Total Accounts	**60,117**	**60,093**	**60,116**	**60,184**	**60,312**	**60,348**	**60,397**	**60,430**	**60,479**	**60,494**

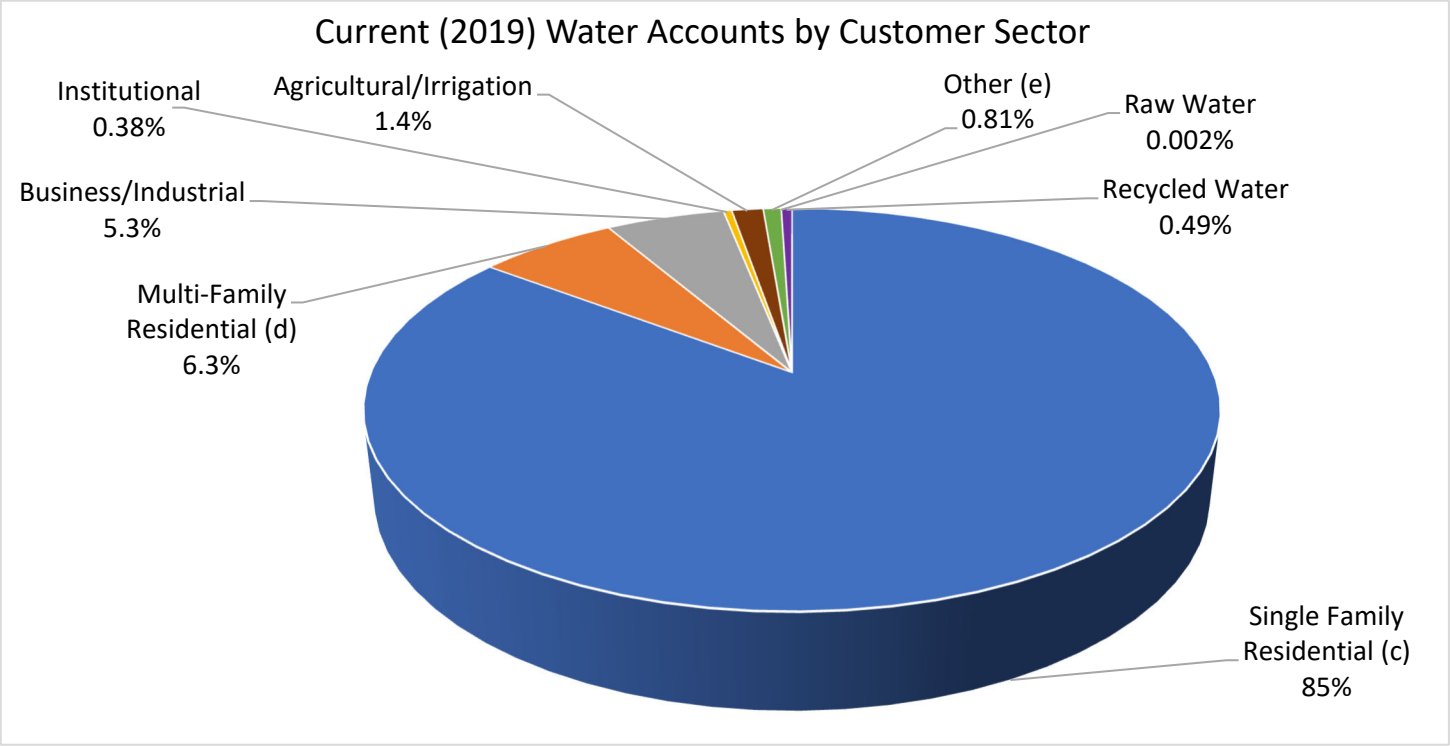


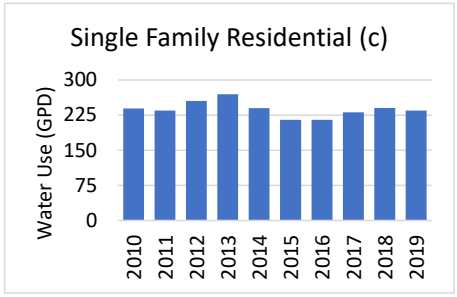
Table 3-3
Number of Accounts by Customer Sector
Marin Municipal Water District

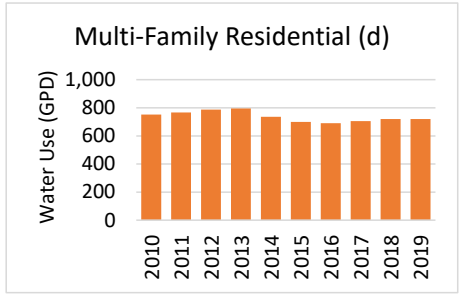
Notes:
(a) Data are presented on a calendar year basis.
(b) Number of accounts by sector per Reference 1. Number of accounts reflects active accounts for each year.
(c) Number of single-family residential accounts does not include dedicated single-family irrigation accounts.
(d) Multi-family residential includes duplexes and 3-10+ unit apartments.
(e) "Other" includes fireline and hydrant sectors.

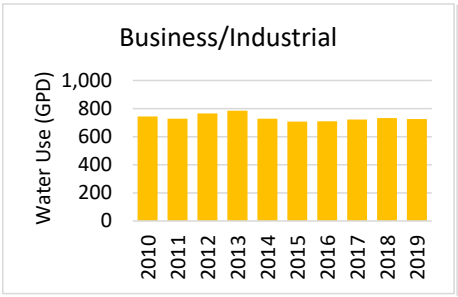
References:
1. Marin Municipal Water District, 2020. 2010-2019 Urban Water Management Plan Water Use Data, provided by Marin Municipal Water District on 9 July 2020.

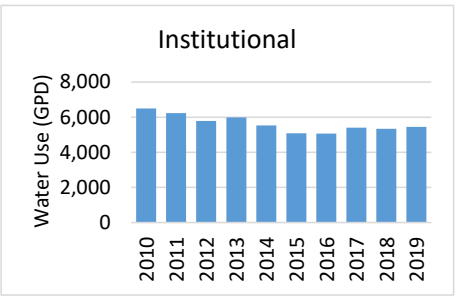
Table 3-4a
Per Account Water Use by Customer Sector
Marin Municipal Water District

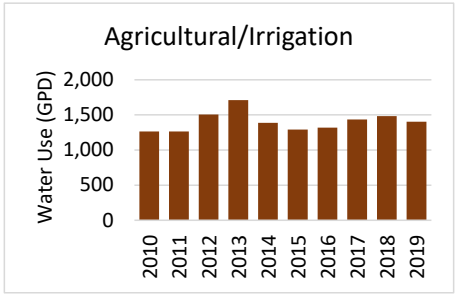
Water Use Sector	Water Use per Account (GPD) (a) (b)									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Single Family Residential (c)	239	235	255	270	240	215	215	231	240	235
Multi-Family Residential (d)	752	767	787	795	737	700	691	706	720	720
Business/Industrial	745	729	766	785	729	708	710	722	734	727
Institutional	6,500	6,228	5,789	5,985	5,527	5,085	5,067	5,399	5,341	5,449
Agricultural/Irrigation	1,261	1,263	1,504	1,708	1,385	1,291	1,317	1,433	1,482	1,402
Other (e)	75	61	89	88	68	69	55	63	68	92
Raw Water	115,184	98,107	134,286	156,569	144,270	135,628	134,245	138,449	137,692	146,440
Recycled Water System (f)	1,784	1,811	2,010	2,252	1,876	1,781	1,642	1,841	1,841	2,006

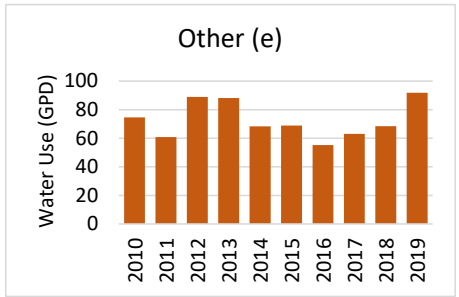


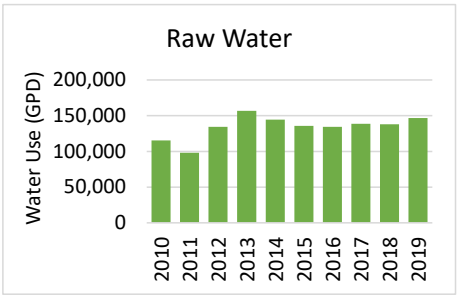


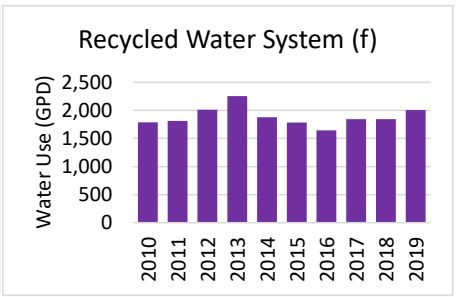










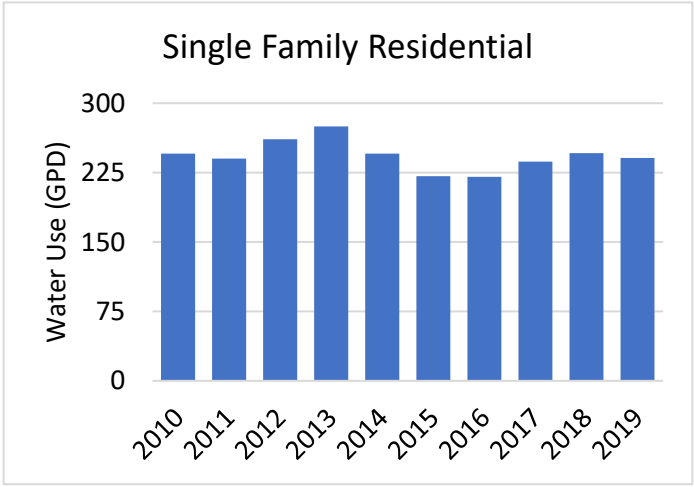


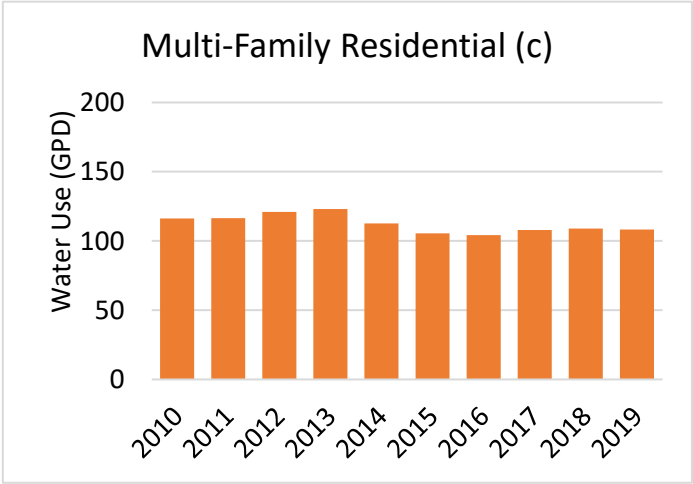
Abbreviations:
GPD = gallons per day

Notes:
(a) Data are presented on a calendar year basis.
(b) Water use and number of accounts by sector per Tables 3-2 and 3-3.
(c) Single-family residential use includes dedicated use by single-family irrigation accounts.
(d) Multi-family residential includes duplexes and 3-10+ unit apartments.
(e) "Other" includes fireline and hydrant sectors.
(f) The recycled water system is supplemented with potable water to meet demands, as necessary. Potable make-up water volume is shown in Table 3-2.

Table 3-4b
Per Dwelling Unit Water Use for Residential Sectors
Marin Municipal Water District

Water Use Sector	Water Use per Dwelling Unit (GPD/DU) (a) (b)									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Single Family Residential	246	240	261	275	245	221	220	237	246	241
Multi-Family Residential (c)	116	116	121	123	113	105	104	108	109	108



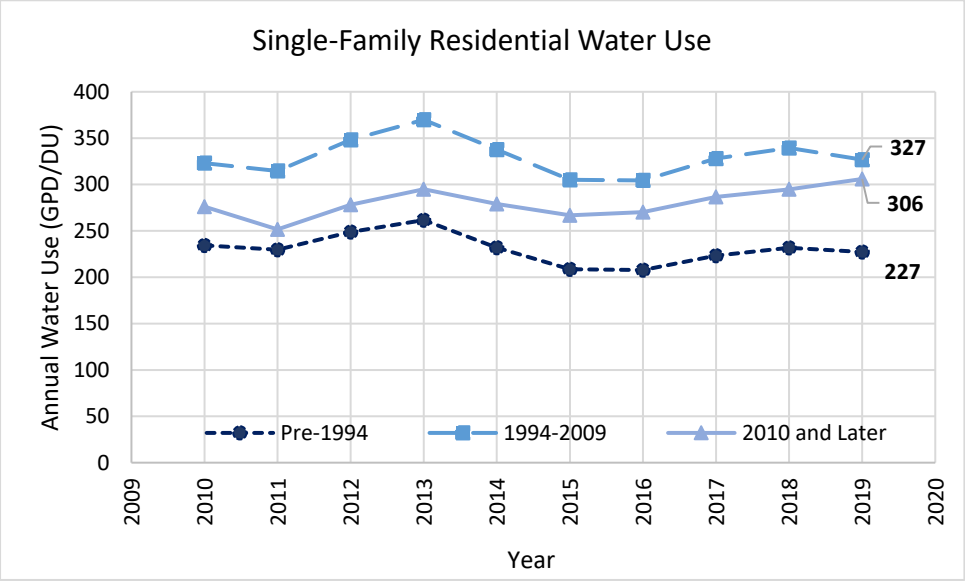


Abbreviations:
DU = dwelling unit
GPD = gallons per day

Notes:
(a) Data are presented on a calendar year basis.
(b) Per dwelling unit water use is calculated based on the number of residential dwelling units per account provided in customer billing data. Data included in this analysis is limited to accounts that received six bills in the specified year.
(c) Multi-family residential includes duplexes and 3-10+ unit apartments.

Table 3-5
Residential Water Use by Age of Construction
Marin Municipal Water District

Construction Age	Average Water Use (GPD per Dwelling Unit) (a) (b)										Number of Accounts, 2019
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
Single Family Residential											
Pre-1994	234	230	249	262	232	208	208	223	232	227	39,003
1994-2009	323	315	348	370	338	305	304	328	339	327	6,776
2010 and Later	276	252	278	295	279	267	270	287	295	306	732
Multi-Family Residential											
Pre-1994	116	117	121	123	112	105	104	107	109	109	2,466
1994-2009	111	110	120	121	115	114	104	121	111	114	209
2010 and Later	132	174	200	185	150	99	81	97	105	115	33



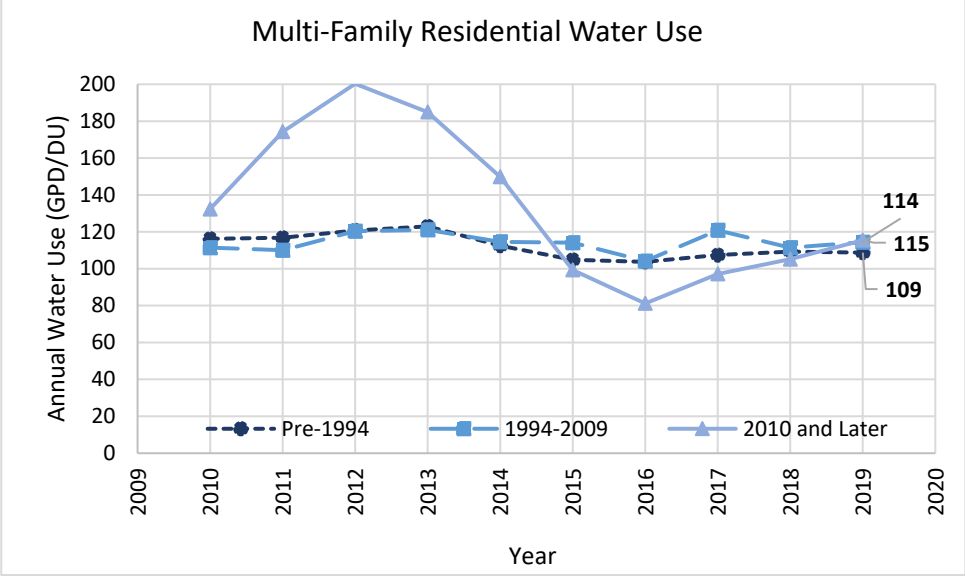


Table 3-5
Residential Water Use by Age of Construction
Marin Municipal Water District

Abbreviations:
-- = not available
DU = dwelling unit
GPD = gallons per day

Notes:
(a) Data are presented on a calendar year basis.
(b) Average water use per dwelling unit is shown for residential sectors based on billing data, per Reference 2. Accounts included in this analysis are limited to that for which construction year is available, based on Marin County Assessor data, and that received 6 bills in the specified year per Reference 1.

References:
1. Marin County, 2020. County Wide Parcel Data ConservationJan2020.gdb, provided by Marin Municipal Water District on 13 February 2020.
2. Marin Municipal Water District, 2020. 2010-2019 Urban Water Management Plan Water Use Data, provided by Marin Municipal Water District on 9 July 2020.

Table 3-6
Monthly Water Use
Marin Municipal Water District

Month	Monthly Water Use (AF) (a)									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Potable Water Use										
January	1,102	1,050	1,197	991	1,316	1,034	989	956	1,079	1,052
February	1,591	1,616	1,829	1,664	1,948	1,630	1,436	1,438	1,684	1,508
March	902	958	1,077	1,064	1,041	1,046	870	867	1,009	859
April	1,602	1,619	1,643	1,926	1,595	1,859	1,474	1,408	1,596	1,440
May	1,207	1,307	1,251	1,609	1,273	1,309	1,177	1,119	1,222	1,219
June	2,246	2,375	2,577	2,889	2,430	2,157	2,262	2,286	2,352	2,211
July	1,898	1,796	2,083	2,146	1,935	1,575	1,836	1,994	1,945	1,804
August	3,162	2,882	3,252	3,127	2,846	2,360	2,797	2,928	2,928	2,862
September	2,246	2,111	2,269	2,175	1,908	1,733	2,029	2,121	2,084	2,152
October	3,058	2,864	2,950	2,991	2,583	2,387	2,530	2,854	2,730	2,878
November	1,633	1,593	1,580	1,908	1,559	1,481	1,404	1,733	1,657	1,809
December	1,790	1,914	1,889	2,361	1,855	1,888	1,646	1,950	2,071	2,186
Recycled Water System Use (b)										
January	--	--	--	--	--	--	--	--	--	--
February	11	10	32	16	40	16	12	11	24	14
March	--	--	--	--	--	--	--	--	--	--
April	19	21	23	66	26	72	30	16	27	14
May	--	--	--	--	--	--	--	--	--	--
June	125	150	156	205	163	132	149	151	160	138
July	--	--	--	--	--	--	--	--	--	--
August	241	202	240	202	209	177	207	225	220	220
September	--	--	--	--	--	--	--	--	--	--
October	194	163	176	192	163	159	157	193	163	192
November	--	--	--	--	--	--	--	--	--	--
December	17	43	25	73	46	48	22	49	62	82

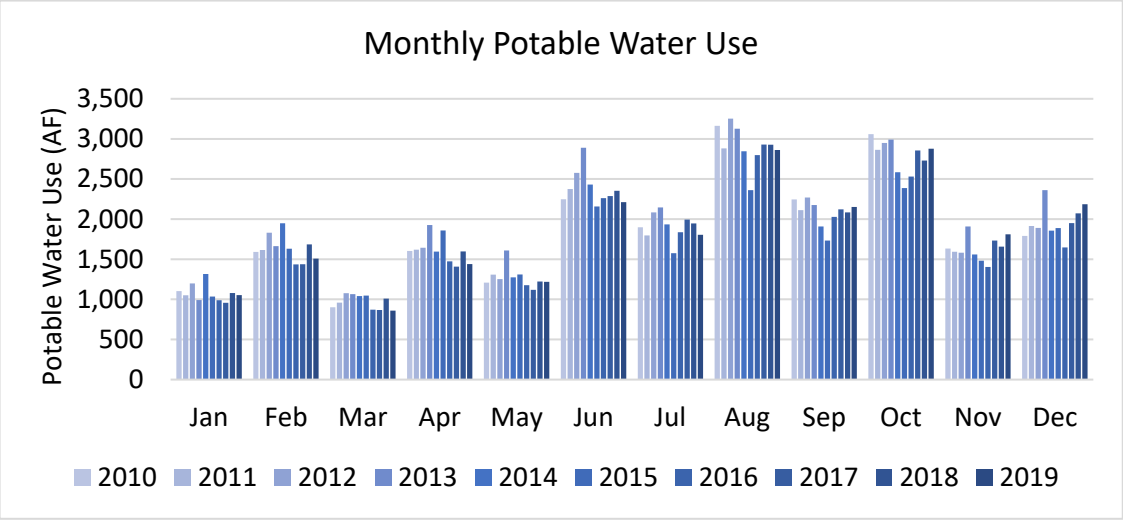
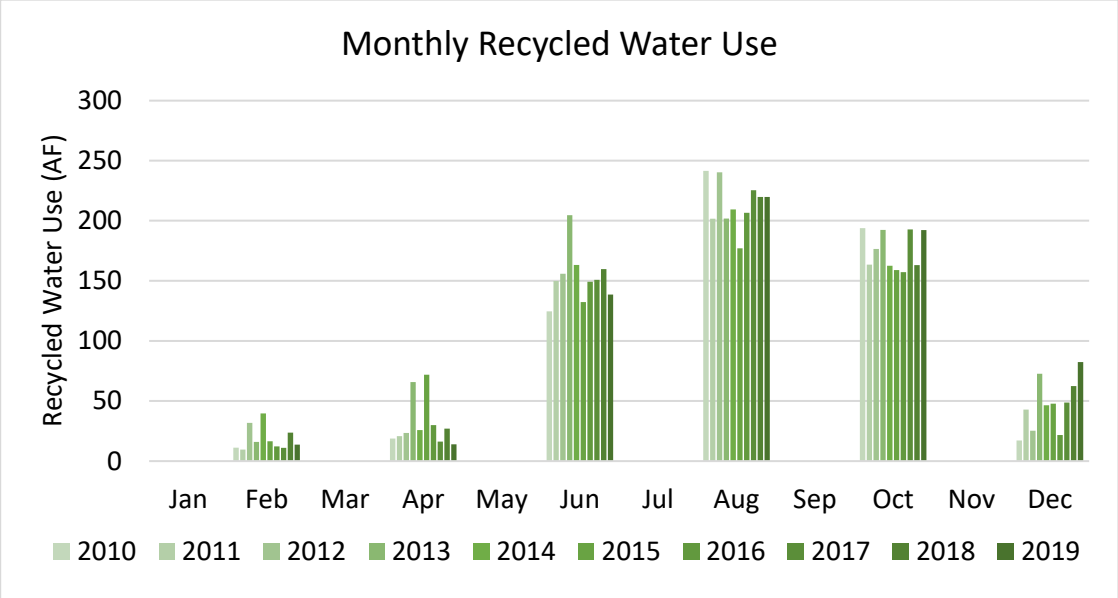


Table 3-6
Monthly Water Use
Marin Municipal Water District



Abbreviations:

-- = not available
AF = acre-feet
MMWD = Marin Municipal Water District

Notes:

(a) Monthly potable and recycled water use per Reference 1. Customers are billed on a bi-monthly basis, and data are presented based on billing cycle. Due to a limitation of the MMWD billing data system, monthly water use data shown is between approximately 0.3% and 0.4% less than the actual total water use shown in Table 3-2.

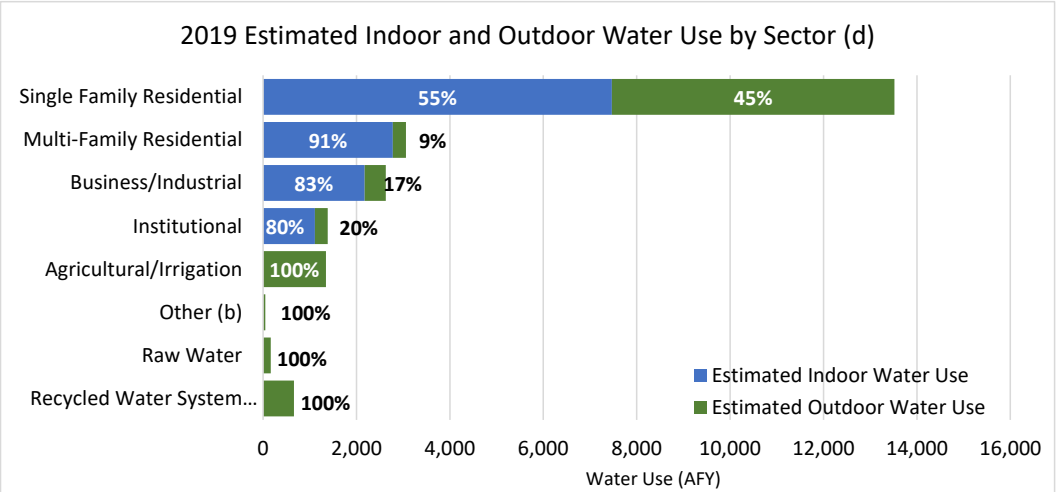
(b) The recycled water system is supplemented with potable water to meet demands, as necessary. Recycled water use shown here reflects all water served through the recycled water system. Potable make-up water volume is shown in Table 3-2.

References:

1. Marin Municipal Water District, 2020. 2010-2019 Urban Water Management Plan Water Use Data, provided by Marin Municipal Water District on 9 July 2020.

Table 3-7
Estimated Indoor and Outdoor Water Use
Marin Municipal Water District

Water Use Sector (a)	2017				2018				2019				Average Pct.	
	Indoor Water Use (AFY)	Outdoor Water Use (AFY)	Pct. Indoor	Pct. Outdoor	Indoor Water Use (AFY)	Outdoor Water Use (AFY)	Pct. Indoor	Pct. Outdoor	Indoor Water Use (AFY)	Outdoor Water Use (AFY)	Pct. Indoor	Pct. Outdoor	Indoor Use	Outdoor Use
Single Family Residential	7,378	5,892	56%	44%	8,984	4,835	65%	35%	7,470	6,046	55%	45%	59%	41%
Multi-Family Residential	2,674	321	89%	11%	2,782	274	91%	9%	2,776	281	91%	9%	90%	10%
Business/Industrial	2,121	499	81%	19%	2,277	388	85%	15%	2,174	451	83%	17%	83%	17%
Institutional	1,144	228	83%	17%	1,153	212	85%	15%	1,112	273	80%	20%	83%	17%
Agricultural/Irrigation	0	1,369	0%	100%	0	1,417	0%	100%	0	1,348	0%	100%	0%	100%
Other (b)	0	35	0%	100%	0	38	0%	100%	0	50	0%	100%	0%	100%
Total (Potable)	**13,318**	**8,344**	**61%**	**39%**	**15,197**	**7,164**	**68%**	**32%**	**13,532**	**8,450**	**62%**	**38%**	**64%**	**36%**
Raw Water	0	310	0%	100%	0	309	0%	100%	0	164	0%	100%	0%	100%
Recycled Water System (c)	0	647	0%	100%	0	657	0%	100%	0	661	0%	100%	0%	100%
Total (Potable, Raw & Recycled)	**13,318**	**9,300**	**59%**	**41%**	**15,197**	**8,129**	**65%**	**35%**	**13,532**	**9,274**	**59%**	**41%**	**61%**	**39%**

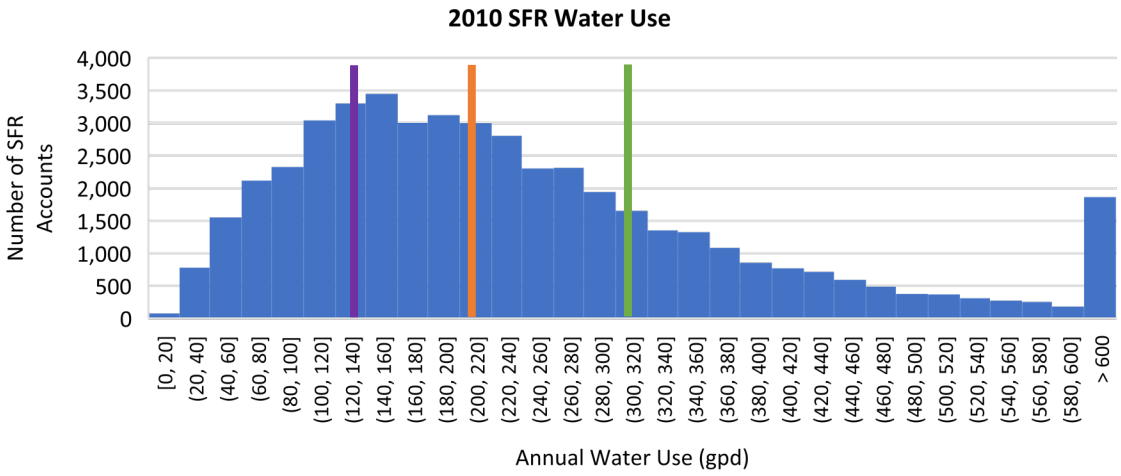


Abbreviations:
AFY = acre-feet per year
Pct. = Percentage
MMWD = Marin Municipal Water District

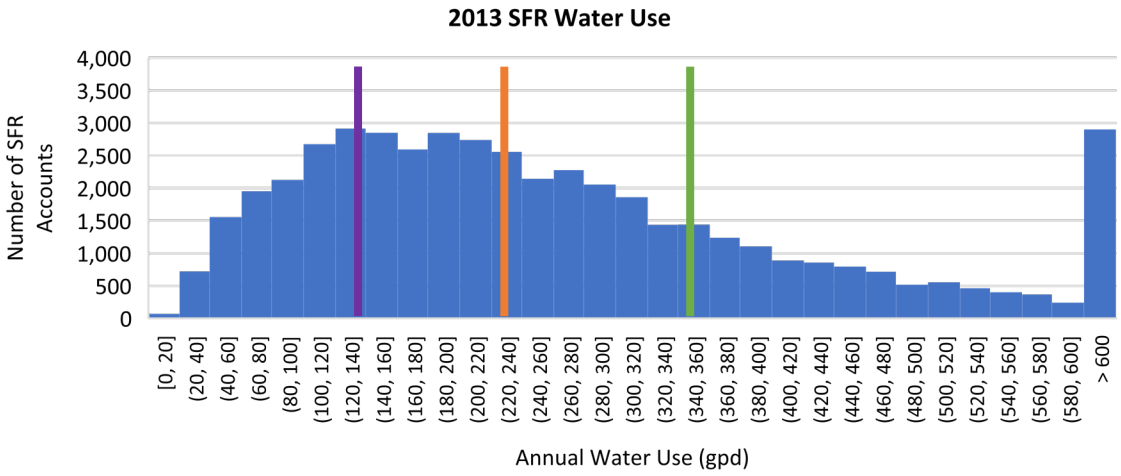
Table 3-7
Estimated Indoor and Outdoor Water Use
Marin Municipal Water District

Notes:
(a) Due to a limitation of the MMWD billing data system, data shown is approximately 0.4% less than the actual total water use shown in Table 3-2.
(b) "Other" includes fireline and hydrant sectors.
(c) The recycled water system is supplemented with potable water to meet demands, as necessary. Recycled water use shown here reflects all water served through the recycled water system. Potable make-up water volume is shown in Table 3-2.
(d) The minimum average daily water use from November through April was used to estimate indoor water use for all non-irrigation customer sectors. This method is used to assess relative proportion of indoor and outdoor use, and conservatively errs on the side of estimating more indoor water use, so that the potential for outdoor water savings is not over-estimated. Raw water, recycled water, agricultural/irrigation and "other" sectors are considered outdoor use only.

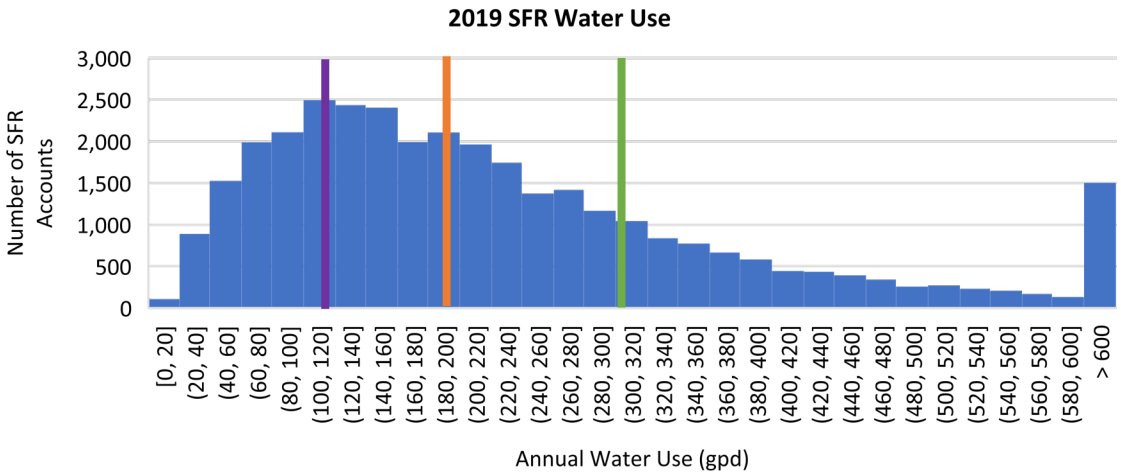
References:
1. Marin Municipal Water District, 2020. 2010-2019 Urban Water Management Plan Water Use Data, provided by Marin Municipal Water District on 9 July 2020.



Count	47,616
Average	246 gpd
25th Percentile	131 gpd
Median	207 gpd
75th Percentile	307 gpd



Count	47,846
Average	275 gpd
25th Percentile	139 gpd
Median	227 gpd
75th Percentile	346 gpd



Count	47,630
Average	241 gpd
25th Percentile	117 gpd
Median	193 gpd
75th Percentile	301 gpd

Abbreviations
gpd = gallons per day
SFR = single-family residential

Legend
- = 25th Percentile (25% of data are lower than this value)
- = Median (50% of data are lower than this value)
- = 75th Percentile (75% of data are lower than this value)

Notes
1. Charts represent histograms (distribution) of SFR water use for three selected years. Data included in chart are limited to SFR accounts that received six water bills in the specified year.

References
1. Marin Municipal Water District, 2020. Customer Billing History, provided by Marin Municipal Water District on 9 July 2020.

SFR Water Use over Time

Marin Municipal Water District
December 2020
C00004.00

eki environment & water

Figure 3-1

4. WATER DEMAND PROJECTIONS

The purpose of this section is to document the basis, methodology, and resulting projected demands for the District through 2045. As described in more detail below, the future water demands for the District were estimated by:

1. Applying an estimated growth rate to accounts within each water use sector based on projected population and employment growth rates,
2. Identifying known planned developments within the District to verify that account growth projections consider all anticipated growth,
3. Evaluating and selecting water demand factors for each water use sector based on review of recent average per account water use representing three scenarios,
4. Estimating future passive savings using the Alliance for Water Efficiency (AWE) Water Conservation Tracking Tool (AWE model), and
5. Calculating estimated future water demand that incorporates the anticipated account growth, water demand factors, and estimated future passive water savings.

This methodology is consistent with California Water Code (CWC) § 10631(d)(4)(A), which requires that "Water use projections, where available, shall display and account for the water savings estimated to result from adopted codes, standards, ordinances, or transportation and land use plans identified by the urban water supplier, as applicable to the service area." The assumptions used as the bases for demand projections were developed in close coordination with the District and reflect a land-use based approach consistent with the District's community planning.

4.1. Basis for Account Growth Projections

Water demand increases as new accounts are added to the system, among other factors. In order to estimate how accounts will grow within the District, recent historical account growth within the District was considered, as well as projected future growth in population and employment. As described below, it was assumed, that depending on the customer sector, the number of accounts will grow at the same *rate* as the projected population or employment growth.

Table 4-1 presents historical population and 2018 Association of Bay Area Governments (ABAG) Plan Bay Area Projections 2040 population and employment growth projections for the District, in context with recent historical population estimates.[7]

Table 4-2, identifies which growth projection was applied to each potable water use sector (population or employment) at the District's direction, identifies the average annual growth rate in accounts observed

[7] Several growth projections were evaluated as potential bases for growth assumptions, including previous 2013 ABAG Plan Bay Area Projections (ABAG, 2013), ABAG Plan Bay Area Projections 2040 (ABAG, 2018), and 2020 Department of Finance (DOF) Total Estimated and Projected Population for California and Counties (DOF, 2020). The DOF (2020) projections are only available at the County-wide level and show a decline in population over the planning horizon and given the recent historical growth observed in the District, are not considered appropriately conservative for planning purposes. Although anticipated to be released in 2020, updated ABAG projections are not yet available. Therefore ABAG (2018) projections were selected as the basis for growth assumptions for the District.

within the District (based on data presented in **Table 3-3**), and the associated average annual growth rate projected by ABAG (2018). With the exception of agricultural/irrigation accounts, recent historical growth rates have been lower than the projected growth rates by ABAG (2018). Recycled water actually decreased by 0.22% over the recent historical time period, and raw water accounts decreased by half.[8] At the District's direction, ABAG (2018) projected growth rates were used and are considered to be reasonably conservative for planning purposes.

The planning horizon for the 2020 UWMP is 2045; however, the ABAG (2018) projections extend only through 2040. For purposes of demand projections, it is therefore assumed that the projected growth rates from 2035 through 2040 extend through 2045.

Table 4-2
Historical and Projected Account Growth Rate by Customer Sector

Water Use Sector	Basis for Account Growth	Average Annual Growth (a)	
		Historic (2010-2019)	ABAG 2018 (2020-2045)
Single Family Residential	population	0.076%	0.34%
Existing Accounts			
New Accounts			
Multi-Family Residential	population	0.056%	0.34%
Business/Industrial	employment	-0.068%	0.15%
Institutional	employment	0.10%	0.15%
Agricultural/Irrigation	employment	0.27%	0.15%
Other	employment	0.26%	0.15%
Raw Water[8]	employment	-50%	0.15%
Recycled Water	employment	-0.22%	0.15%

Abbreviations:
ABAG = Association of Bay Area Governments

Notes:
(a) Growth is presented on an average annual basis over the indicated period. When applied to account growth, the specific growth rate between each 5-year period, per ABAG (2018) was applied.

4.2. Change in Number of Accounts based on Projected Growth

Table 4-3, presents the projected increase in accounts over the planning horizon as well as the incremental increase in accounts from 2019 per sector. There are no known major developments within the District's service area, and thus the projected increase in accounts reflects the assumed level of growth described in Section 4.1.

4.3. Water Demand Factors

Water use rates are influenced by a variety of factors, including weather, economic recession, and state and local regulations, among other drivers. Given this, selecting a "representative" baseline year is

[8] The number of raw water accounts dropped from 2 to 1 over this time period.

important to developing the land-use based water demand factors to estimate baseline water use by existing customers, which can then be extrapolated and applied to future growth within the District.

Water demand factors based on historical use within the District were used as the basis of future demand projections for potable water accounts, considering in particular the range of water use associated with pre-drought conditions, post-drought conditions, and a midpoint scenario that assumes water use partially rebounds to pre-drought conditions. **Table 3-2** provides historical water use by sector within the District. To more fully capture total water use within the District, non-revenue water is estimated as a percentage of water production as discussed in 4.3.2.

4.3.1. Potable, Raw, and Recycled Water

As shown in **Table 4-4**, the District evaluated a range of water demand factors for each water use sector using three water use scenarios, based primarily on recent historical average per account water use for selected time periods,[9] representing pre-drought water use rates, post-drought water use rates, and a partial rebound to pre-drought water use rates. Specifically:

1. *Pre-drought demand factors* based on the maximum per account water use by sector for 2011 through 2013 (**Table 3-4a**), generally representing higher water use before drought restrictions were put in place.
2. *Post-drought demand factors* based on the maximum per account water use by sector for 2017 through 2019 (**Table 3-4a**), generally representing lower water use than pre-drought conditions but with some amount of rebound.
3. *Partial rebound demand factors* estimated as the midpoint of the pre-drought and post-drought demand factors, representing an average of the two scenarios.

[9] Given the results discussed in Section 3.4, water demand factors for new SFR accounts are based on water use for homes constructed in 1994 and later.

Table 4-4
Potential Water Demand Factors Considered

Water Use Sector	Water Demand Factor (GPD/account)		
	Pre-Drought (2011-2013)	Partial Rebound	Post-Drought (2017-2019)
Single Family Residential			
Existing Accounts	270	255	240
New Accounts	365	350	335
Multi-Family Residential	795	758	720
Business/Industrial	785	759	734
Institutional	6,228	5,839	5,449
Agricultural/Irrigation	1,708	1,595	1,482
Other	89	90	92
Raw Water	156,569	147,509	138,449
Recycled Water	2,252	2,129	2,006

Abbreviations:
GPD = gallons per day

As shown in **Table 4-5**, below, for purposes of developing the District's 2045 demand projections, the District directed EKI to apply partial rebound demand factors to residential and raw water sectors and pre-drought demand factors to all other sectors.

Table 4-5
Selected Water Demand Factors

Water Use Sector	Water Demand Factor (GPD/account)	Basis for Demand Factor
Single Family Residential		
Existing Accounts	255	Partial rebound
New Accounts	350	Partial rebound
Multi-Family Residential	758	Partial rebound
Business/Industrial	785	Pre-drought
Institutional	6,228	Pre-drought
Agricultural/Irrigation	1,708	Pre-drought
Other	89	Pre-drought
Raw Water	147,509	Partial rebound
Recycled Water	2,252	Pre-drought

Abbreviations:
GPD = gallons per day

The recycled water system is supplemented with potable water to meet demands, as necessary. Between 2010 and 2018, potable water was used to meet between 9% and 30% of recycled water system demand; in 2019, the recycled water plant was shut down due to upgrades and 100% of recycled water demand was met by potable water. However, following plant upgrades, it is anticipated that all demand by the recycled

water system will be met by recycled water, thus demand projections are based on total recycled water system use, and do not include a projection of potable make-up water.

4.3.2. Non-Revenue Water (Potable Water System)

Non-revenue water is water that has been produced but not billed, and thus does not generate revenue for the supplier. Non-revenue water includes unbilled authorized uses (such as water for fighting fires and flushing mains) and water losses (including real losses due to distribution system leaks and apparent losses due to metering inaccuracies). For the purposes of this assessment, non-revenue water is estimated as total potable water produced minus the total billed potable water use on an annual basis. As shown in **Table 4-6**, potable non-revenue water is projected to range from 2,758 AFY to 2,777 AFY through 2045, based on the average percentage of non-revenue reported from 2017 to 2019 (10%, see **Table 3-2**).

4.4. Passive Water Savings Estimates

Passive water savings are the water savings associated with the natural replacement of older toilets, showerheads, clothes washers, and other water using appliances with newer high efficiency devices that are available due to both market shifts and increasing efficiency mandated by the building code and other regulatory requirements. The AWE model[10] was used to estimate future passive savings within the District. The AWE model takes into account estimates of historical population, residential building stock, number of accounts, and projected population and account growth to estimate future passive savings. The estimated passive savings are presented in **Table 4-6** and are subtracted from the water demand projected based on the water demand factors described in Section 4.3 above. Passive savings are only applied to potable water use.

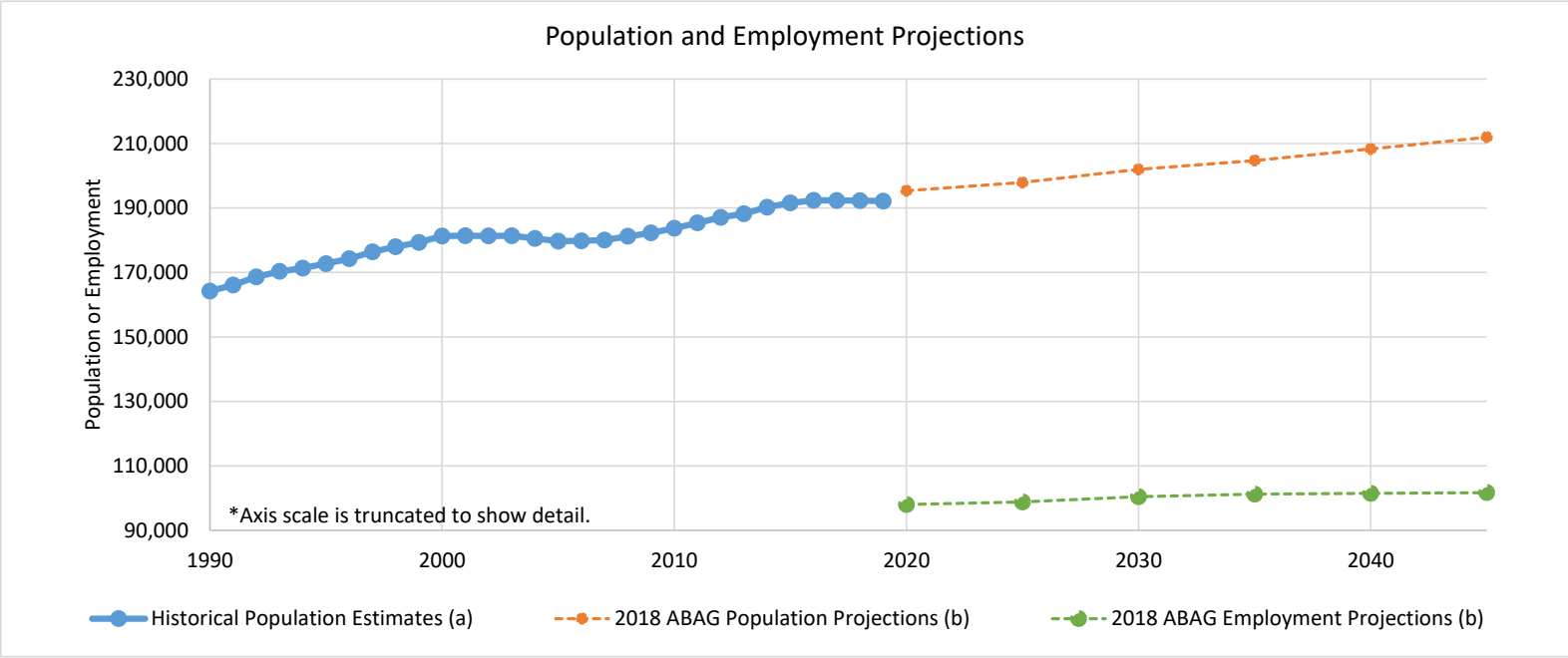
4.5. Projected Water Demand Through 2045

Future water demand was projected for each sector based on their respective demand factors, and is shown in **Table 4-6**. Potable and raw water demand is projected to increase to 26,915 AFY in 2045, which is a 4.9% increase over 2019 potable and raw water demand. Recycled water demand is projected to increase to 771 AFY, which is a 17% increase over the 2019 recycled water system demand. Both potable and raw water, and recycled water demand projections are higher than the District's 2015 UWMP demand projections.

[10] Alliance for Water Efficiency, Water Conservation Tracking Tool Version 3, released in July 2016.

Table 4-1
Population and Employment Growth Projections
Marin Municipal Water District

Category	Growth Projections											Total Growth Rate 2020-2045	Average Annual Growth Rate 2020-2045
	2015	2016	2017	2018	2019	2020	2025	2030	2035	2040	2045 (c)		
Population													
Historical Population Estimates (a)	191,575	192,402	192,328	192,277	192,138	--	--	--	--	--	--	--	--
2018 ABAG Population Projections (b)	--	--	--	--	--	195,360	197,939	201,987	204,750	208,324	211,961	8.5%	0.34%
Employment													
2018 ABAG Employment Projections (b)	--	--	--	--	--	98,019	98,822	100,449	101,246	101,474	101,703	3.8%	0.15%



Abbreviations:
-- = not available
ABAG = Association of Bay Area Governments
DOF = California Department of Finance
MMWD = Marin Municipal Water District

Table 4-1
Population and Employment Growth Projections
Marin Municipal Water District

Notes:

(a) Historical population estimates are adjusted from DOF county estimates using a conversion factor provided by the District, per Reference 3. 2016-2020 estimates were updated using 2020 DOF population estimates, per Reference 2.

(b) 2018 ABAG population and employment projections per Reference 1. Unincorporated county population and employment is adjusted for proportion within the MMWD service area using a conversion factor provided by the District (i.e., 76% of unincorporated population/employment), per Reference 3.

(c) ABAG 2018 includes projections through 2040. 2045 population and employment projections are calculated based on 2035-2040 growth rates (1.7% and 0.23%, respectively).

References:

1. ABAG, 2018. Association of Bay Area Governments, Plan Bay Area Projections 2040, released on November 2018.
2. DOF, 2020. California Department of Finance - Demographic Research Unit, Population Estimates for Cities, Counties, and the State, 2011-2020, with 2010 Benchmark, Report E-4, released on 1 May 2020.
3. Marin Municipal Water District, 2020. MMWD Population 2019 Demand Analysis.xls, provided by Marin Municipal Water District on 9 April 2020.

Table 4-3
Change in Number of Accounts based on Projected Growth
Marin Municipal Water District

Projected Number of Accounts

Water Use Sector	Number of Accounts (a)				
	2025	2030	2035	2040	2045 (b)
Single Family Residential (c)	52,410	53,482	54,214	55,160	56,123
Multi-Family Residential (d)	3,857	3,936	3,990	4,060	4,130
Business/Industrial	3,266	3,320	3,346	3,353	3,361
Institutional	229	233	235	235	236
Agricultural/Irrigation	866	881	888	890	892
Other (e)	495	503	507	508	509
Raw Water	1	1	1	1	1
Recycled Water	297	302	304	305	306
Total Accounts	**61,422**	**62,657**	**63,484**	**64,512**	**65,558**

Incremental Increase in Accounts from 2019

Water Use Sector	Number of Accounts				
	2025	2030	2035	2040	2045
Single Family Residential (c)	817	1,889	2,621	3,567	4,530
Multi-Family Residential (d)	60	139	193	263	333
Business/Industrial	32	86	112	119	127
Institutional	2	6	8	8	9
Agricultural/Irrigation	8	23	30	32	34
Other (e)	5	13	17	18	19
Raw Water	0	0	0	0	0
Recycled Water	3	8	10	11	12
Total New Accounts	**928**	**2,163**	**2,990**	**4,018**	**5,064**

Estimate of Known Planned Development

Water Use Sector	Number of Accounts (f)				
	2025	2030	2035	2040	2045
Single Family Residential (c)	--	--	--	--	--
Multi-Family Residential (d)	--	--	--	--	--
Business/Industrial	--	--	--	--	--
Institutional	--	--	--	--	--
Agricultural/Irrigation	--	--	--	--	--
Other (e)	--	--	--	--	--
Raw Water	--	--	--	--	--
Recycled Water	--	--	--	--	--
Total New Accounts	**--**	**--**	**--**	**--**	**--**

Table 4-3
Change in Number of Accounts based on Projected Growth
Marin Municipal Water District

Abbreviations:
-- = not available
ABAG = Association of Bay Area Governments

Notes:
(a) Growth in number of accounts is estimated based on ABAG 2018 projected growth rates for population and employment. Residential sectors are estimated relative to population growth, and growth in all other account types are estimated relative to employment growth.

(b) ABAG 2018 includes projections through 2040. For the purposes of demand and account projections, it is assumed that the growth rate remains constant from 2036 through 2045.

(c) Single-family residential includes irrigation.
(d) Multi-family residential includes duplexes and 3-10+ unit apartments.
(e) "Other" includes fireline and hydrant sectors.
(f) No new developments are currently known/anticipated.

References:
1. ABAG, 2018. Association of Bay Area Governments, Plan Bay Area Projections 2040, released on November 2018.

Table 4-6
Projected Water Demand
Marin Municipal Water District

Water Use Sector	Projected Demand (AFY) (a)				
	2025	2030	2035	2040	2045
Potable and Raw Water					
Single Family Residential (b)					
Existing Accounts	14,751	14,751	14,751	14,751	14,751
New Accounts (c)	321	741	1,028	1,399	1,777
Multi-Family Residential (d)	3,275	3,342	3,388	3,447	3,507
Business/Industrial	2,875	2,922	2,945	2,952	2,959
Institutional	1,600	1,627	1,640	1,643	1,647
Agricultural/Irrigation	1,659	1,686	1,700	1,704	1,707
Other (e)	49	50	51	51	51
Potable Water Served through Recycled Water System (f)	0	0	0	0	0
Raw Water	171	174	176	176	176
Non-revenue Water (Potable) (g)	10%	10%	10%	10%	10%
	2,758	2,760	2,753	2,761	2,777
Estimated Passive Savings (h)	-733	-1,301	-1,749	-2,125	-2,437
Total Potable and Raw Water Demand	**26,726**	**26,753**	**26,682**	**26,758**	**26,915**
Recycled Water					
Recycled Water	750	762	768	770	771
Total Recycled Water Demand	**750**	**762**	**768**	**770**	**771**

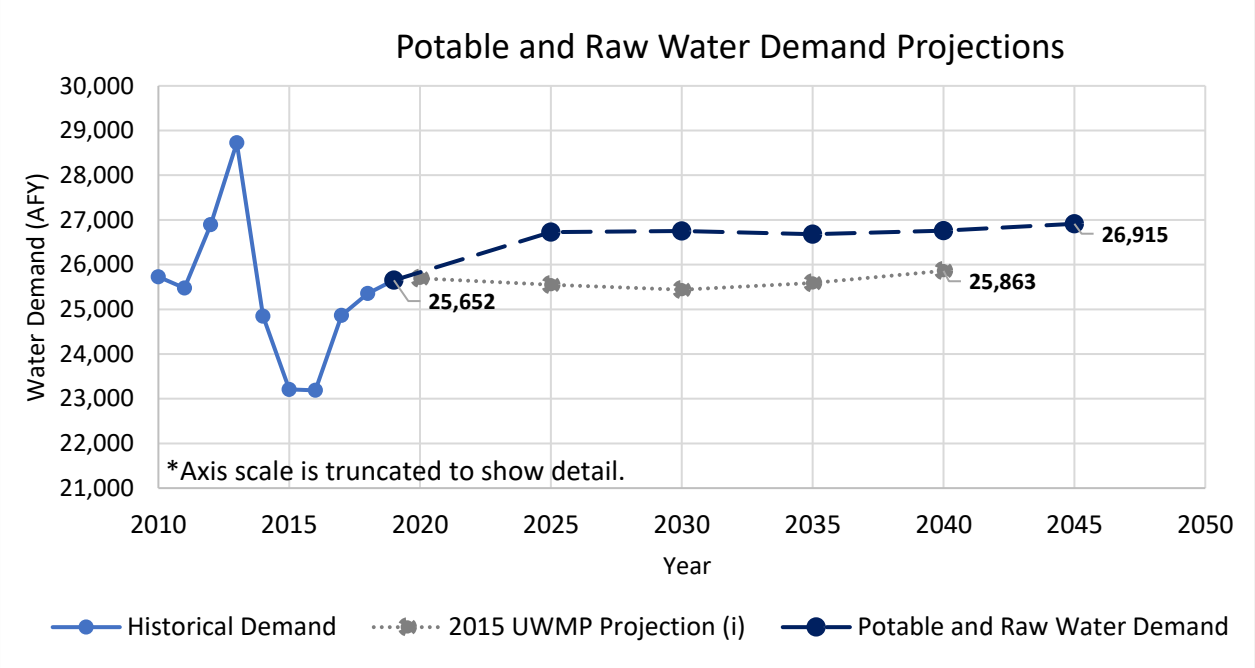
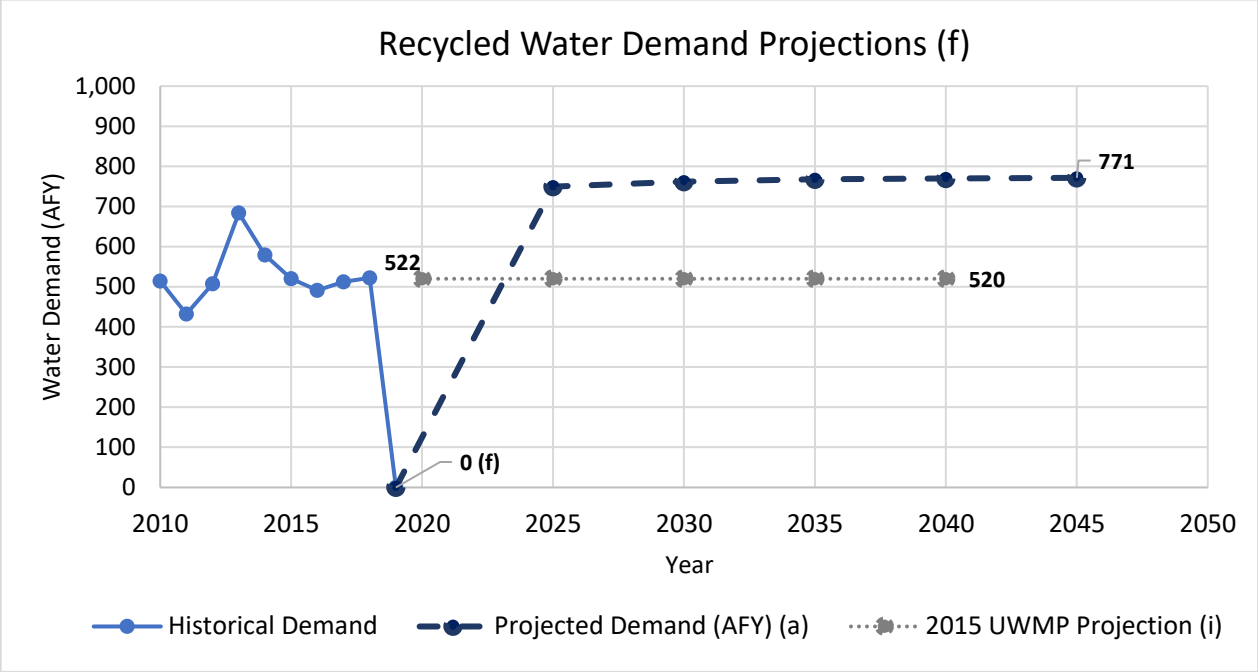


Table 4-6
Projected Water Demand
Marin Municipal Water District



Abbreviations:
ABAG = Association of Bay Area Governments
AFY = acre-feet per year
AWE = Alliance for Water Efficiency
UWMP = Urban Water Management Plan

Notes:
(a) Water demand projections are estimated based on partial rebound demand factors for residential and raw water sectors and pre-drought demand factors for all other sectors, based on recent historical use. Growth in accounts is based on ABAG 2018 projections, as identified in Table 4-1.
(b) Single-family residential includes irrigation.
(c) Water demand factors for new single family residential accounts are based on water use per dwelling unit for buildings constructed in 1994 and later.
(d) Multi-family residential includes duplexes and 3-10+ unit apartments.
(e) "Other" includes fireline and hydrant sectors.
(f) The recycled water system is supplemented with potable water to meet demands, as necessary. The recycled water plant was shut off in 2019 to allow for infrastructrure upgrades. Following the upgrades, potable make-up water to the system, if any, is expected to be de minimis.
(g) Estimates of potable and raw non-revenue water are based on the average percentage non-revenue water for 2017 through 2019, per Table 3-2.
(h) Passive water savings are based on the AWE Conservation Tracking Tool.
(i) 2015 UWMP projections per Reference 2 and include raw water demand.

Table 4-6
Projected Water Demand
Marin Municipal Water District

References:

1. ABAG, 2018. Association of Bay Area Governments, Plan Bay Area Projections 2040, released on November 2018.
2. Marin Municipal Water District, 2016. Urban Water Management Plan – 2015 Update, prepared by RMC Water and Environment, dated June 2016.

5. CONSERVATION PROGRAM PARTICIPATION

The following section evaluates historical participation in water conservation programs by District customers and the estimated water savings associated with that participation. This information is used to inform future program selection and implementation assumptions, and to support the demand management measure (DMM) reporting required in UWMPs under CWC § 10631.(e).[11]

For five water conservation programs selected by the District, additional analyses have been conducted, including: (1) a refined estimate of the actual water conservation savings achieved by District customers based on customer billing data (Section 5.3.2), and (2) program participation trends in relation to spatial distribution (Section 5.4), property characteristics (Section 5.5), and customer demographics (Section 5.6). The following five programs were included in the detailed analyses:

1. Advanced Metering Infrastructure (AMI) Leak Notifications Program
2. Rain Barrel Rebate Program
3. Residential High Efficiency Clothes Washer (HECW) Rebate Program
4. SFR Water Use Surveys/Audits Program
5. SFR Weather-Based Irrigation Controller (WBIC) Rebate Program

The goals of these more detailed analyses are to identify participation drivers and to help the District better understand which customers are participating in which programs. The District can accordingly use this information to inform the strategic design, selection, and marketing of future conservation programs and services.

5.1. Conservation Programs

The District currently provides a broad variety of conservation programs directly to customers. These programs are described in **Table 5-1** below.

Table 5-1
Description of Conservation Programs

Program	Description	Eligible Customer Class	Program Run Dates
CII Water Use Evaluation Program	CII customers are provided on site water use evaluations, recommendations to improve efficiency, and pre-qualified for applicable rebates.	CII	1995 - Current
AMI Leak Notifications Program	Customers with AMI meters receive notifications of water use patterns indicative of leaks. Rather than having to wait until their next water bill, customers are able to receive timely information and stop leaks much faster. Water Efficiency staff runs automated reports	SFR, CII, Ag. & Irr.	2018 - Current

[11] The information presented herein supports a portion of the required DMM analysis, focusing on device and education-focused programs. Additional details regarding customer billing rates and structure, conservation staffing levels, customer metering, etc. are required under CWC § 10631.(e), but not addressed herein.

Table 5-1
Description of Conservation Programs

Program	Description	Eligible Customer Class	Program Run Dates
	to monitor water use of AMI customers. AMI meters record water use in 15 minute intervals as compared to every other month as is typical for most residential meter reads.		
HET Rebate Program	**2007-2010**: Up to a $250 rebate when customers upgrade a tank-style 3.5 gpf or higher to a new, high-efficiency model. **2013-Current**: Up to $100 rebate to replace a 3.5 gpf or more per flush or a 1.6 gpf model year 2001 or older with an HET.	SFR	2007 - 2010 2013 - Current
HET Direct Install Program	Free HET and installation to replace existing 3.5 gpf toilets.	MFR, CII	2013 - 2015
Hot Water Recirculating System	Single family or duplex residential customers can apply for a rebate up to $50 towards the cost of a hot water recirculating system to create a looped system to recirculate cold water back to the water heater.	SFR	2014 - 2019
Irrigation Improvement Equipment Program	Commercial and multi-family customers can apply for a rebate up to $1,500 when they install qualifying irrigation equipment to improve outdoor water use efficiency.	Ag. & Irr.	2015 - 2017
Landscape Plan Review Program	MMWD has developed water conservation requirements for landscape professionals and homeowners when designing and installing landscapes and irrigation systems. Plan review requirements apply to all new construction and rehabilitated (renovations or changes made to sites with an existing irrigation system) landscape projects requiring a building permit, plan check, or design review.	SFR, CII	1986 - Current
Large Landscape WBIC Rebate Program	Commercial customers can apply for a rebate up to $30 per active irrigation station when they purchase and install a new weather based irrigation controller to replace an existing standard controller.	Ag. & Irr.	2013 - 2015
Laundry-to-Landscape System	Single family or duplex residential customers can apply for a rebate up to $50 towards the cost of a 3-way diverter valve and/or air vent. Products must be installed as part of a residential laundry to landscape system that uses discharge water from a single domestic clothes washer in a one or two family dwelling.	SFR	2015 - 2019
Organic Mulch Rebate Program	Single family or duplex residential customers can apply for a rebate up to $50 towards the cost of organic mulch. By applying mulch to their gardens, customers will be able to adjust their irrigation schedules as they	SFR	2014 - 2019

Table 5-1
Description of Conservation Programs

Program	Description	Eligible Customer Class	Program Run Dates
	realize mulched areas of their gardens can remain healthy with less water.		
Pool Cover Rebate Program	Single family or duplex residential customers can apply for a rebate up to $50 towards the cost of a pool cover. Covering a swimming pool when it is not in use is the most effective means of reducing evaporative water loss.	SFR	2014 - 2019
Rain Barrel Rebate Program	**2014-2019**: Single family or duplex residential customers can apply for a rebate up to $50 towards the cost of a rain barrel to collect rainwater that can be used to supplement landscape irrigation. **2020**: Residential and commercial customers with active potable water service can apply for a rebate up to $0.50 per gallon of storage when they install rain barrels and/or cisterns at their sites. Total rebates for rain barrels and cisterns may not exceed $1,000 per site.	SFR	2014 – 2019 2020 - Current
Residential HECW Rebate Program	MMWD customers can apply for a rebate towards the cost of installing a qualifying residential high-efficiency clothes washer that meets current water and energy efficiency requirements.	SFR	1998 - 2010 2013 – Current
SFR Turf Removal Program	MMWD customers participated in the state Save Our Water turf replacement program, which offered $2/sq ft of turf removed.	SFR	2015 - 2016
SFR Water Use Surveys/Audits Program	A free service for SFR customers that involves a visit to their property to review water use and identify ways to save water indoors and outside.	SFR	1995 - Current
SFR WBIC Rebate Program	Residential customers can apply for a rebate up to $20 per active irrigation station when they purchase and install a new weather based irrigation controller to replace an existing standard controller.	SFR	2013 - 2015
Tier 4 Exemption Program	An incentive program designed to help save water and lower customer's water bill. To qualify, customers must meet the District's current water conservation standards and pass a verification site visit. The customer's property then becomes exempt from Tier Four water rates for a two-year period. This means their water will be billed at no higher than Tier Three rates.	SFR	2004 - 2015
Time of Sale (Toilet Retrofit) Program	An ordinance-based program that required the installation of low flow plumbing (toilets no greater than 1.6 gpf and pressure reducing valves set at no greater than 50 psi unless required for irrigation) at	SFR	2002 - 2006

Table 5-1
Description of Conservation Programs

Program	Description	Eligible Customer Class	Program Run Dates
	the time of resale. Ordinance applied to SFR, multi-family and hotel/motel structures.		
ULFT Rebate Program	Offered a rebate of up to $75 or $100 when customers upgrade a tank-style 3.5 gpf or higher to a new, 1.6 gpf model.	SFR	1993 - 2007
WaterSense Smart Controller Rebate	Residential and commercial customers can apply for a rebate up to $100 towards the cost of a qualifying EPA WaterSense weather-based irrigation controller.	SFR, CII	2020-Current
Water Use Surveys/Audits Program (Excluding SFR Participants)	Consultation activities include a review, evaluation and report of indoor plumbing devices and/or a review and report of the landscape irrigation system.	MFR, CII, Ag. & Irr.	1995 - Current
Water Waste Report Program	The general public can report water waste situations to MMWD online or over the phone. These contacts are logged into a database and followed up on by field staff to research and notify properties about water waste situations.	SFR, CII	1998, 2000 - Current
Water-wise Community Garden Program	The Water-Wise Community Gardens program provided resources and rebates for school and community gardens to improve water efficiency. Implementation of a water-related project or improvement to the irrigation system could qualify for a rebate of up to $1,000 per site.	CII, Ag. & Irr.	2017

Abbreviations:
Ag. = agricultural
AMI = Advanced Metering Infrastructure
CII = commercial, industrial and institutional
EPA = Environmental Protection Agency
gpf = gallons per flush
HECW = high efficiency clothes washer
HET = high-efficiency toilet
Irr. = irrigation
MF = multi-family
MFR = multi-family residential
MMWD = Marin Municipal Water District
psi = pounds per square inch
SFR = single family residential
sq ft = square feet
ULFT = ultra low flow toilet
WBIC = Weather Based Irrigation Controller

In addition to programs offered by the District, several regional-based programs are offered through the SMSWP, including: (1) education and outreach to schools, (2) public outreach and educational workshops, (3) Qualified Water Efficient Landscaper (QWEL) Training, and (4) garden tours. Currently, the District implements its own school education and outreach programs separate from the SMSWP.

5.2. Historical Conservation Program Participation

As shown in **Table 5-2**, the District has implemented 22 different conservation programs offered directly to customers from 1986 through 2020. Of the programs implemented by the District, the ultra low flow toilet (ULFT) Rebate Program, Residential High Efficiency Clothes Washer (HECW) Rebate Program, and SFR Water

Use Surveys/Audits Program had the highest participation, with 27,269, 17,807, and 12,837 participants, respectively. Through the SFR Turf Removal Program, over 55,000 sq ft of turf has been removed.

Table 5-3 summarizes District participation in the regional SMSWP water conservation school education and outreach programs during the 2007-2008 through 2019-2020 school years. Over this period, over 74,000 students were reached through 20 different programs, including assemblies, presentations, workshops and other educational materials.

5.3. Estimated Savings from Past Programs

5.3.1. Estimated Water Savings Based on AWE Model

The AWE model[12] was used to estimate water savings associated with the implementation of all device or turf replacement and audit programs identified in **Table 5-2** for the period of 2010 to 2020. Water savings estimates were based on District-specific values calculated per Section 5.3.2, AWE model default values, values developed for the District in 2015, and other literature values, as needed. The specific assumptions used in this assessment are presented in **Appendix B**. The results of this analysis are presented in **Table 5-4**.

Based on the record of water conservation program participation within the District and application of the AWE Model, it is estimated that the District conservation programs included in this assessment resulted in a savings of between 1,441 AFY and 6,366 AFY between 2010 and 2020.[13] In addition, over this period, it is estimated that the District saved 8,352 AFY through passive savings. Thus, the total active and passive savings achieved by the District between 2010 and 2020 is estimated to be between 13,277 AFY and 14,718 AFY.

5.3.2. Estimated Water Savings for Selected Programs Based on Customer Billing Data

Water use savings associated with implementation of specific water conservation programs are typically estimated based on literature values, which may or may not accurately capture the specific ways customers in a specific area (i.e., the District) use water. Therefore, District customer billing data were analyzed using a modified *Difference in Difference Estimation Method* (Columbia Public Health, 2013) to assess the amount of water typically saved through implementation of the selected programs. As described further in **Appendix C**, a version of this method is used to compare the water use patterns in a participant group to that of a cohort group to isolate the impact (in terms of water savings) of participation in a specific water conservation program.

[12] Alliance for Water Efficiency, Water Conservation Tracking Tool Version 3, released in July 2016.

[13] Free ridership refers to customers who participate in a conservation program, but who would have taken the water saving action (e.g., replace a toilet) regardless of whether the conservation program incentive was available. The amount of free ridership is unknown, and thus a range of savings is shown, assuming 0% to 100% free ridership for programs, as appropriate.

Table 5-5 summarizes the average estimated water savings for each selected conservation program from 2010-2018.[14] The AMI Leak Notifications Program demonstrated the most savings at 29,023 gallons per account per year (gal/acct/yr), followed by the SFR WBIC Rebate Program at 17,258 gal/acct/yr.

Table 5-5
Average Estimated Water Savings Achieved by Selected Conservation Programs from 2010-2018

Conservation Program (a)	Number of Participants in Analysis	Estimated Savings due to Program (d) (gal/acct/yr)	Estimated MMWD-Specific Unit Savings (d)	Default AWE Model Unit Savings Factors
AMI Leak Notifications Program (b)	62	29,023	29,023 gal/event/yr	n/a (e)
Residential HECW Rebate Program (b)	1,031	4,281	4,276 gal/unit/yr	5,000 gal/unit/yr
SFR Water Use Surveys/Audits Program (b)	1,682	6,273	6,273 gal/survey/yr	12,373 gal/survey/yr
SFR WBIC Rebate Program (c)	108	17,258	17,258 gal/WBIC/yr	5,639 gal/WBIC/yr (f)

Abbreviations:
acct = account
AMI = Advanced Metering Infrastructure
AWE = Alliance for Water Efficiency
DSS = Decision Support System
gal = gallon
HECW = high efficiency clothes washer
MMWD = Marin Municipal Water District
n/a = not available
SFR = single family residential
sq ft = square feet
WBIC = Weather-Based Irrigation Controller
yr = year

Notes:
(a) This analysis was also performed for the Rain Barrel Rebate Program. However, due to the limited sample size the results were not considered robust and thus are not presented herein.
(b) Program participants included in this analysis are limited to those that: (1) have only participated in the specified program, (2) have only participated in the program in the specified year, and (3) have sufficient water use data within the study periods.
(c) All of the participants have participated in more than one conservation program, thus the analysis is not limited to those that only participated in this program.
(d) Estimated annual water savings associated with the program are calculated as the incremental amount of water saved by the program participants over that of the comparison cohort accounts, as shown in **Tables 5-6a** through **5-6d**. Water savings comparison cohorts for SFR customers are stratified geographically based on Census Block Groups.
(e) Not available for either the AWE or DSS models.
(f) Default value not available in the AWE model. Water savings factor shown is per the District's 2015 DSS Model, and is based on a program that provides multiple types of landscape rebates and other equipment upgrades.

Tables 5-6a through **5-6d** summarize the detailed results of these analyses, including the number of participants included in the analysis for each year, the total amounts rebated, the change in water use by participants and their comparison cohort groups, and the estimated savings values by year and in total.

[14] This time period was selected so that at least two full years of water use billing data could be analyzed following the program participation year.

Table 5-5 also shows the default water savings factors included in the AWE model,[15] which are based on available literature values and other assumptions. Water savings for District customers for the Residential HECW Rebate Program are generally consistent with AWE model default values. However, based on analysis of District customers specifically, water savings for the SFR Water Use Surveys/Audits Program are lower than the default values, and therefore evaluation of potential savings for future programs would be significantly overestimated for District customers if default values are used. Conversely, savings for the SFR WBIC Rebate Program are higher than default DSS model values, resulting in a potential for under-estimation of program savings if the default values were used.

5.4. Spatial Trends in Program Participation

Given the large amount of program participation data for some programs, it can be difficult to ascertain whether participation in these programs has been evenly distributed across the service area, or if participation tends to be clustered in certain regions. In order to identify program participation density for conservation programs in the District service area, a geostatistical spatial analysis was performed.[16] This analysis identifies participation "hot spots," which are areas where a higher density of participation is observed than would be expected by randomly distributed participation. Similarly, "cold spots," or areas of lower than expected participation, are identified. Ineligible parcels (i.e., parcels with no sector use relevant to each respective conservation program) were excluded from each analysis, as well as very large rural SFR parcels (e.g., greater than 10 acres), to reduce skewing of density mapping. High density participation areas are identified in red and low density participation areas are identified in blue on **Figures 5-1a** through **5-1f.**

Figure 5-1a shows the results of the AMI Leak Notifications Program, which includes SFR, CII, and agriculture/irrigation accounts. The rebate and survey programs require a customer to opt-in to participate. Participation in the AMI Leak Notifications Program, however, occurs when a customer is notified once a leak is detected for an account based on AMI data. Areas of higher participation (high incidence of leaks) were focused in the southern portion of the service area in the Cities of Belvedere and Tiburon, with no distinct areas of low participation. **Figure 5-1b** shows the results of this analysis when focused on just the Cities of Belvedere and Tiburon. Within these areas, distinct areas of high participation (or rate of leaks) are identified, primarily in the southern portion of the area, and areas of low participation (or rate of leaks) are identified in the northern and southern portions of the area.

Figures 5-1c through **5-1f** show the results of the participation destiny analysis for the Residential HECW Rebate Program, the Rain Barrel Rebate Program, the SFR Water Use Surveys/Audits Program, and the SFR WBIC Rebates Program, all of which target residential accounts. Participation was similar between

[15] Default value not available in the SFR WBIC Rebate Program. Water savings factor shown is per the District's 2015 DSS Model, and is based on a program that provides multiple types of landscape rebates and other equipment upgrades.

[16] The ESRI ArcGIS 10.8 Optimized Hot Spot Analysis tool was used for spatial hot spot analysis of program participation. The hot spot analysis calculates a Getis Ord GI* statistic for each cell. This statistical z-score evaluates how the event (in this case, participation in the program) clusters spatially, by looking at the cell in the context of the neighboring cells. For the purposes of this study, hot and cold spots are identified as cells with a 90% or greater level of statistical confidence.

the Residential HECW Rebate and SFR Water Use Surveys/Audits Programs, with areas of high participation in the southern and central portions of the service area and low participation in the northwestern portion. The Residential HECW Rebate Program also had more areas of low participation along the western portion of the District. By contrast, the SFR WBIC Rebates Program had only one cluster of high participation towards the southern portion of the service area, while the Rain Barrel Rebate Program had one cluster of high participation in the northern portion of the service area. It should be noted that these programs only included 110 and 162 participants, respectively, and therefore produced less robust results than the other programs that were assessed.

Based on this information, the District could consider targeting outreach to the portions of its service area that have historically had lower program participation, particularly within the Residential HECW Rebate Program and SFR Water Use Surveys/Audits Program.

5.5. Building Stock Characteristics

Certain characteristics related to building age can influence, or at least be correlated with, water use. In general, older homes and businesses tend to have higher water using fixtures that were installed prior to passage of key changes to the Federal and California Plumbing, Energy, and Building Codes; these accounts present an opportunity for increasing water conservation. Homes and businesses with larger landscaped areas tend to use more water than those with smaller landscaped areas. Similarly, larger homes may have more occupants and therefore more water use.

In order to assess the distribution of housing stock and other key water use characteristics, service area-wide data were evaluated based on Marin County Assessor parcel data. These data included lot sizes and building construction date for residential program participants. Building construction date for parcels within the District based on Marin County Assessor data is shown on **Figure 5-2**. This figure shows parcels for all land use types for which building construction date is available (e.g., residential, commercial, open space, etc.).

Building stock characteristics of conservation program participants for each of the selected programs are summarized in **Table 5-7**.[17] The first chart shows the total number of participants by program by age of building construction, while the second chart shows the results after controlling for the relative number of parcels within each age category.

The average year of building construction for each program ranged from 1954 to 1987. The majority of program participants are in homes built prior to 1994, for all programs. When the results are normalized based on total building stock, CII participants in the AMI Leak Notifications Program and Residential HECW Rebate Program had the highest rates of participation for homes constructed prior to 1994.[18] Participation by SFR customers in homes constructed between 1994 and 2009 was notably higher than that of participants with pre 1994 or 2010 and new homes.

[17] Results for SFR, MFR, CII and Irr. participants are shown separately, given the diversity of building stock.

[18] The rebate and survey programs require a customer to opt-in to participate. Participation in the AMI Leak Notifications Program, however, occurs when a customer is notified once a leak is detected for an account based on AMI data.

Based on this analysis, the District appears to be successfully reaching buildings in most age ranges for most programs. However, there appears to be some potential to increase participation in: (1) the Rain Barrel Rebate Program in buildings constructed in 1994 and later, and (2) SFR WBIC Rebates and Water Use Surveys/Audits for customers with homes built prior to 1994 and 2010 and later.

5.6. Demographic Characteristics of Residential Conservation Program Participation

Residential conservation programs are generally open to all residents in the District service area. Although the programs are available to all residents, those with certain demographic characteristics can tend to participate at higher rates than others in some programs. The analyses described in the following sections were performed for the five selected programs in order to better understand trends in customer demographics among residential conservation program participants in the District – specifically, income, whether the home occupants rent or own the property, and household age.

5.6.1. Household Income Trends

Household income data were based on the estimated 2017 median household income by Census Block Group (Census, 2019).[19] The following sections discuss the breakdown of program participation in residential programs by income classification. These income levels are defined as follows: low income (<$94,850/year), moderate income ($94,850-$124,500), and high income (>$124,500), based on Marin County income designations for a three-person household (HCD, 2017). Given that these classifications reflect the median of all households in a given Census Block Group, this reflects the predominant income for that area (neighborhood), but does not mean that every participant or household in that area falls within the same income group.

Figure 5-3a shows the distribution of income groups across the service area and **Table 5-8a** shows the distribution of residential program participants by income level. The first chart in **Table 5-8a** shows the percentage of participants in each program that live in areas of each income level grouping. Across all programs, participation was highest in the high income category, ranging from 53% to 66%, and lowest in the low income category, with participation ranging from 0.78% to 19%.

The second chart on **Table 5-8a** shows participation rates controlled for the number of parcels within the service area within each income group. Customers in all three income groups appear to be well represented in the Rain Barrel Rebate Program and the Residential HECW Programs. The AMI Leak Notifications Program, SFR WBIC Rebate Program, and SFR Water Use Surveys/Audits Program showed very low participation by customers in low income areas and high participation by customers in high income areas.

[19] Census Block Group is the smallest geographical unit for which the United States Census Bureau publishes income data.

These results suggest that there are opportunities to increase program participation by lower income households in the SFR WBIC Rebate Program and Water Use Surveys/Audits Program.[20]

5.6.2. Homeownership Trends

In order to evaluate whether home ownership appears to be a driving factor in program participation, residential program participation was compared to the proportion of the population that live in renter-occupied homes, based on Census data. Rentership status was based on 2017 Census estimates of the population within a Census Block Group that live in a renter-occupied home versus an owner-occupied home (Census, 2019). Rentership is thus presented as the proportion of the population within a Census Block Group that lives in a renter-occupied home. A Census Block Group with a rentership of less than 25% indicates that the area consists primarily of owner-occupied homes, while a rentership population of greater than 75% indicates that the area is predominantly made up of those who rent their homes.

Figure 5-3b shows the distribution of renter-occupancy rate across the District. **Table 5-8b** shows the distribution of residential program participation by the percentage of the population that live in renter-occupied homes ("rentership").

The first chart in **Table 5-8b** shows the percentage of participants in each program that live in areas of each percent rentership grouping. Participation in conservation programs was higher in Census Block Groups with a lower percentage of rentership (high home ownership). Between 51% and 56% of participants across all conservation programs were in Census Block Groups that had less than or equal to 25% rentership, compared to between 0% and 1.0% of participants in the high rentership category (≥ 75% rentership).

The second chart in **Table 5-8b** shows participation rates controlled for the number of customers within the District that fall within each rentership classification. When the relative proportion of number of customers within each rentership group is controlled for, participants in the low rentership (high home ownership) category are 2.6% to 8.1% higher than the overall percentage of customers in the same category. Conversely, participants in the moderate to high rentership groups (≤50%-75% rentership) were underrepresented by 3.2% to 15%.

These results suggest that there are opportunities to increase participation across all programs in areas with higher levels of rentership.

5.6.3. Household Age Trends

Median household age is based on 2017 Census estimates of the median age of household members by Census Block Group (Census, 2019). Median age is broken up as follows: <35 years old, 35-45 years old, 45-55 years old, and >55 years old. Given that these classifications reflect the median age of all household

[20] While the AMI Leak Notifications Program also had lower levels of participation by low income households, given that participation in this program occurs when customers are notified of leaks using AMI data, it is not appropriate to specifically target selected customers for participation.

members in a given Census Block Group, this reflects the predominant age for that area but does not mean that every participant or household in that area falls within the same age group.

Figure 5-3c shows the distribution of median household age by Census Block Group across the service area and **Table 5-8c** shows the distribution of residential program participants by age group. The first chart in **Table 5-8c** shows the percentage of participants in each program that live in areas of each household age grouping. Across all programs, participation was highest for households whose median household member age was between 45-55 years, ranging from 51% to 64%. The lowest participation was in households with a median age of less than 35 years, comprising 0% to 1.2% of all participants.

The second chart in **Table 5-8c** shows participation rates controlled for the number of parcels within the service area within each median household age group. Compared to the overall distribution of customers, there was little difference among age groups for most conservation programs, with the exception of the AMI Leak Notifications Program,[21] which had a higher proportion of participants from households with a median age older than 55 years (19% higher) and a lower proportion of participants 35-45 years (12% lower), and the Rain Barrell Rebate Program, which had a higher proportion of participants from households with a median age between 45 and 55 years (6.3% higher).

These results suggest that, while there are some differences in participation rates across age groups, the District has been generally successful at reaching customers of all age groups in all programs.

5.7. Summary

Sections 5.4 through 5.6 above identify opportunities for the District to increase customer participation in each of the selected programs through targeted outreach to certain customer classes. The results of these analyses can be combined to identify specific customers by overlaying these results spatially. For example, one may identify SFR customers to target with the SFR WBIC Rebate Program by overlaying customers in areas: (1) outside of high participation as identified on **Figure 5-1f**, (2) within low income areas identified on **Figure 5-3a**, and (3) in areas with between 50% and 75% rentership as shown on **Figure 5-3b**. As show on **Figure 5-4,** by overlaying these key metrics, approximately 9,000 SFR customers are identified for potential targeting of SFR WBIC Rebate Program outreach materials.

[21] Participation in the AMI Leak Notifications Program occurs when a customer is notified once a leak is detected for an account based on AMI data, and is not driven by a customer choice to participate.

Table 5-2
Summary of Conservation Program Participation
Marin Municipal Water District

Program Name	End Use		Number of Program Participants																																			Pct. of Accounts (b)
	Sector (a)	Indoor/ Outdoor	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Total	
AMI Leak Notifications Program (c)	SFR, CII, Ag. & Irr.	Both	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	690	1,187	**1,877**	**3.4%**
CII Water Use Evaluation Program	CII	Both	--	--	--	--	--	--	--	--	--	25	42	23	40	56	47	17	4	20	42	16	15	33	53	140	65	89	66	47	41	32	35	35	11	4	**998**	**24%**
HET Rebate Program	SFR	Indoor	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	612	839	1,624	51	--	--	214	1,169	1,226	772	591	427	308	**7,833**	**14%**
HET Direct Install Program (d)	MFR, CII	Indoor	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	42	124	68	--	--	--	--	**234**	**3.80%**
Hot Water Recirculating System	SFR	Outdoor	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	10	141	31	26	13	15	**236**	**0.43%**
Irrigation Improvement Equipment Program	Ag. & Irr.	Outdoor	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	30	12	22	--	--	**64**	**4.6%**
Landscape Plan Review Program	SFR, CII	Outdoor	3	6	29	24	28	39	30	21	32	31	36	38	66	29	27	47	46	40	56	50	74	50	42	45	30	50	76	89	72	88	91	104	114	120	**1,723**	**2.9%**
Large Landscape WBIC Rebate Program (c)	Ag. & Irr.	Outdoor	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5	6	--	--	--	--	**11**	**0.80%**
Laundry-to-Landscape System	SFR	Outdoor	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	13	1	5	--	--	**19**	**0.035%**
Organic Mulch Rebate Program	SFR	Outdoor	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	87	782	203	107	98	80	**1,357**	**2.5%**
Pool Cover Rebate Program	SFR	Outdoor	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	10	142	43	10	13	14	**232**	**0.43%**
Rain Barrel Rebate Program (c)	SFR	Outdoor	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	19	100	20	11	6	6	**162**	**0.30%**
Residential HECW Rebate Program (c)(e)	SFR	Indoor	--	--	--	--	--	--	--	--	--	--	--	--	720	967	826	942	1,472	1,366	1,344	1,248	1,688	1,537	1,620	1,654	252	--	--	133	675	615	439	187	57	65	**17,807**	**33%**
SFR Turf Removal Program (c)	SFR	Outdoor	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	11	44	--	--	--	**55**	**0.10%**
SFR Water Use Surveys/Audits Program (c)	SFR	Both	--	--	--	--	--	--	--	--	--	127	234	380	246	281	470	634	465	319	46	329	83	264	755	892	699	1,102	862	849	1,033	838	498	712	466	253	**12,837**	**24%**
SFR WBIC Rebate Program (c)	SFR	Outdoor	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2	66	42	--	--	--	--	**110**	**0.20%**
Tier 4 Exemption Program (c)	SFR	Both	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	23	6	7	4	3	3	0	1	2	0	2	2	--	--	--	--	**53**	**0.10%**
Time of Sale (Toilet Retrofit) Program	SFR	Indoor	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	327	419	630	391	53	--	--	--	--	--	--	--	--	--	--	--	--	--	**1,820**	**3.4%**
ULFT Rebate Program	SFR	Indoor	--	--	--	--	--	--	--	4	3,552	3,425	3,877	5,112	2,779	2,629	2,078	942	2,580	15	56	174	45	1	--	--	--	--	--	--	--	--	--	--	--	--	--	**27,269**	**50%**
Water Use Surveys/Audits Program (Excluding SFR Participants)	MFR, CII, Ag. & Irr.	Both	--	--	--	--	--	--	--	--	--	49	10	37	26	9	1	6	2	4	2	3	228	362	558	317	463	311	504	504	364	415	128	125	71	22	**4,521**	**58%**
Water Waste Report Program	SFR, CII	Both	--	--	--	--	--	--	--	--	--	--	--	--	6	--	46	16	127	99	41	18	33	80	52	42	33	67	52	68	584	541	190	142	162	151	**2,550**	**4.4%**
Water-wise Community Garden Program	CII, Ag. & Irr.	Outdoor	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	22	--	--	**22**	**0.40%**
Total Turf Removed (sq ft)																																						
SFR Turf Removal Program (Turf Removed)	SFR	Outdoor	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	10,364	45,348	--	--	--	**55,712**	**--**
WBIC Stations Rebated																																						
SFR WBIC Rebate Program (Station Rebated) (f)	SFR	Outdoor	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	20	719	394	--	--	--	--	**1,133**	**--**
Large Landscape WBIC Rebate Program (Station Rebated) (f)	Ag. & Irr.	Outdoor	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	191	123	--	--	--	--	**314**	**--**

Table 5-2
Summary of Conservation Program Participation
Marin Municipal Water District

Abbreviations

Ag. & Irr. = Agricultural & Irrigation
CII = Commercial, Industrial, and Institutional
HECW = High Efficiency Clothes Washer
HET = High Efficiency Toilet
MFR = multi-family residential
Pct. = Percentage
SFR = Single-family residential
sq ft = Square feet
ULFT = Ultra Low Flow Toilet
WBIC = Weather-Based Irrigation Controller

Notes

(a) Each record provided in the sources below is assumed to be one participant. However, some customers may have participated multiple times, but program records do not include sufficient detail to identify this.
(a) Predominant sector for program participants.
(b) Participation is calculated as a percentage of total accounts of the predominant sector indicated.
(c) Indicated program will be included in detailed program analysis.
(d) Three participant records did not incude date and name; thus, they were not included herein.
(e) Only residential washer models are qualified for rebate (i.e. no coin op models).
(f) Number of WBIC rebates shown is based on the number of active valve stations.
(g) Colored shading is added for visualization purposes. Green shading represents higher participation values.

Table 5-3
Summary of Conservation School Education Program Participation
Marin Municipal Water District

Activity	Number of Students Reached by School Year (a)													
	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	Total
Assembly	1,175	2,967	5,942	5,138	6,955	6,962	7,418	6,161	6,890	6,127	6,579	8,122	3,690	**74,126**
BF Garden Registration	--	0	--	--	--	--	--	--	--	--	--	--	--	**0**
BF School Garden Registration	0	--	--	--	--	--	--	--	--	--	--	--	--	**0**
Bus Transportation Paid	--	--	92	75	50	--	218	242	--	--	--	--	--	**677**
Bus Transportation Pending	--	--	56	--	--	--	--	--	--	--	--	--	--	**56**
Event (Staffing)	--	--	90	824	172	120	85	610	330	830	1,250	250	--	**4,561**
Event (Support)	--	--	--	0	--	--	--	--	--	--	--	--	--	**0**
Field Trip (LHS)	--	1,151	--	--	--	--	--	--	--	--	--	--	--	**1,151**
Flyer/Material Distribution	--	--	4,951	2,324	1,344	1,052	--	--	--	--	--	--	--	**9,671**
Hands-on Student Activities	900	--	122	--	--	--	--	--	--	--	--	--	--	**1,022**
Other	--	--	1	--	--	--	--	--	--	--	1	--	--	**2**
Presentation (Classroom)	2,561	372	332	529	731	504	727	550	539	502	834	554	138	**8,873**
Presentation (Misc)	--	40	37	0	0	23	22	--	52	11	11	--	--	**196**
Presentation (Pre-Field Trip)	--	--	936	631	778	834	--	--	--	--	--	--	--	**3,179**
Restoration Field Trip	--	--	768	552	890	558	--	--	--	--	--	--	--	**2,768**
School Garden Grants	--	500	--	--	--	--	--	--	--	--	--	--	--	**500**
Student Projects	25	10	--	--	--	--	--	--	--	--	--	--	--	**35**
Teacher Workshop	1,500	0	--	--	--	--	--	--	--	--	--	--	--	**1,500**
Technical Garden Support	--	0	--	--	--	--	--	--	--	--	--	--	--	**0**
Water Walk Field Trip	--	--	--	149	190	169	285	443	456	338	481	130	66	**2,707**
Total	**6,161**	**5,040**	**13,327**	**10,222**	**11,110**	**10,222**	**8,755**	**8,006**	**8,267**	**7,808**	**9,156**	**9,056**	**3,894**	**111,024**

Table 5-3
Summary of Conservation School Education Program Participation
Marin Municipal Water District

Abbreviations

BF = Bay-Friendly
LHS = Lawrence Hall of Science
Misc = miscellaneous

Notes

(a) School education program participation is presented by number of students reached, per Marin Municipal Water District, 2020. School year is assumed to start in September and end in August.
(b) Colored shading is added for visualization purposes. Green shading represents higher participation values.

Source

Marin Municipal Water District, 2020. School Education.xlsx, provided by MMWD on 1 April 2020.

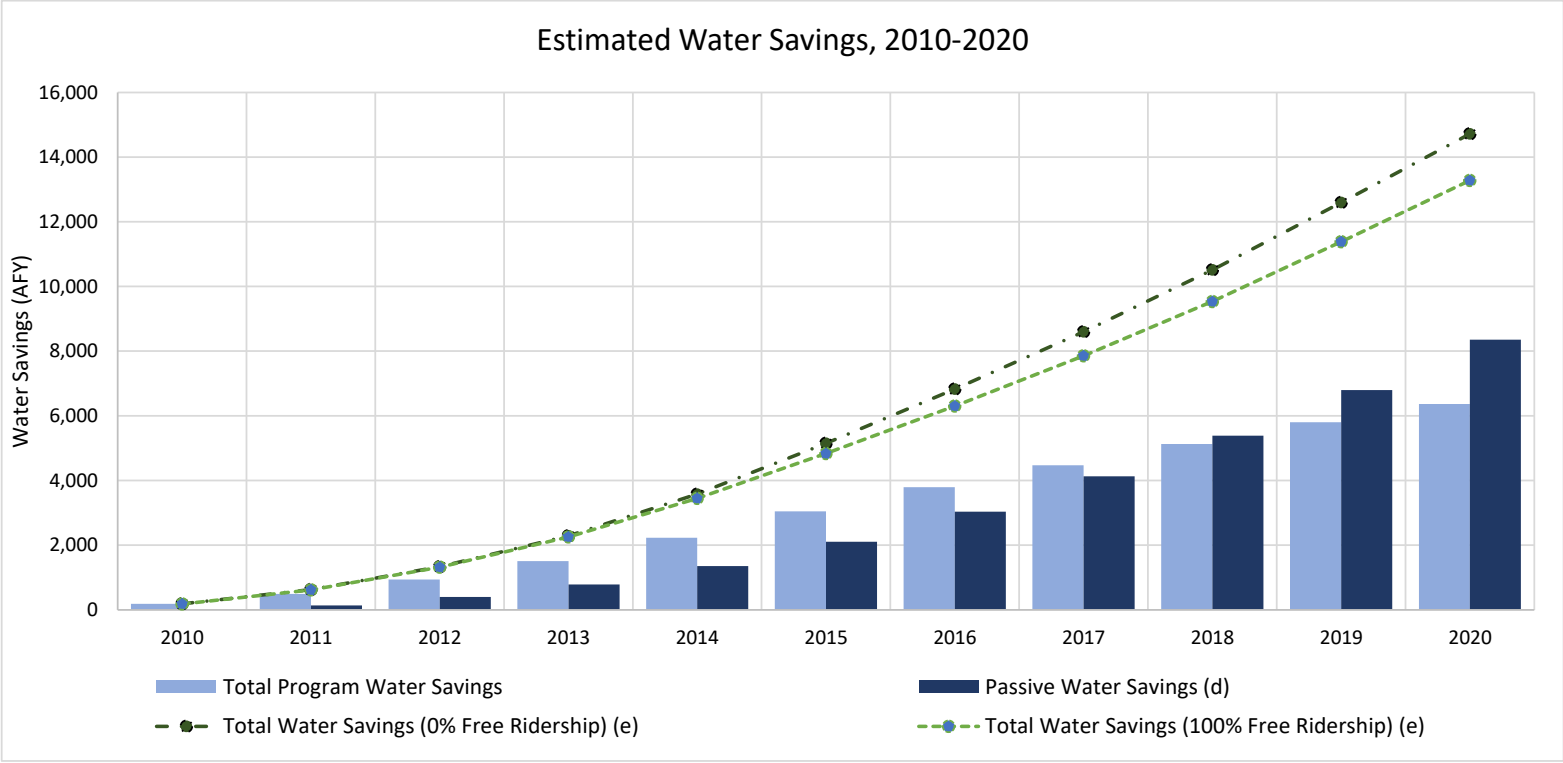
Table 5-4

Estimated Water Savings Achieved by Conservation Programs and Passive Savings

Marin Municipal Water District

Water Saving Type	End Use		Estimated Cumulative Water Savings (AFY) (b)										
	Sector (a)	Indoor/ Outdoor	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Conservation Programs (c)													
AMI Leak Notifications Program	SFR, CII, Ag. & Irr.	Both	0	0	0	0	0	0	0	0	61	229	396
CII Water Use Evaluation Program	CII	Both	19	59	110	165	220	268	307	343	370	389	401
HET Rebate Program	SFR	Indoor	1.5	3.0	4.4	12	59	148	263	397	553	719	880
HET Direct Install Program	MFR, CII	Indoor	1.8	3.5	5.1	19	74	174	270	363	453	540	625
Hot Water Recirculating System	SFR	Outdoor	0	0	0	0	0.06	1.0	2.1	3.3	4.7	6.1	7.5
Irrigation Improvement Equipment Program	Ag. & Irr.	Outdoor	0	0	0	0	0	0.52	1.2	2.4	3.5	4.6	5.7
Large Landscape WBIC Rebate Program	Ag. & Irr.	Outdoor	0	0	0	0	0	1.5	4.7	8.0	11	15	18
Laundry-to-Landscape System	SFR	Outdoor	0	0	0	0	0	0.21	0.44	0.76	1.1	1.4	1.7
Organic Mulch Rebate Program	SFR	Outdoor	0	0	0	0	0	0.04	0.07	0.12	0.17	0.22	0.27
Pool Cover Rebate Program	SFR	Outdoor	0	0	0	0	0.21	3.3	7.3	12	16	21	22
Rain Barrel Rebate Program	SFR	Outdoor	0	0	0	0	0	0.11	0.22	0.34	0.5	0.6	0.7
Residential HECW Rebate Program	SFR	Indoor	3.3	6.4	9.4	14	27	47	72	99	124	149	172
SFR Turf Removal Program	SFR	Outdoor	0	0	0	0	0	0.38	2.4	4.5	6.5	9	11
SFR Water Use Surveys/Audits Program	SFR	Both	27	90	173	272	390	508	607	703	787	850	891
SFR WBIC Rebate Program	SFR	Outdoor	0	0	0	0	3.7	10	15	21	27	33	39
Water Use Surveys/Audits Program (Excluding SFR Participants)	MFR, CII, Ag. & Irr.	Both	133	328	630	1,015	1,428	1,834	2,166	2,420	2,597	2,710	2,761
Water Waste Report Program	SFR, CII	Both	0.70	2.7	5.4	9.0	24	48	70	91	110	125	133
Water-wise Community Garden Program	CII, Ag. & Irr.	Outdoor	0	0	0	0	0	0	0	0.38	0.76	1.1	1.5
Total Program Water Savings			*185*	*493*	*937*	*1,506*	*2,226*	*3,043*	*3,790*	*4,468*	*5,126*	*5,801*	*6,366*
Passive Water Savings (d)			*0*	*135*	*398*	*785*	*1,351*	*2,106*	*3,035*	*4,128*	*5,384*	*6,794*	*8,352*
Total Water Savings (100% Free Ridership) (e)			**180**	**617**	**1,320**	**2,254**	**3,444**	**4,834**	**6,302**	**7,853**	**9,533**	**11,380**	**13,277**
Total Water Savings (0% Free Ridership) (e)			**185**	**628**	**1,336**	**2,290**	**3,577**	**5,149**	**6,824**	**8,596**	**10,510**	**12,595**	**14,718**

Table 5-4
Estimated Water Savings Achieved by Conservation Programs and Passive Savings
Marin Municipal Water District



Abbreviations

Ag. & Irr. = Agricultural & Irrigation
CII = Commercial, Industrial, and Institutional
HECW = High Efficiency Clothes Washer
HET = High Efficiency Toilet
MFR = multi-family residential
SFR = single-family residential
WBIC = weather-based irrigation controller

Table 5-4

Estimated Water Savings Achieved by Conservation Programs and Passive Savings

Marin Municipal Water District

Notes

(a) Predominant sector for program participants.

(b) Water savings are estimated per the AWE model.

(c) The water savings associated with the landscape plan review program and the tier 4 exemption program are estimated as a part of passive savings. Additional programs with participation prior to 2010 are not included herein.

(d) Passive water savings are water savings associated with the natural change out of water using fixtures and devices with higher efficiency ones, due to plumbing code and market changes. Passive savings are estimated for the whole service area.

(e) Free ridership refers to customers who participate in a conservation program, but who would have taken the water saving action (e.g., replace a toilet) regardless of whether the conservation program incentive was available. The amount of free ridership is unknown, and thus a range is shown. Free ridership is applied to device, hot water recirculation systems, turf replacement, and other irrigation equipment programs only.

Sources

1. Marin Municipal Water District, 2020. Program Participation Data, provided by Marin Municipal Water District on 1 April 2020 and 16 June 2020.

Table 5-6a
Estimated Water Savings Achieved by the AMI Leak Notifications Program
Marin Municipal Water District

Year	Number of Participants (a)	Average Water Use Reduction (b)		Estimated Savings due to Program (d) (gal/acct/yr)
		Participant Group (gal/yr)	Cohort Group (c) (gal/yr)	
2018	62	15,291	-13,732	29,023
Total	**62**	**--**	**--**	**--**
Avg (e)	**--**	**15,291**	**-13,732**	**29,023**

Abbreviations:

avg = average
gal/acct/yr = gallons per account per year
gal/yr = gallons per year
MFR = multi-family residential
SFR = single family residential
-- = not applicable

Notes:

(a) Program participants included in this analysis are limited to those that: (1) have only participated in the specified program, (2) have only participated in the program in the specified year, and (3) have sufficient water use data within the study periods.
(b) A negative value indicates that average water use increased following program participation.
(c) Customers included in the comparison cohort groups are limited to those that: (1) have not participated in any water efficiency program based on available data and (2) have sufficient water use data within the study periods.
(d) Estimated annual water savings associated with the program are calculated as the incremental amount of water saved by the program participants over that of the comparison cohort accounts. Water savings comparison cohorts for SFR and MFR customers are stratified geographically based on Census Block Groups. Cohorts for participants in other sectors are stratified by sector only.
(e) The estimated savings are the weighted average based on the number of participants. Water use reduction averages are not weighted.

Sources:

1. Marin Municipal Water District, 2020. Customer Billing History, provided by Marin Municipal Water District on 9 July 2020.

Table 5-6b
Estimated Water Savings Achieved by the Residential HECW Rebate Program
Marin Municipal Water District

Year	Number of Participants (a)	Total HECW Rebated (unit)	Total Rebate Amount ($)	Average Water Use Reduction (b)		Estimated Savings due to Program (d) (gal/acct/yr)	Estimated Unit Savings (gal/yr/unit)
				Participant Group (gal/yr)	Cohort Group (c) (gal/yr)		
2013	68	68	$3,400	11,985	6,905	5,080	5,080
2014	354	355	$17,750	16,344	11,441	4,904	4,890
2015	315	315	$28,150	11,402	8,680	2,723	2,723
2016	186	186	$27,900	5,852	2,356	3,496	3,496
2017	84	84	$12,600	2,545	-4,824	7,369	7,369
2018	24	24	$3,600	2,068	-6,486	8,553	8,553
Total	**1,031**	**1,032**	**$93,400**	--	--	--	--
Avg (e)	--	--	--	**8,366**	**3,012**	**4,281**	**4,276**

Abbreviations:

avg = average
gal/acct/yr = gallons per account per year
gal/yr = gallons per year
gal/yr/unit = gallons per year per unit device rebated
HECW = high efficiency clothes washer
MFR = multi-family residential
SFR = single family residential
-- = not applicable

Notes:

(a) Program participants included in this analysis are limited to those that: (1) have only participated in the specified program, (2) have only participated in the program in the specified year, and (3) have sufficient water use data within the study periods.
(b) A negative value indicates that average water use increased following program participation.
(c) Customers included in the comparison cohort groups are limited to those that: (1) have not participated in any water efficiency program based on available data and (2) have sufficient water use data within the study periods.
(d) Estimated annual water savings associated with the program are calculated as the incremental amount of water saved by the program participants over that of the comparison cohort accounts. Water savings comparison cohorts for SFR and MFR customers are stratified geographically based on Census Block Groups. Cohorts for participants in other sectors are stratified by sector only.
(e) The estimated savings are the weighted averages based on the number of participants. Water use reduction averages are not weighted.

Sources:

1. Marin Municipal Water District, 2020. Customer Billing History, provided by Marin Municipal Water District on 9 July 2020.

Table 5-6c
Estimated Water Savings Achieved by the SFR Water Use Surveys/Audits Program
Marin Municipal Water District

Year	Number of Participants (a)	Average Water Use Reduction (b)		Estimated Savings due to Program (d) (gal/acct/yr)
		Participant Group (gal/yr)	Cohort Group (c) (gal/yr)	
2013	311	14,784	7,320	7,464
2014	346	18,632	11,006	7,627
2015	299	16,028	8,114	7,914
2016	210	8,473	1,782	6,690
2017	311	-4,120	-5,694	1,574
2018	205	379	-6,112	6,491
Total	**1,682**	**--**	**--**	**--**
Avg (e)	**--**	**9,029**	**2,736**	**6,273 (f)**

Abbreviations:

avg = average
gal/acct/yr = gallons per account per year
gal/yr = gallons per year
MFR = multi-family residential
MMWD = Marin Municipal Water District
SFR = single family residential
-- = not applicable

Notes:

(a) Program participants included in this analysis are limited to those that: (1) have only participated in the specified program, (2) have only participated in the program in the specified year, and (3) have sufficient water use data within the study periods. It is noted that participants was not limited to SFR customers.
(b) A negative value indicates that average water use increased following program participation.
(c) Customers included in the comparison cohort groups are limited to those that: (1) have not participated in any water efficiency program based on available data and (2) have sufficient water use data within the study periods.
(d) Estimated annual water savings associated with the program are calculated as the incremental amount of water saved by the program participants over that of the comparison cohort accounts. Water savings comparison cohorts for SFR and MFR customers are stratified geographically based on Census Block Groups. Cohorts for participants in other sectors are stratified by sector only.
(e) The estimated savings are the weighted average based on the number of participants. Water use reduction averages are not weighted.
(f) MMWD often promoted rebates to SFR customers during the water use survey. As such, it is likely that many customers also participated in rebate programs, which eliminated them from the participant group. The participants who did not follow up with the rebate programs might have different water use habits than those who did. Thus, the estimated savings presented here is different than the expected value.

Sources:

1. Marin Municipal Water District, 2020. Customer Billing History, provided by Marin Municipal Water District on 9 July 2020.

Table 5-6d
Estimated Water Savings Achieved by the SFR WBIC Rebate Program
Marin Municipal Water District

Year	Number of Participants (a)	Total WBIC Rebated (unit)	Total WBIC Station (station)	Total Rebate Amount ($)	Average Water Use Reduction (b)		Estimated Savings due to Program (d) (gal/acct/yr)	Estimated Unit Savings	
					Participant Group (gal/yr)	Cohort Group (c) (gal/yr)		(gal/yr/WBIC)	(gal/yr/station)
2014	66	66	719	$12,937	27,226	11,131	16,095	16,095	1,477
2015	42	42	394	$7,676	27,387	8,303	19,084	19,084	2,034
Total	**108**	**108**	**1,113**	**$20,613**	--	--	--	--	--
Avg (e)	--	--	--	--	**27,307**	**9,717**	**17,258**	**17,258**	**1,694**

Abbreviations:

avg = average
gal/acct/yr = gallons per account per year
gal/yr = gallons per year
gal/yr/WBIC = gallons per year per WBIC rebated
gal/yr/station = gallons per year per WBIC station
SFR = single family residential
WBIC = weather-based irrigation controller
-- = not applicable

Notes:

(a) Program participants included in this analysis are limited to those that have sufficient water use data within the study periods. All the participants have participated in more than one conservation program, thus the analysis is not limited to those that only participated in this program.
(b) A negative value indicates that average water use increased following program participation.
(c) Customers included in the comparison cohort groups are limited to those that: (1) have not participated in any water efficiency program based on available data and (2) have sufficient water use data within the study periods.
(d) Estimated annual water savings associated with the program are calculated as the incremental amount of water saved by the program participants over that of the comparison cohort accounts. Water savings comparison cohorts for SFR customers are stratified geographically based on Census Block Groups.
(e) The estimated savings are the weighted averages based on the number of participants. Water use reduction averages are not weighted.

Sources:

1. Marin Municipal Water District, 2020. Customer Billing History, provided by Marin Municipal Water District on 9 July 2020.

Table 5-7
Building Stock Characteristics by Program Participants
Marin Municipal Water District

Water Efficiency Program (a)	Sector (b)	Avg Year Built	Avg Lot Size (sq ft)	Avg Lot Size (ac)	Year of Construction		
					pre-1994	1994-2009	2010 and Later
AMI Leak Notifications Program	SFR	1987	24,291	0.56	64%	33%	2.7%
	CII	1957	479,819	11	100%	0%	0%
	Irrig.	1973	953,284	22	93%	7.5%	0%
Rain Barrel Rebate Program	SFR	1971	11,669	0.27	91%	9.0%	0%
Residential HECW Rebate Program	SFR	1975	13,834	0.32	84%	15%	0.67%
	MFR	1979	47,317	1.1	89%	11%	0.24%
	CII	1954	118,839	2.7	95%	1.3%	3.9%
SFR Water Use Surveys/Audits Program	SFR	1977	19,155	0.44	81%	18%	0.99%
SFR WBIC Rebate Program	SFR	1978	20,113	0.46	81%	19%	0%

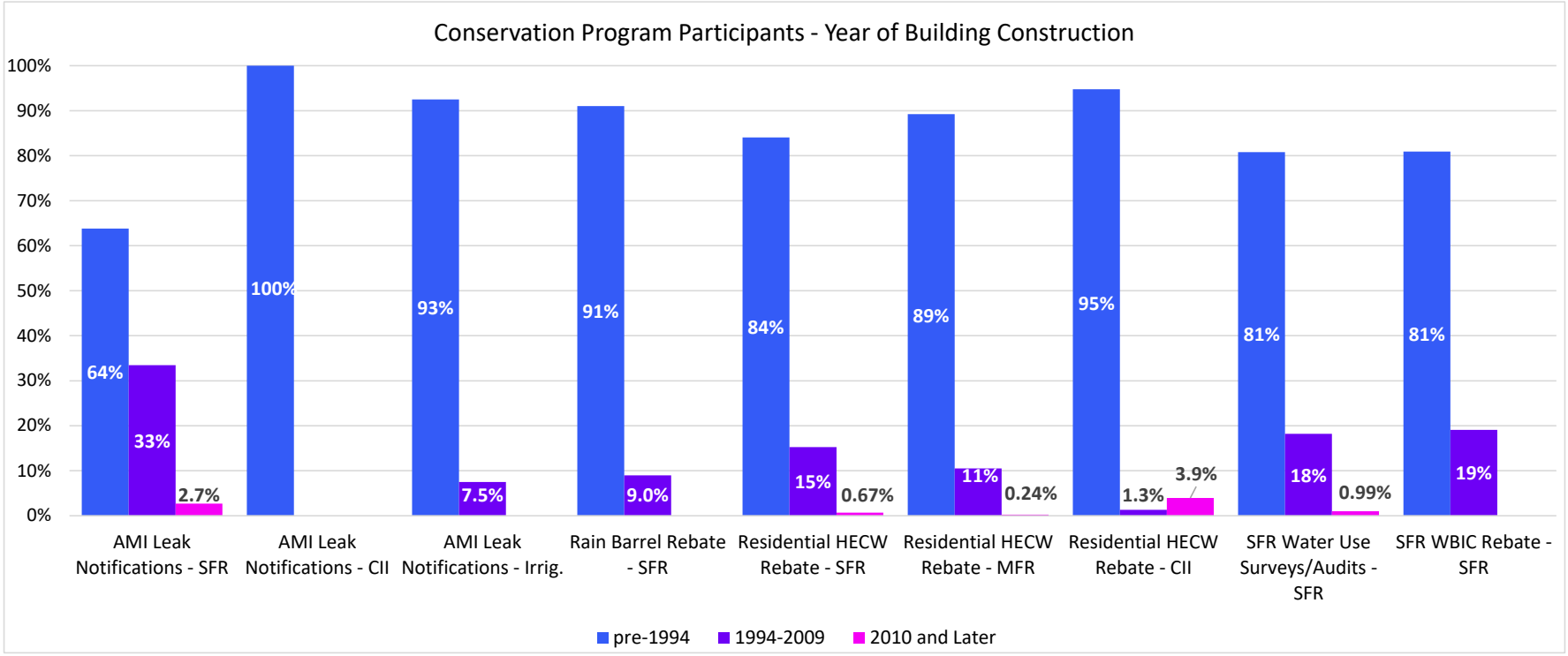


Table 5-7
Building Stock Characteristics by Program Participants
Marin Municipal Water District

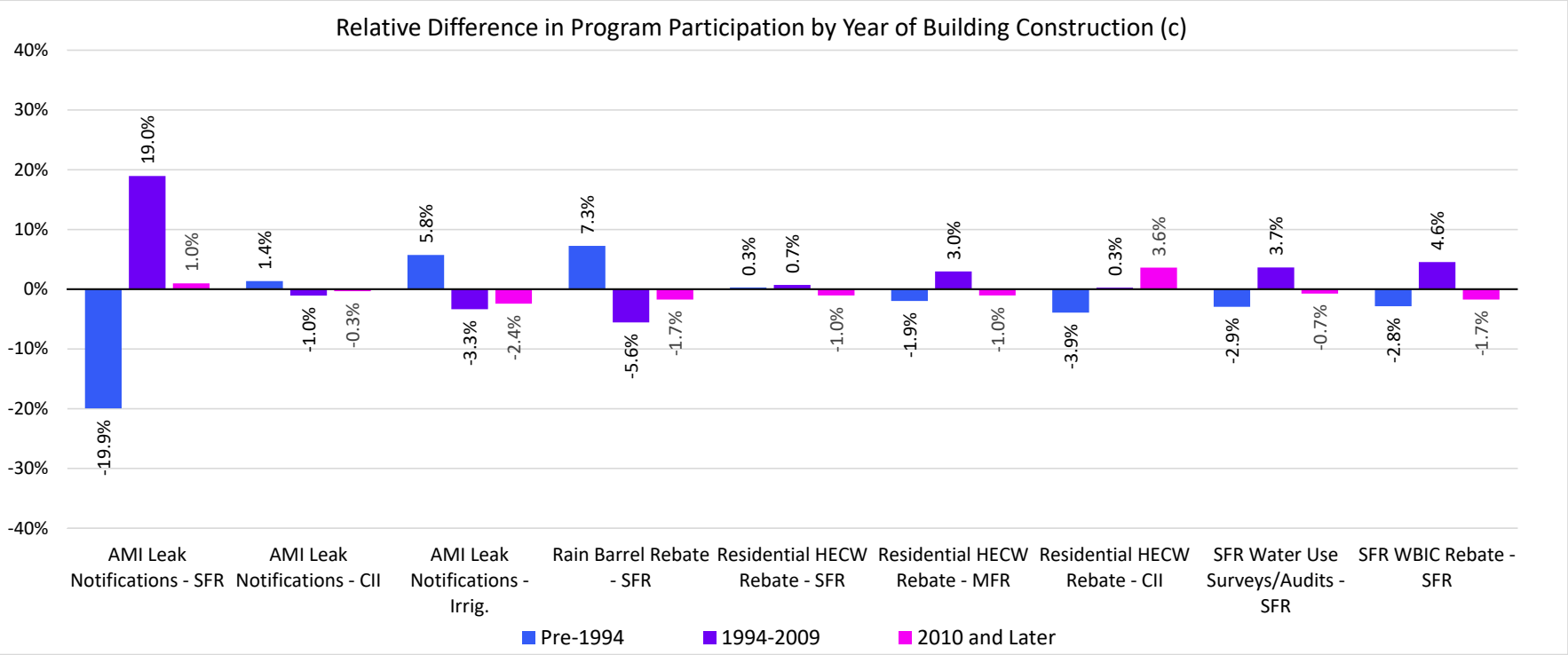


Table 5-7
Building Stock Characteristics by Program Participants
Marin Municipal Water District

Abbreviations:

ac = acre
avg = average
CII = commercial, industrial, and institutional
Irrig. = Irrigation
HECW = High Rfficiency Clothes Washer
MFR = multi-family residential
SFR = single family residential
sq ft = square feet

Notes:

(a) Program participants included in this analysis are limited to those for which relevant parcel data are available. The analysis is also limited to sectors with more than 50 participants in a given program.
(b) Program participants in the business / industrial and institutional sectors are grouped as "CII", and participants in the agricultural / irrigation sector are presented as "Irrig." in this analysis.
(c) Relative difference is calculated as the percentage of program participation by year of construction minus the overall percentage of residential customers by year of construction within the service area.

Sources:

1. Marin County, 2020. Sonoma county Assessor Parcel Data, provided via Marin Municipal Water District, 13 February 2020.

Table 5-8a
Residential Customer Program Participation by Median Household Income
Marin Municipal Water District

Median Household Income (a)		Percentage of Residential Customers in MMWD (b)	Percentage of Participating Residential Customers (b)				
			AMI Leak Notifications Program	Rain Barrel Rebate Program	Residential HECW Rebate Program	SFR Water Use Surveys/Audits Program	SFR WBIC Rebate Program
Low Income	<$94,850	20%	0.78%	19%	18%	15%	13%
Moderate Income	$94,850 - $124,500	26%	33%	28%	26%	25%	23%
High Income	>$124,500	54%	66%	53%	57%	59%	65%

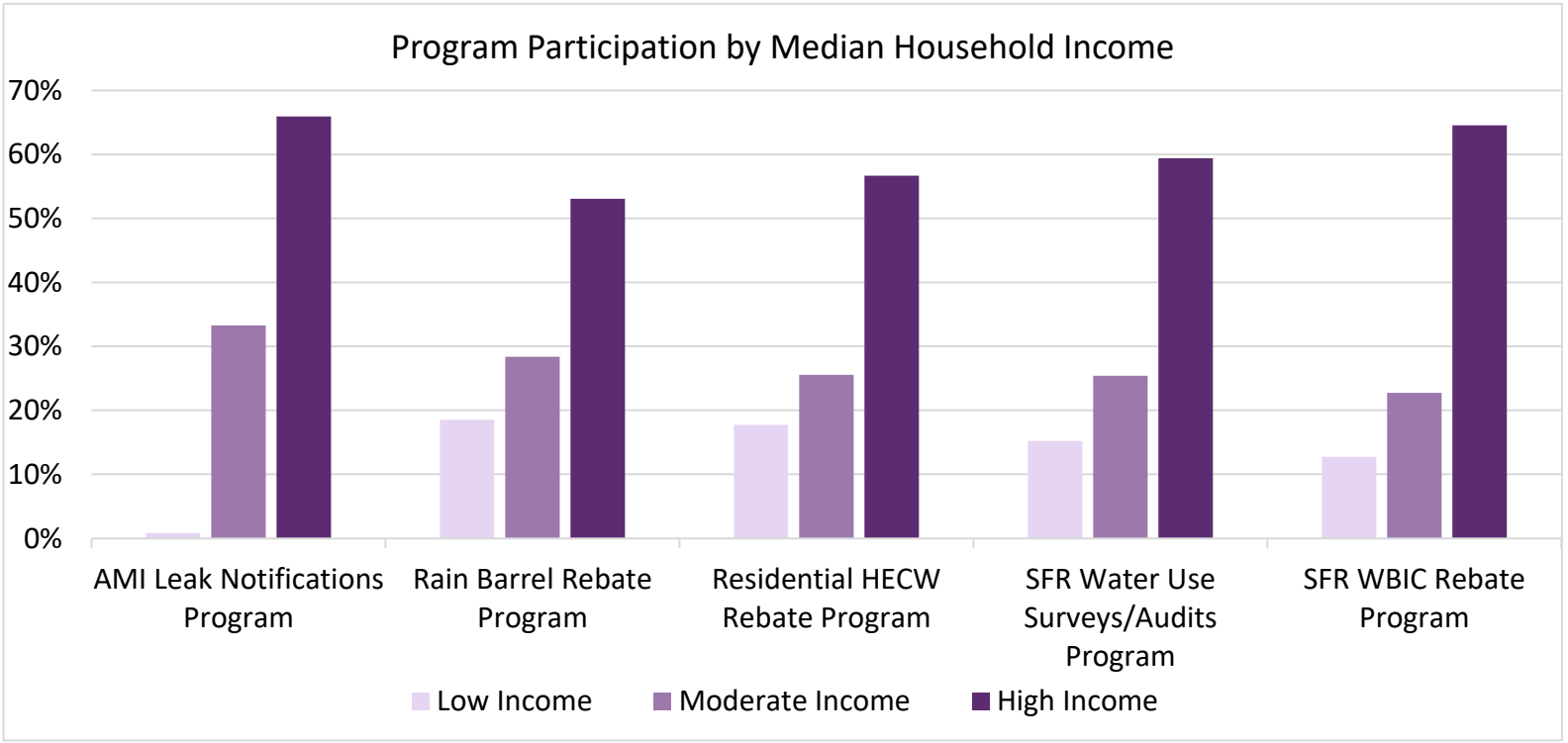
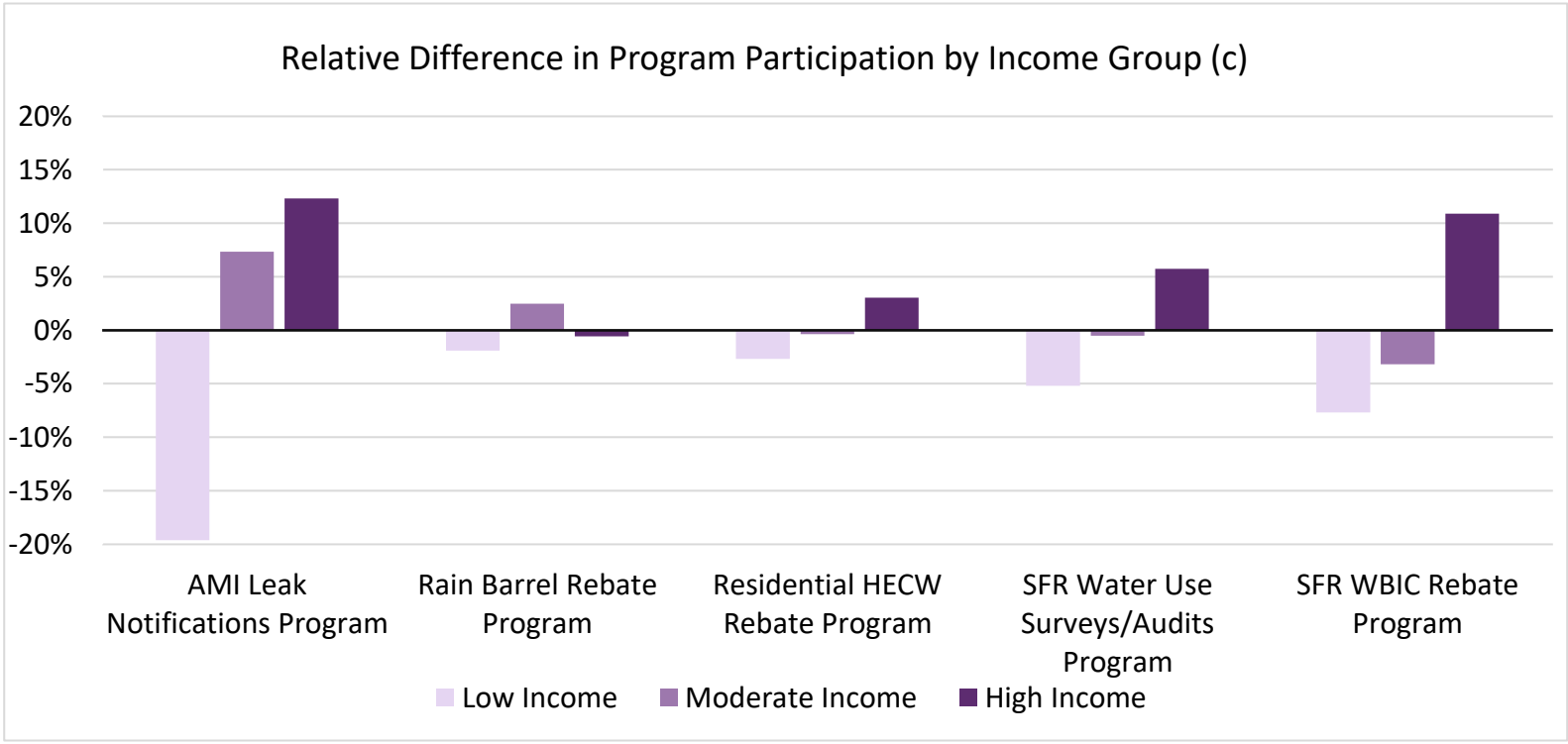


Table 5-8a
Residential Customer Program Participation by Median Household Income
Marin Municipal Water District



Abbreviations:

AMI = Advanced Metering Infrastructure
HECW = High Efficiency Clothes Washer
HUD = United States Department of Housing and Urban Development
MMWD = Marin Municipal Water District
SFR = single family residential
WBIC = weather-based irrigation controller

Table 5-8a
Residential Customer Program Participation by Median Household Income
Marin Municipal Water District

Notes:
(a) Household income is based on estimated 2017 median household income by Census Block Group, per Census (2019). Income level groupings are based on California Department of Housing and Community Development (HCD) income levels for Marin County for a 3-person household in 2017 (HCD, 2017). The average persons per household is 2.4 for Marin County, based on Census data.
(b) Residential customers include both single-family and multi-family customers. Participants included in this analysis are limited to those for which location data are available.
(c) Relative difference is calculated as the percentage of program participation by income group minus the overall percentage of residential customers by income group within the service area.

References:
1. Census, 2019. 2013-2017 American Community Survey (ACS) 5-year estimates. TIGER/Line Shapefiles by Block Group, https://www.census.gov/geo/maps-data/data/tiger-data.html, United States Census Bureau, downloaded on 14 January 2020.
2. HCD, 2017. Memorandum: State Income Limits for 2017, California Department of Housing and Community Development, dated June 9, 2017.

Table 5-8b
Residential Customer Program Participation by Percentage of Renters
Marin Municipal Water District

Percentage of Renters (a)		Percentage of Residential Customers in MMWD (b)	Percentage of Participating Residential Customers (b)				
			AMI Leak Notifications Program	Rain Barrel Rebate Program	Residential HECW Rebate Program	SFR Water Use Surveys/Audits Program	SFR WBIC Rebate Program
Low Rentership	≤25%	48%	51%	56%	52%	53%	55%
Low to Moderate Rentership	25.1%-50%	34%	48%	34%	34%	34%	36%
Moderate to High Rentership	50.1%-75%	16%	1.1%	9.3%	13%	12%	8.2%
High Rentership	≥75%	2.0%	0.11%	0.62%	1.0%	0.84%	0%

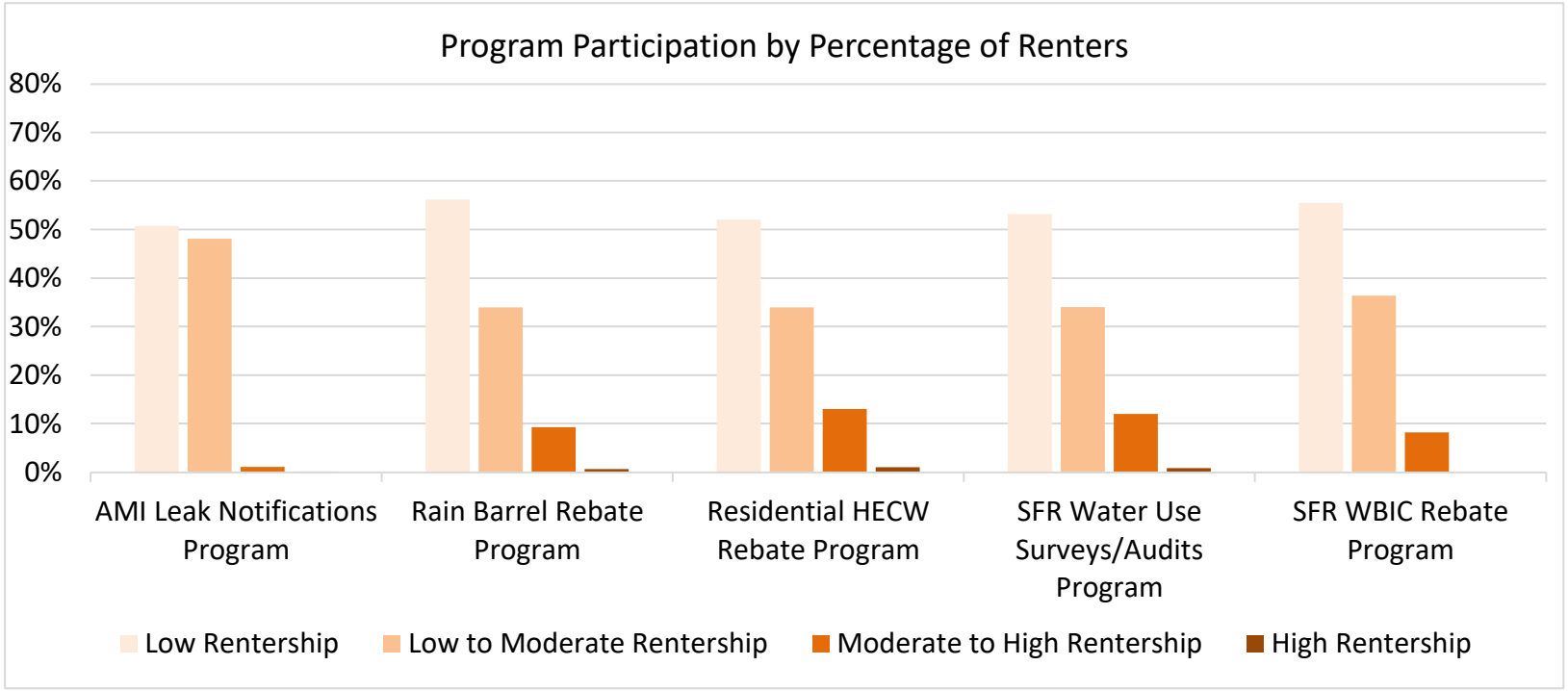
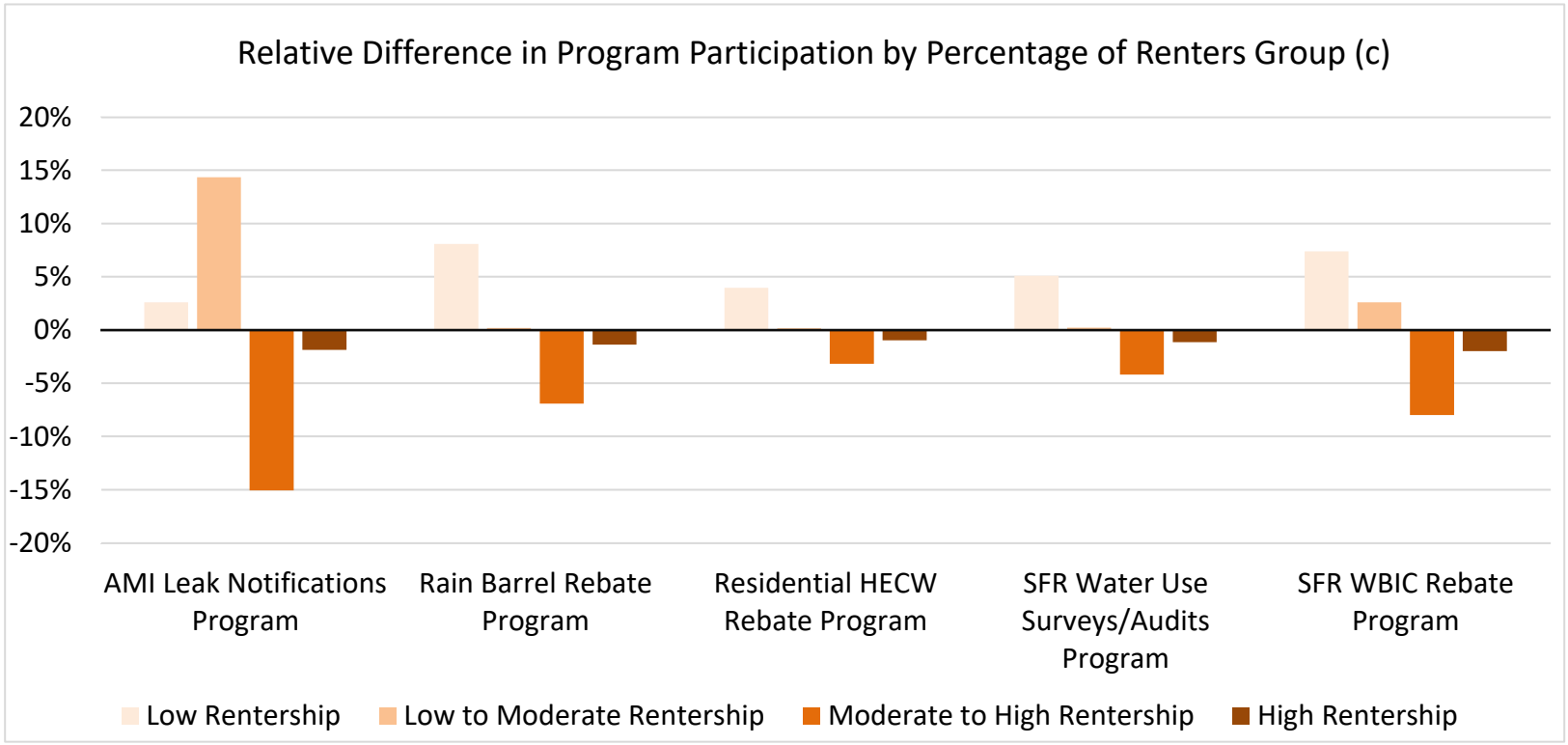


Table 5-8b
Residential Customer Program Participation by Percentage of Renters
Marin Municipal Water District



Abbreviations:

AMI = Advanced Metering Infrastructure
HECW = High Efficiency Clothes Washer
MMWD = Marin Municipal Water District
SFR = single family residential
WBIC = weather-based irrigation controller

Table 5-8b
Residential Customer Program Participation by Percentage of Renters
Marin Municipal Water District

Notes:

(a) Percent rentership reflects the proportion of population within a given Census Block Group that lives in renter-occupied homes. Low rentership indicates an area consists predominantly of owner-occupied homes; high rentership indicates an area consists predominantly of renter-occupied homes. Rentership is based on estimated percentage of rentership by Census Block Group, per Census (2019).

(b) Residential customers include both single-family and multi-family customers. Participants included in this analysis are limited to those for which location data are available.

(c) Relative difference is calculated as the percentage of program participation by percent of renters group minus the overall percentage of residential customers by percent of renters group within the service area.

References:

1. Census, 2019. 2013-2017 American Community Survey (ACS) 5-year estimates. TIGER/Line Shapefiles by Block Group, https://www.census.gov/geo/maps-data/data/tiger-data.html, United States Census Bureau, downloaded on 14 January 2020.

Table 5-8c
Residential Customer Program Participation by Median Household Age
Marin Municipal Water District

Median Household Age (a)	Percentage of Residential Customers in MMWD (b)	Percentage of Participating Residential Customers (b)				
		AMI Leak Notifications Program	Rain Barrel Rebate Program	Residential HECW Rebate Program	SFR Water Use Surveys/Audits Program	SFR WBIC Rebate Program
<35 Years	1.6%	0.11%	1.2%	0.97%	0.92%	0%
35-45 Years	27%	15%	23%	27%	23%	30%
45-55 Years	57%	51%	64%	58%	58%	55%
>55 Years	14%	34%	12%	14%	17%	15%

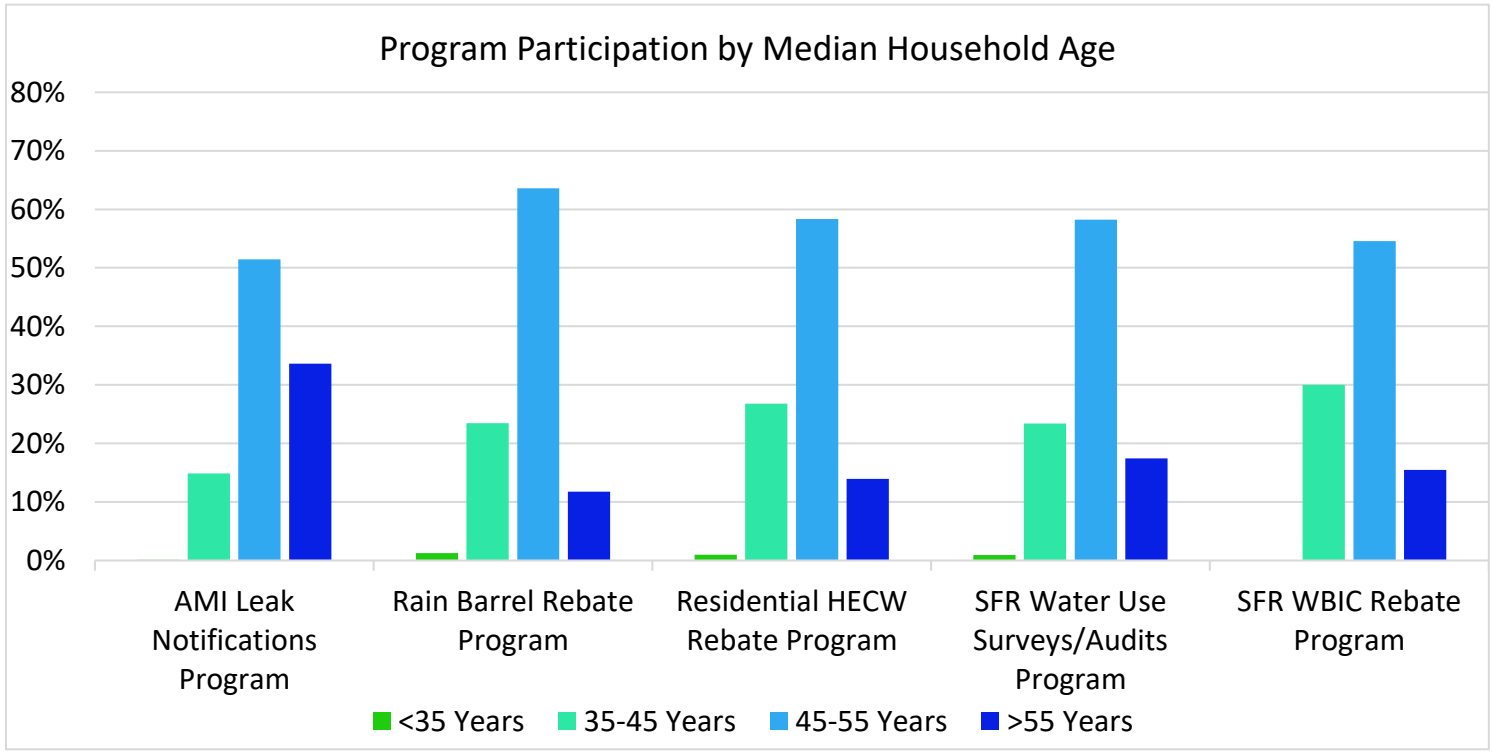
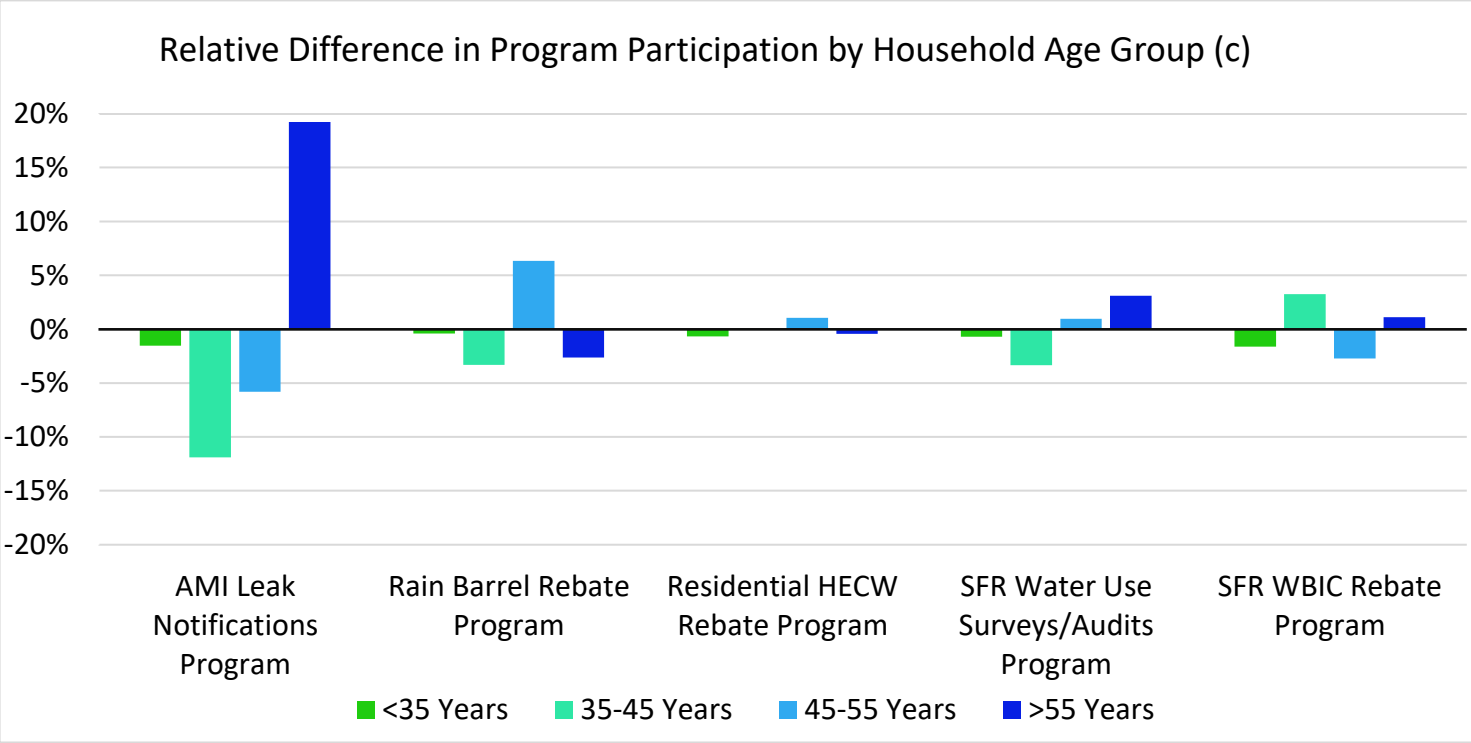


Table 5-8c
Residential Customer Program Participation by Median Household Age
Marin Municipal Water District



Abbreviations:

AMI = Advanced Metering Infrastructure
HECW = High Efficiency Clothes Washer
MMWD = Marin Municipal Water District
SFR = single family residential
WBIC = weather-based irrigation controller

Table 5-8c
Residential Customer Program Participation by Median Household Age
Marin Municipal Water District

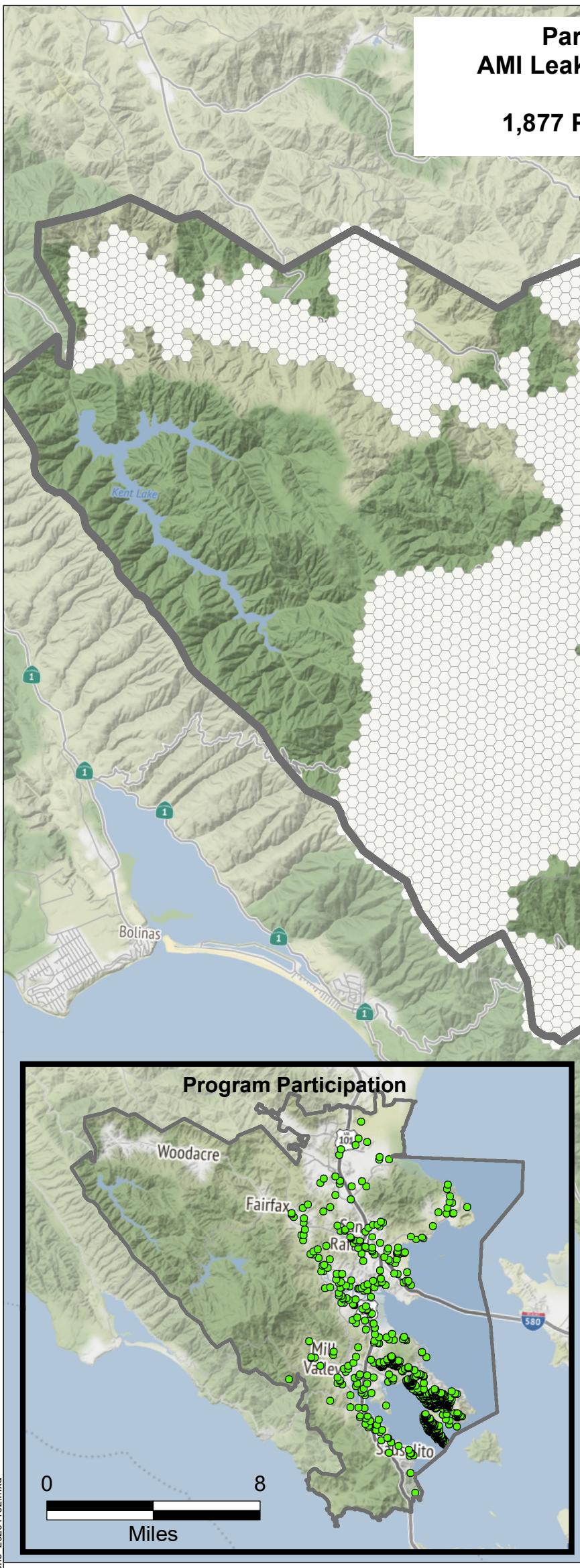
Notes:

(a) Median household age is based on the estimated median age of household members by Census Block Group, per Census (2019).
(b) Residential customers include both single-family and multi-family customers. Participants included in this analysis are limited to those for which location data are available.
(c) Relative difference is calculated as the percentage of program participation by household age group minus the overall percentage of residential customers by household age group within the service area.

References:

1. Census, 2019. 2013-2017 American Community Survey (ACS) 5-year estimates. TIGER/Line Shapefiles by Block Group, https://www.census.gov/geo/maps-data/data/tiger-data.html, United States Census Bureau, downloaded on 14 January 2020.

Participation Density
AMI Leak Notifications Program
2018 - 2020
1,877 Participants Analyzed



Legend

Participation Hot and Cold Spots

- Cold Spot - 99% Confidence
- Cold Spot - 95% Confidence
- Cold Spot - 90% Confidence
- Not Significant
- Hot Spot - 90% Confidence
- Hot Spot - 95% Confidence
- Hot Spot - 99% Confidence

Program Participation

- AMI Leak Notifications
- Service Area

Notes

1. All locations are approximate.
2. Program participation hot and cold spots were evaluated using the Esri ArcGIS 10.8.0 Optimized Hot Spot Analysis tool, which calculates a Getis-Ord GI* statistic. This statistic is a measure of the spatial distribution of incidents (participation) relative to a random, equally-spaced distribution.
3. Participants included in this analysis are limited to those for which detailed participation records and location data are available.

Sources

1. Water use efficiency program data provided by Marin Municipal Water District on April 2020.
2. Basemaps provided by ESRI and Stamen Design, under CC BY 3.0. Data by OpenStreetMap, under ODbL.

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Miles

Participation Density for AMI Leak Notifications Program

Marin Municipal Water District
December 2020
C00004.00

Figure 5-1a

eki environment & water

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Participation Density
AMI Leak Notifications Program
2018 - 2019
932 Participants Analyzed

Strawberry
Ring Mountain Open Space Preserve
Horse Hill Open Space Preserve
Tiburon Uplands Nature Preserve
Saint Hilary's Open Space Preserve
Angel Island State Park
Sausalito

Program Participation

0 1.5 3
Miles

Legend

Participation Hot and Cold Spots

- Cold Spot - 99% Confidence
- Cold Spot - 95% Confidence
- Cold Spot - 90% Confidence
- Not Significant
- Hot Spot - 90% Confidence
- Hot Spot - 95% Confidence
- Hot Spot - 99% Confidence

Program Participation

- AMI Leak Notifications Program
- Service Area

Notes

1. All locations are approximate.
2. Program participation hot and cold spots were evaluated using the Esri ArcGIS 10.8.0 Optimized Hot Spot Analysis tool, which calculates a Getis-Ord GI* statistic. This statistic is a measure of the spatial distribution of incidents (participation) relative to a random, equally-spaced distribution.
3. Participants included in this analysis are limited to those for which detailed participation records and location data are available.

Sources

1. Water use efficiency program data provided by Marin Municipal Water District on April 2020.
2. Basemaps provided by ESRI and Stamen Design, under CC BY 3.0. Data by OpenStreetMap, under ODbL.

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Participation Density for AMI Leak Notifications Program - Belvedere and Tiburon

Marin Municipal Water District
December 2020
C00004.00
Figure 5-1b

eki environment & water

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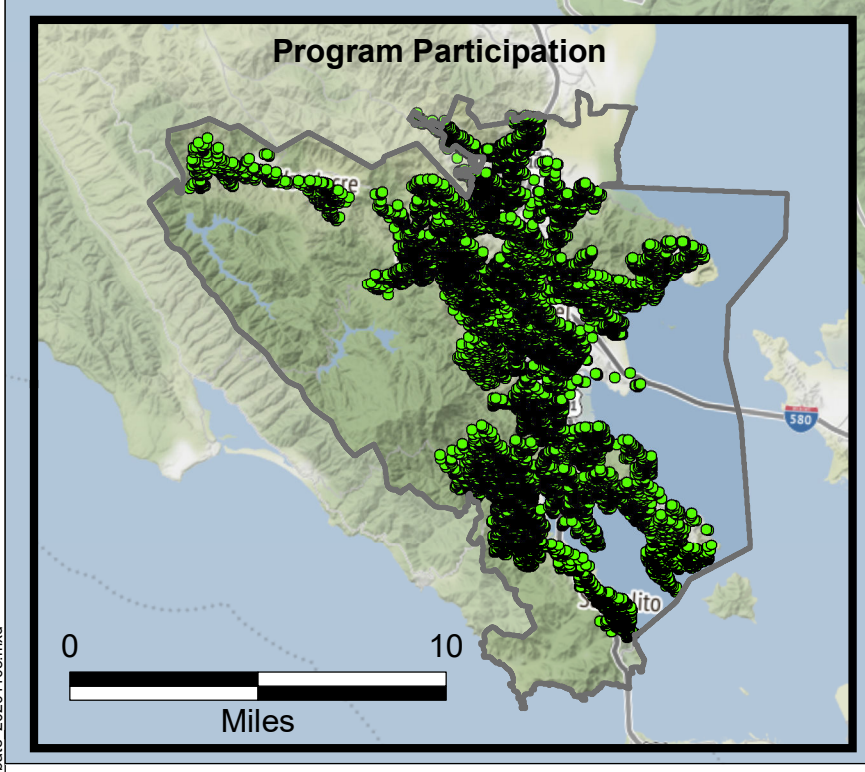
Participation Density
Residential HECW Rebate Program
1998 - 2019
17,311 Participants Analyzed



Legend

Participation Hot and Cold Spots

- Cold Spot - 99% Confidence
- Cold Spot - 95% Confidence
- Cold Spot - 90% Confidence
- Not Significant
- Hot Spot - 90% Confidence
- Hot Spot - 95% Confidence
- Hot Spot - 99% Confidence

Program Participation

- Residential HECW Rebate Program
- Service Area Boundary

Abbreviation

CII = commercial, industrial, and institutional
HECW = high efficiency clothes washer
MFR = multi-family residential
SFR = single family residential

Notes

1. All locations are approximate.
2. Program participation hot and cold spots were evaluated using the Esri ArcGIS 10.8.0 Optimized Hot Spot Analysis tool, which calculates a Getis-Ord GI* statistic. This statistic is a measure of the spatial distribution of incidents (participation) relative to a random, equally-spaced distribution.
3. Participants included in this analysis are limited to those for which detailed participation records and location data are available.
4. The HECW Rebate Program is open to SFR, MFR, and CII customers, but only residential washers are rebated.

Sources

1. Water use efficiency program data provided by Marin Municipal Water District on April 2020.
2. Basemaps provided by ESRI and Stamen Design, under CC BY 3.0. Data by OpenStreetMap, under ODbL.

N

0 1.5 3
Miles

Participation Density for Residential HECW Rebate Program

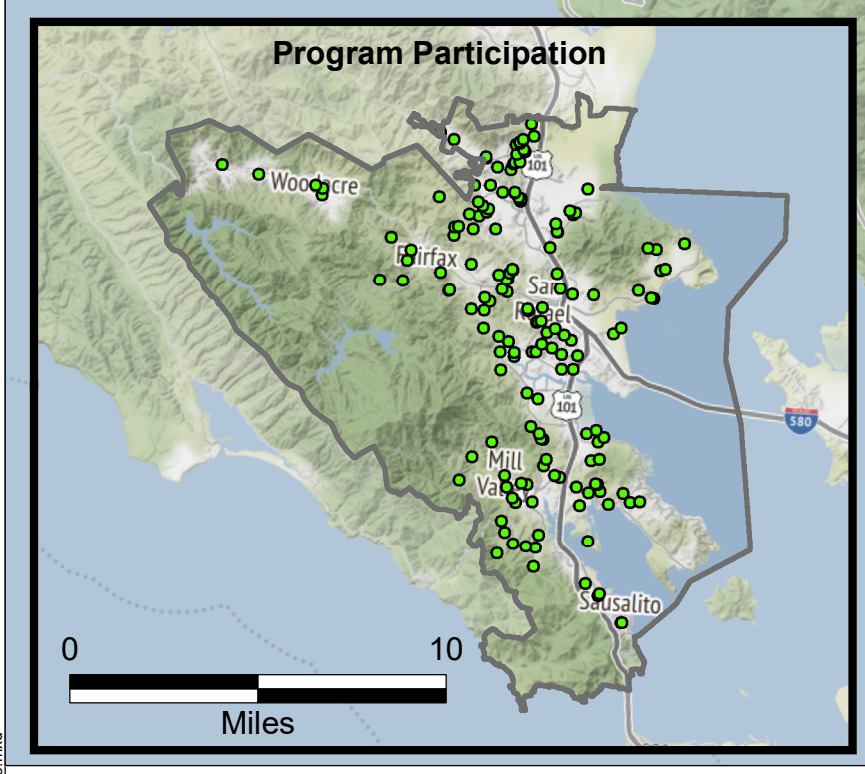
Marin Municipal Water District
December 2020
C00004.00

Figure 5-1c

eki environment & water

Path: X:\C00004 SonomaMarin\Map\2020\12 MMWD\Fig5-1c MMWD HotSpot RES CII HECW Rebate 20201103.mxd

Participation Density
Rain Barrel Rebate Program
2014-2020
162 Participants Analyzed



Legend

Participation Hot and Cold Spots

- Cold Spot - 99% Confidence
- Cold Spot - 95% Confidence
- Cold Spot - 90% Confidence
- Not Significant
- Hot Spot - 90% Confidence
- Hot Spot - 95% Confidence
- Hot Spot - 99% Confidence

Program

- Rain Barrel Rebate
- Service Area

Notes

1. All locations are approximate.
2. Program participation hot and cold spots were evaluated using the Esri ArcGIS 10.8.0 Optimized Hot Spot Analysis tool, which calculates a Getis-Ord GI* statistic. This statistic is a measure of the spatial distribution of incidents (participation) relative to a random, equally-spaced distribution.
3. Participants included in this analysis are limited to those for which detailed participation records and location data are available.

Sources

1. Water use efficiency program data provided by Marin Municipal Water District on April 2020.
2. Basemaps provided by ESRI and Stamen Design, under CC BY 3.0. Data by OpenStreetMap, under ODbL.

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0 1.5 3

Miles

Participation Density for Rain Barrel Rebate Program

Marin Municipal Water District
December 2020
C00004.00

Figure 5-1d

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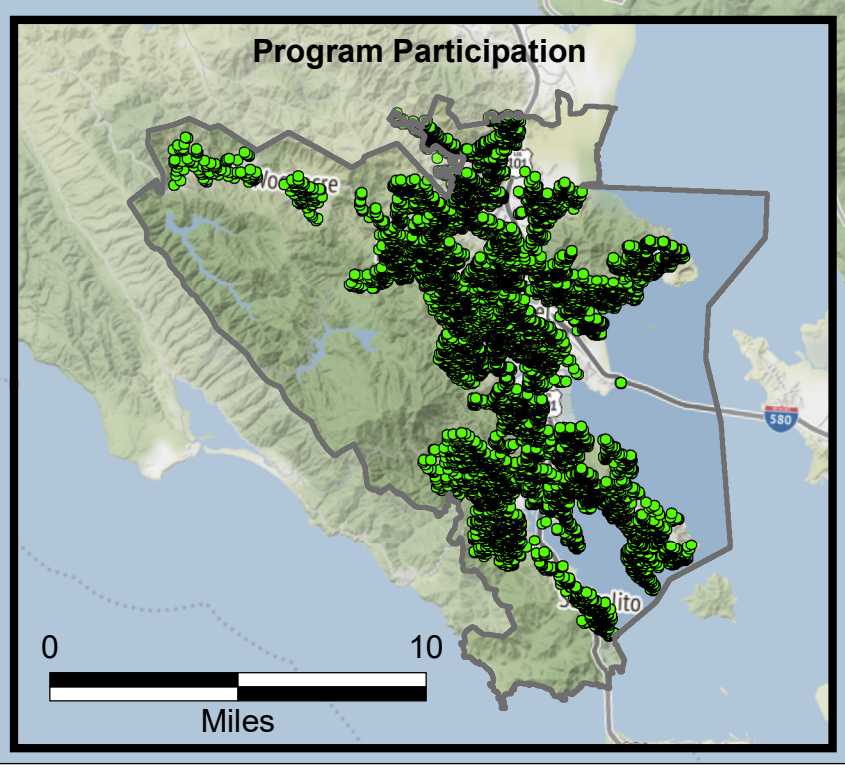
Participation Density
SFR Water Use Surveys/Audits Program
1995 - 2020
12,833 Participants Analyzed



Legend

Participation Hot and Cold Spots

- Cold Spot - 99% Confidence
- Cold Spot - 95% Confidence
- Cold Spot - 90% Confidence
- Not Significant
- Hot Spot - 90% Confidence
- Hot Spot - 95% Confidence
- Hot Spot - 99% Confidence

Program Participation

- SFR Water Use Surveys/Audits Program
- Service Area Boundary

Abbreviation

SFR = single family residential

Notes

1. All locations are approximate.
2. Program participation hot and cold spots were evaluated using the Esri ArcGIS 10.8.0 Optimized Hot Spot Analysis tool, which calculates a Getis-Ord GI* statistic. This statistic is a measure of the spatial distribution of incidents (participation) relative to a random, equally-spaced distribution.
3. Participants included in this analysis are limited to those for which detailed participation records and location data are available.

Sources

1. Water use efficiency program data provided by Marin Municipal Water District on April 2020.
2. Basemaps provided by ESRI and Stamen Design, under CC BY 3.0. Data by OpenStreetMap, under ODbL.

N
0 1.5 3
Miles

Participation Density for SFR Water Use Surveys/Audits Program

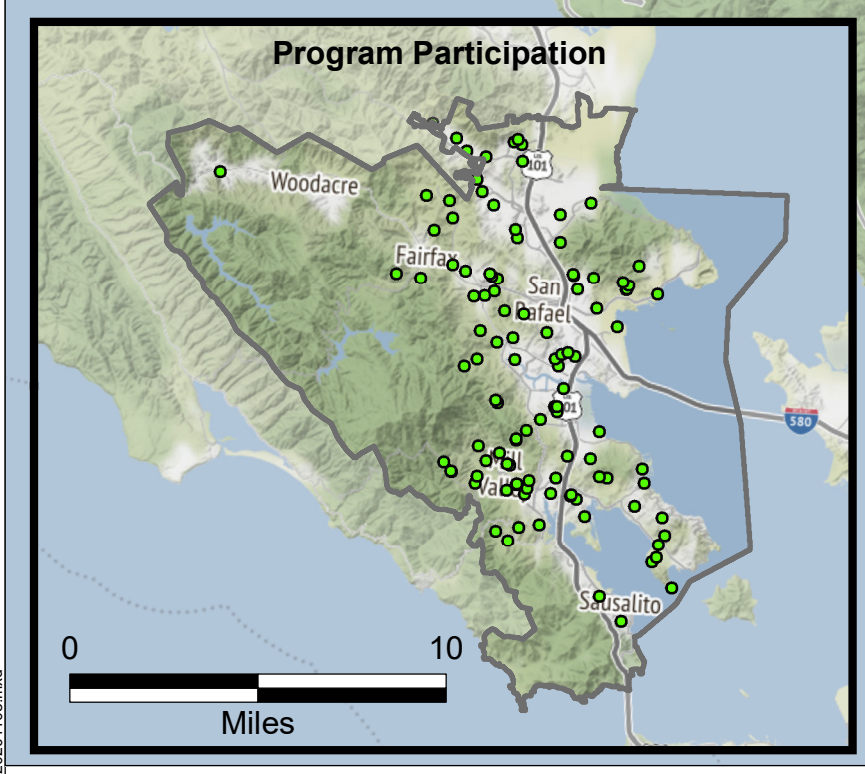
Marin Municipal Water District
December 2020
C00004.00

Figure 5-1e

eki environment & water

Path: X:\C00004_SonomaMarin\Map\20201\2_MMWD\Fig5-1e_MMWD_HotSpot_SFR_WaterUseSurveys_20201103.mxd

Participation Density
SFR WBIC Rebates Program
2013-2015
110 Participants Analyzed



Legend

Participation Hot and Cold Spots

- Cold Spot - 99% Confidence
- Cold Spot - 95% Confidence
- Cold Spot - 90% Confidence
- Not Significant
- Hot Spot - 90% Confidence
- Hot Spot - 95% Confidence
- Hot Spot - 99% Confidence

Program

- SFR WBIC Rebates
- Service Area

Abbreviation

SFR = single family residential
WBIC = Weather-Based Irrigation Controller

Notes

1. All locations are approximate.
2. Program participation hot and cold spots were evaluated using the Esri ArcGIS 10.8.0 Optimized Hot Spot Analysis tool, which calculates a Getis-Ord GI* statistic. This statistic is a measure of the spatial distribution of incidents (participation) relative to a random, equally-spaced distribution.
3. Participants included in this analysis are limited to those for which detailed participation records and location data are available.

Sources

1. Water use efficiency program data provided by Marin Municipal Water District on April 2020.
2. Basemaps provided by ESRI and Stamen Design, under CC BY 3.0. Data by OpenStreetMap, under ODbL.

N
0 1.5 3
Miles

Participation Density for SFR WBIC Rebates Program

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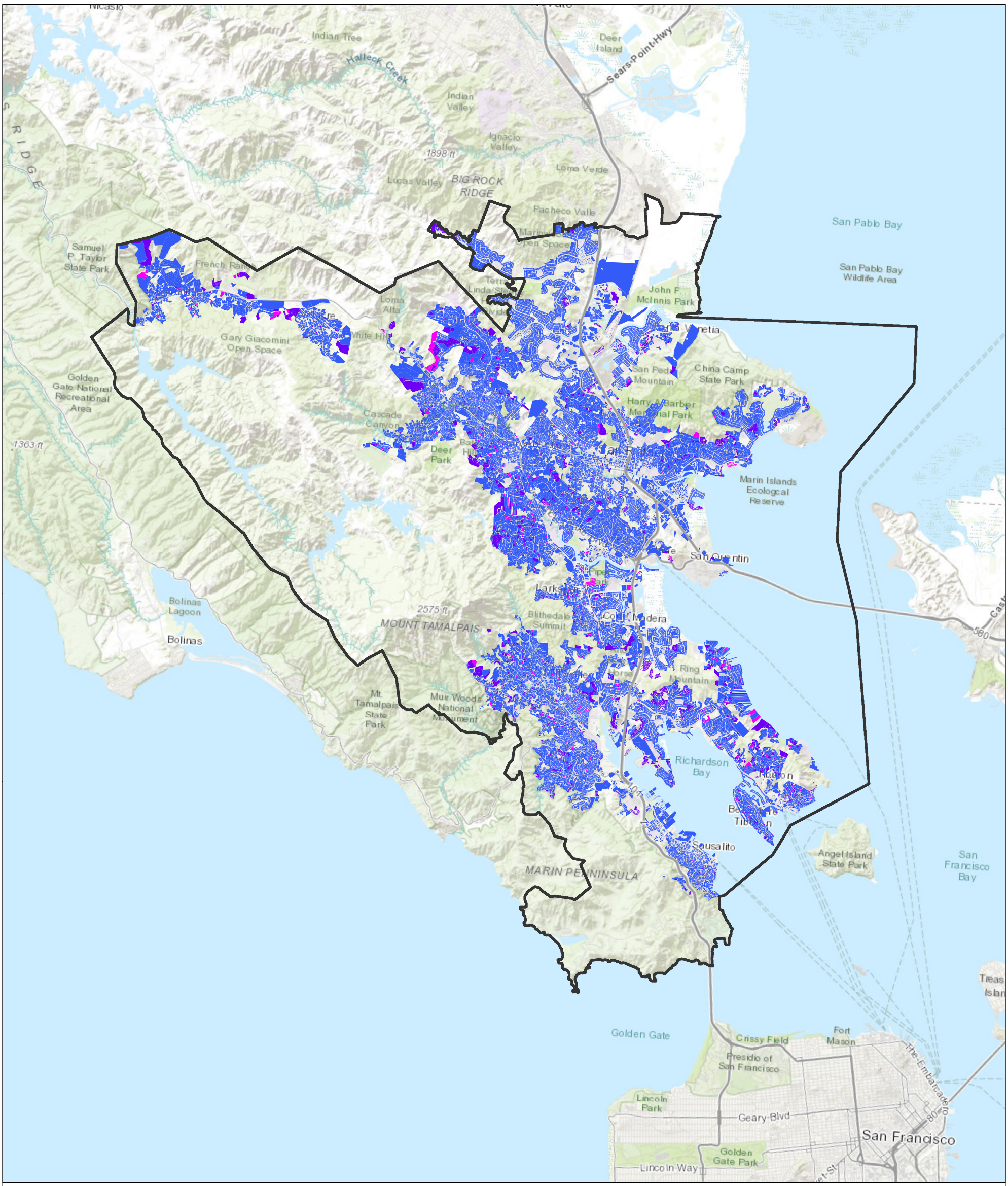
Marin Municipal Water District
December 2020
C00004.00

Figure 5-1f

Path: X:\C00004 SonomaMarin\Map\2020\12 MMWD\Fig5-1f MMWD HotSpot SFR WBIC Rebate 20201103.mxd



Legend

Service Area Boundary

Year Built

- <1994 (54,743 parcels)
- 1994 - 2009 (3,355 parcels)
- 2010 and newer (826 parcels)

N

0 2 4

Miles

Age of Building Stock

Notes

1. All locations are approximate.
2. Construction date for Marin County parcels is based on year primary building was constructed, per Reference 1.

Sources

1. Marin County, 2020. ConservationJan2020.gdb, provided by Marin Municipal Water District, 13 February 2020.
2. Basemap provided by ESRI.

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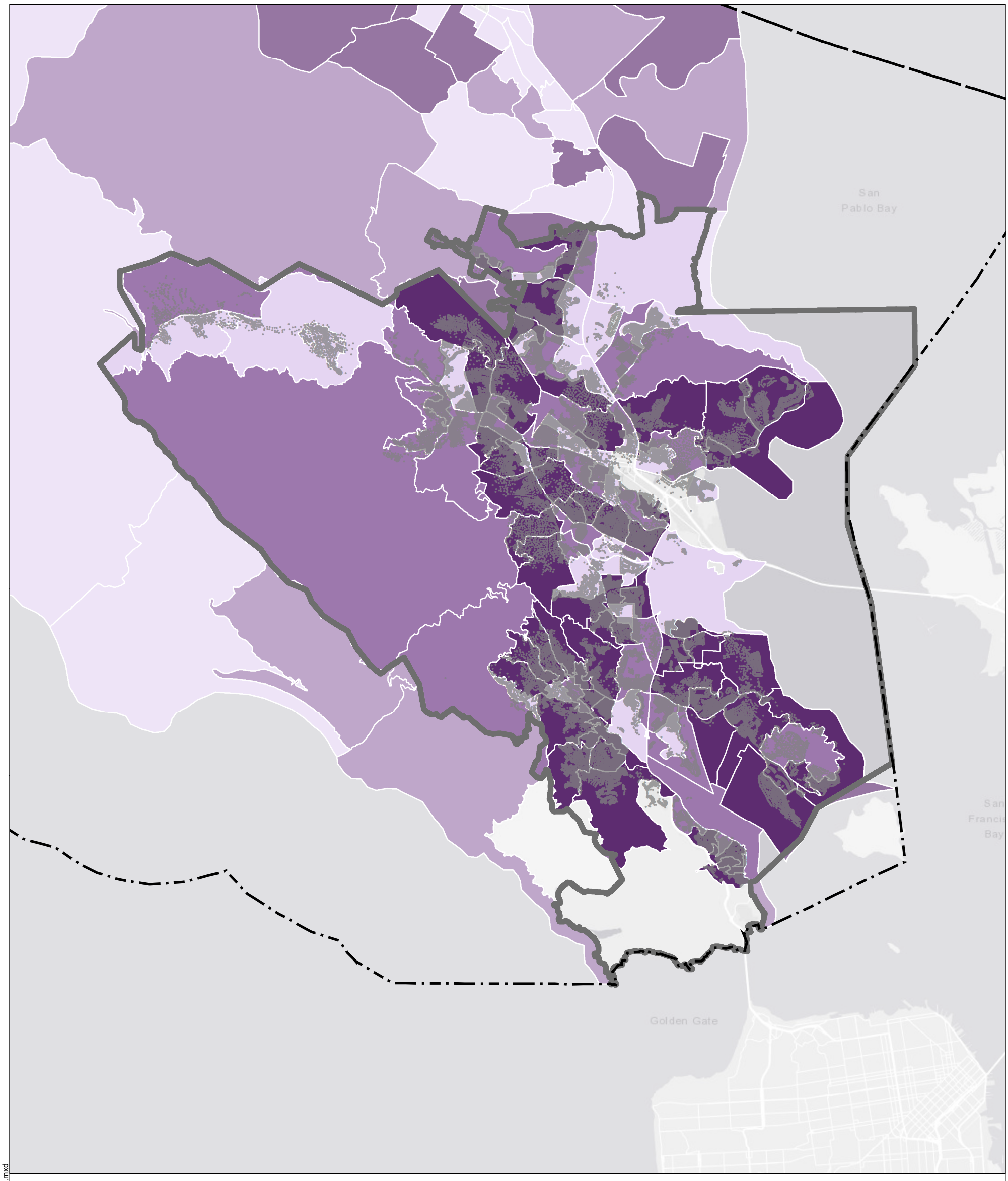
C00004.00

Figure 5-2

Path: X:\C00004 SonomaMarin\Map\2020\12 MMWD\Fig5-2 MMWD BldgStock 20201030.mxd



Legend

- County Boundary
- Service Area Boundary
- Residential Customers

Median Household Income

- <$94,850 (Low)
- $94,850 - $124,500 (Medium)
- >$124,500 (High)

N

0 2 4

Miles

Sources

1. Census, 2019. 2013-2017 American Community Survey (ACS) 5- ear estimates. TIGER/Line Shapefiles by Block Group, https://www.census.gov/geo/maps-data/data/tiger-data.html, United States Census Bureau.
2. HCD, 2017. Memorandum: State Income Limits for 2017, California Department of Housing and Community Development, dated June 9, 2017.
3. Basemap provided by ESRI.

Abbreviations

HUD = Housing and Community Development

Notes

1. All locations are approximate.
2. Household income is based on estimated 2017 median household income by Census Block Group, per Census (2019). Income level groupings are based on California Department of Housing and Community Development (HCD) income levels for Marin County for a 3-person household in 2017 (HCD, 2017). The average persons per household is 2.4 for Marin County.

Median Household Income

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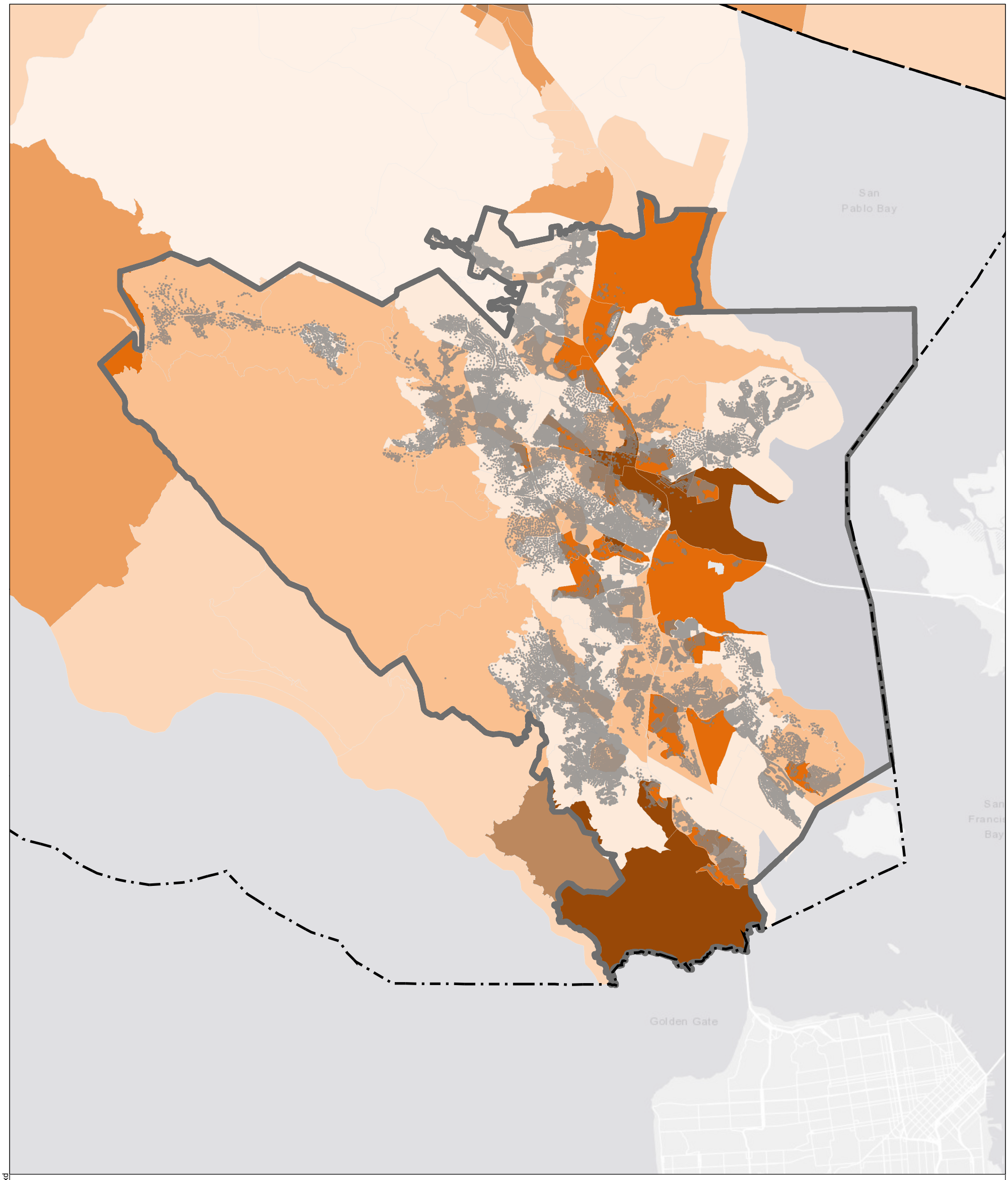
Marin Municipal Water District
December 2020
C00004.00

Figure 5-3a

Path: X:\C00004_SonomaMarin\Map\2020\12_MMWD\Fig5-3a_MMWD_HouseholdIncome_20201105.mxd



Legend

- County Boundary
- Service Area Boundary
- Residential Customers

Percentage of Renters

- ≤25%
- 25.1% - 50%
- 50.1% - 75%
- ≥75%

N

0 2 4

Miles

Notes

1. All locations are approximate.
2. Percentage of renter-occupied housing units is based on the estimated 2017 number of renter-occupied housing units by Census Block Group, per Census (2019).

Sources

1. Census 2019. 2013-2017 American Community Survey (ACS) 5-year estimates. TIGER/Line Shapefiles by Block Group, https://www.census.gov/geo/maps-data/data/tiger-data.html, United States Census Bureau.
2. Basemap provided by ESRI.

Percentage of Renters

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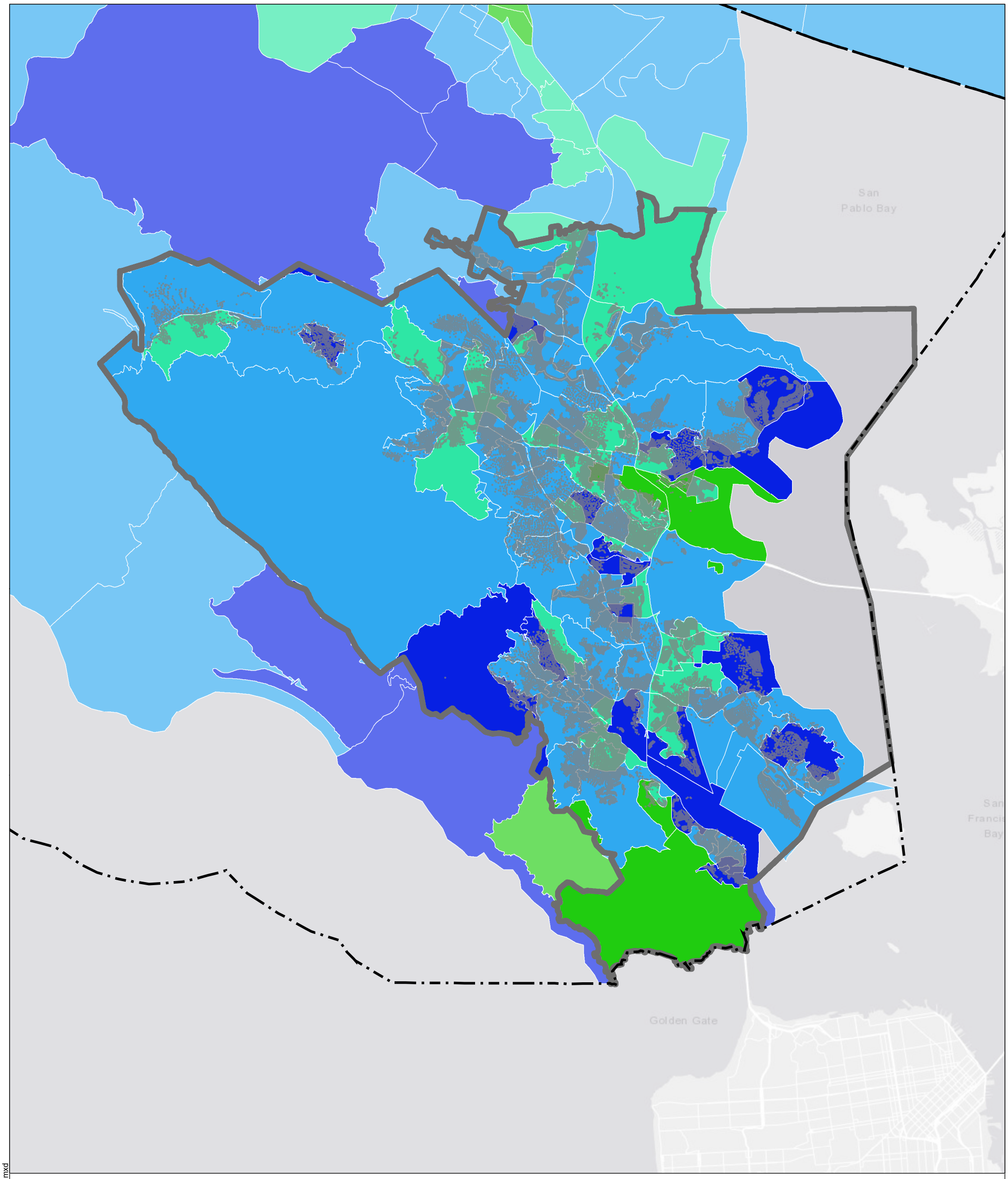
Marin Municipal Water District
December 2020
C00004.00
Figure 5-3b

Path: X:\C00004_SonomaMarin\Map\2020\12_MMWD\Fig5-3b_MMWD_PercentRenters_20201105.mxd



Legend

- County Boundary
- Service Area Boundary
- Residential Customers

Median Household Age

- <35 Years
- 35 - 45 Years
- 45 - 55 Years
- >55 Years

N

0 2 4

Miles

Notes

1. All locations are approximate.
2. Household age is based on estimated 2017 median age of household members by Census Block Group, per Census (2019).

Sources

1. Census, 2019. 2013-2017 American Community Survey (ACS) 5- ear estimates. TIGER/Line Shapefiles by Block Group, https://www.census.gov/geo/maps-data/data/tiger-data.html, United States Census Bureau.
2. Basemap provided by ESRI.

Median Household Age

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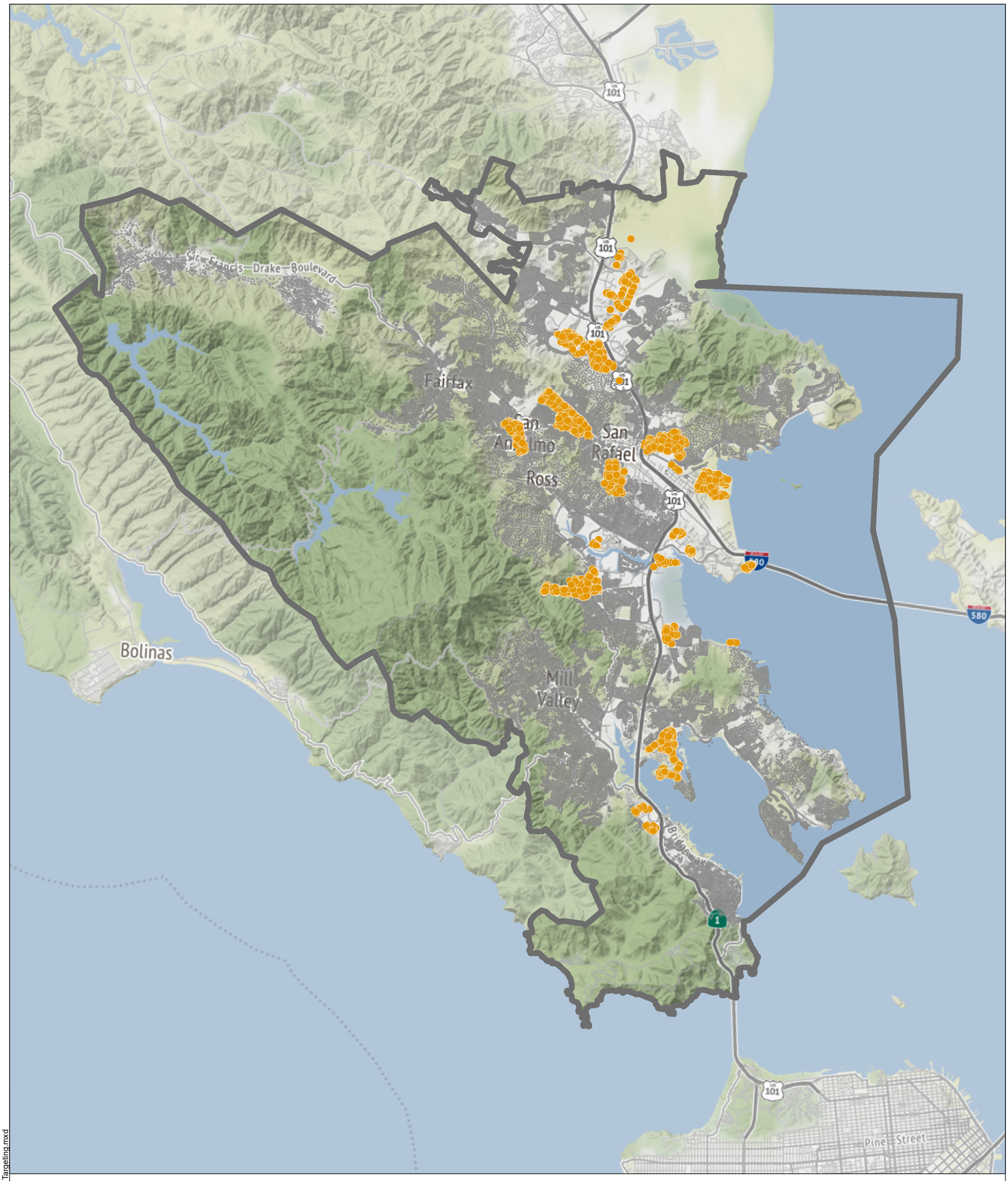
Marin Municipal Water District
December 2020
C00004.00
Figure 5-3c

Path: X:\C00004_SonomaMarin\Map\2020\12_MMWD\Fig5-3c_MMWD_HouseholdIncome_20201208.mxd



Legend

- All SFR Customers
- SFR Customers to Potentially Target with Outreach (8,891 customers)

Abbreviation

SFR = single family residential
WBIC = Weather-Based Irrigation Controller

Notes

1. All locations are approximate.
2. SFR customers to potentially target with outreach for the SFR WBIC Rebate Program are identified as those (1) outside areas of high participation, (2) within low income household areas, and (3) within areas of 50-75% rentership.

Sources

1. Water use efficiency program data provided by Marin Municipal Water District on April 2020.
2. Basemaps provided by ESRI and Stamen Design, under CC BY 3.0. Data by OpenStreetMap, under ODbL.

N

0 2 4

Miles

SFR Customers to Potentially Target with SFR WBIC Rebate Program Outreach

Marin Municipal Water District
December 2020
C00004.00

Figure 5-4

eki environment & water

Path: X:\C00004_SonomaMarinMap\2020\12_MMWD\Fig5-4_MMWD_HotSpot_SFR_WBIC_Rebate_Targeting.mxd

6. CONSERVATION PROGRAM UPDATE

The following section evaluates current and potential conservation programs for both the District and the SMSWP. The purpose of this section is to compile programs that are prioritized by both the District and by all Water Contractors in the SMSWP collectively in order to calculate the potential water savings and economic feasibility of those programs. Section 6.1 discusses the methodology used to prioritize conservation programs. Section 6.2 describes the programs given high priority for implementation by all nine Water Contractors collectively, and Section 6.3 describes programs given high priority by the District. Section 6.4 analyzes the potential water savings and cost-benefit for those programs selected by the District as both individual programs and in three implementation scenarios. By assessing the feasibility of these programs, the District can make more informed decisions regarding program selection and implementation.

6.1. Methodology for Screening of Potential Water Conservation Programs

In order to evaluate the potential for new conservation programs, a comprehensive list of over 100 conservation programs was developed (**Appendix D**). Each of the nine Water Contractors were first asked to review and identify any additional programs to add to this list. Following receipt of feedback from the Water Contractors, each Water Contractor was asked to review the list and identify:

- Priority (on a scale of 1 to 5, with 5 being the highest priority) as a program to be implemented regionally through the SMSWP;
- Priority (on a scale of 1 to 5, with 5 being the highest priority) as a program to be implemented locally through their agency;
- Preference for the program to be implemented either regionally or locally; and
- Whether each program is currently or has previously been implemented by their agency.

The list of water conservation programs is organized into four categories, specifically: (1) retailer actions and water rates, (2) public outreach and education, (3) device-based and financial incentive programs, and (4) policies and regulations. The results of the water conservation program prioritization and screening are summarized for all Water Contractors combined, representing overall regional priorities and preferences (**Table 6-1**), and for each individual Water Contractor, representing each agencies local priorities and preferences. **Table 6-1** shows the average prioritization ranking for all Water Contractors for each program for regional and local implementation as well as the percentage of Water Contractors that prefer each program to be implemented at the local level or the regional level.[22] The results presented in **Table 6-1** are discussed below for each water conservation program category. **Table 6-2** provides the results of this screening for the Marin Municipal Water District, including priorities and preferences for each water conservation program, and identifies the target sector, whether the program addresses indoor or outdoor water use, and the primary end use.

[22] Water Contractors were asked to provide a preference for local or regional implementation for all programs they ranked a priority score of 3 or above. Thus, the percentages of Water Contractors shown in **Table 6-1** does not sum to 100%.

6.2. Screening of Regional Conservation Measures

6.2.1. Retailer Actions and Water Rate Based Conservation Programs

Of the 15 retailer action and water rate based conservation programs included in the screening list, the Water Contractors identified the following ten programs as high priority (average score of three or higher) to implement at the local level:

1. Install Advanced Metering Infrastructure (AMI) for High Water Users and Large Landscape Accounts
2. Install AMI in New Development
3. Customer Water Loss Reduction (AMI Leak Notifications)
4. Install AMI for Existing Accounts
5. Tiered Water Rates (Conservation Pricing)
6. Water Budgeting/Monitoring for Large Landscape Accounts
7. Water Budget Based Billing for Only Irrigation Customers
8. Modification to or Implementation of Tiered Rate Conservation Pricing
9. Establish Separate Pricing Structure for Irrigation Accounts
10. Rate Structure Evaluation
11. Increase Enforcement of State Water Waste Regulations

By their nature as water retailer actions, these programs do not lend themselves to regional implementation. However, in some cases, such as the "Increase Enforcement of State Water Waste Regulations" program, there may be an opportunity to coordinate across the region at a policy or education level. For example, SB-407[23] requires older plumbing fixtures to be replaced with new, more efficient fixtures that meet current water efficiency standards; this requirement is supposed to be enforced at time of sale. If this or similar policies are being enforced differently across Water Contractor jurisdictions, it could result in confusion among customers. Thus, even for retailer action-based programs, there may be opportunity for the Water Contractors to coordinate these efforts and share staff education resources.

6.2.2. Public Outreach and Education Based Conservation Programs

Of the 11 public outreach and education-based water conservation programs included in the screening, the Water Contractors identified the following six programs as high priority (average score of three or higher), with a preference for regional implementation through SMSWP:

1. Qualified Water Efficient Landscaper (QWEL) Training
2. Public Outreach through Print & Electronic Media – Focused on Outdoor Irrigation
3. Educational Workshops
4. School Education Programs
5. Public Outreach through Print & Electronic Media – Focused on Indoor Conservation
6. Garden tour

[23] SB 407: https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=200920100SB407

All of these programs are currently being implemented by the SMSWP. In addition to these programs, the Water Contractors also indicated that water use surveys or audits for single-family residential and CII customers were a high priority; however, the Water Contractors generally expressed a preference for these programs to be implemented locally.

6.2.3. Device and Financial Incentive Based Conservation Programs

Of the 61 device- and financial incentive- based water conservation programs included in the screening list, the Water Contractors identified the following 11 programs as high priority (average score of three or higher) to implement at either the regional or local level:

1. Landscape Conversion or Turf Removal – multi-family residential (MFR) and CII
2. Landscape Conversion or Turf Removal – single family residential (SFR)
3. High Efficiency Faucet Aerator / Showerhead Giveaway – Residential Customers
4. Smart Irrigation Controller (Weather-Based Irrigation Controller) Rebates – Large Landscape
5. Drip Irrigation Incentive for SFR
6. High Efficiency Faucet Aerator / Showerhead Giveaway – CII Customers
7. Drip Irrigation Incentive for MFR and CII
8. High Efficiency Clothes Washer Rebate – Residential
9. Smart Irrigation Controller (Weather-Based Irrigation Controller) Rebates – SFR
10. Restaurant Spray Nozzle Rebates
11. Incentivize Irrigation Equipment Upgrades – SFR

The above list includes four programs that focus on indoor water use ("High Efficiency Faucet Aerator / Showerhead Giveaway – Residential Customers", "High Efficiency Faucet Aerator / Showerhead Giveaway – CII Customers", "High Efficiency Clothes Washer Rebate – Residential," and "Restaurant Spray Nozzle Rebates"). The remaining preferred programs all focus on outdoor water use, including turf removal and methods to increase irrigation efficiency.

Of these preferred programs, the Water Contractors expressed a preference for two of the programs to be administered at a regional level rather than local level, specifically the "High Efficiency Clothes Washer Rebate – Residential" and the "Restaurant Spray Nozzle Rebates".

6.2.4. Policy and Regulation Based Conservation Programs

Of the 29 policy- and regulation- based water conservation programs included in the screening list, the Water Contractors identified the following six programs as high priority (average score of three or higher) to implement at the local level:

1. Water Waste Ordinance
2. Require Submetering of Landscaping for New MFR and Commercial Developments
3. Require Water Efficiency Plan Reviews for New CII Development
4. Require High Efficiency Clothes Washers in New Development
5. Require Weather Adjusting Smart Irrigation Controllers, Rain Sensors, and/or Soil Moisture Sensors in New Development
6. Demand Offset/Water Neutral Policy for Large New Developments

Nearly all of the highest priority programs focus on ensuring efficiency in new developments, and target both indoor and outdoor water use. The Water Contractors expressed that the program "Require Irrigation Designers / Installers be Certified (QWEL)" is a high priority at the local level but were split equally as to whether they would prefer this program to be implemented at a local or regional level. Further, given the shift in state policy regarding recycled water use (i.e., that non-potable use of recycled water use will no longer be counted towards water conservation), some Water Contractors were conflicted as to how recycled water should be considered in policies regarding new development, in particular with respect to the program "Demand Offset/Water Neutral Policy for Large New Development."

6.2.5. Regional Program Screening Findings

With some exceptions, the Water Contractors expressed a strong preference for water conservation programs to be implemented locally rather than regionally through the SMSWP, with the exception of programs that are already implemented regionally by the SMSWP. However, as listed above, there was general consensus among Water Contractors about which water conservation programs are a high priority, and thus important for the region. Given this consensus, while there is not an apparent desire to implement programs regionally, there may be opportunity for further coordination and collaboration on these programs, such as sharing of educational resources, training of staff (e.g., building permit and plan review staff), and collaboration on creating similar program structure and requirements (such as for financial incentive-based programs) across the region.

6.3. Screening of Local Conservation Measures

Table 6-2 shows the results of this screening for the Marin Municipal Water District, and lists the programs considered by the District to be medium or high priority to consider for the future. **Table 6-2** also identifies the target sector, whether the program addresses indoor or outdoor water use, and the primary targeted end use.

- **Retailer Actions and Water Rate Based Conservation Programs.** Eleven retailer action and water rate based conservation programs were identified as medium or high priority for potential future implementation, all of which are currently implemented locally by the District. Four programs target outdoor water use and seven target both indoor and outdoor water use.

- **Public Outreach and Education Based Conservation Programs.** The District ranked seven public outreach and education-based water conservation programs as medium to medium-high priority for potential future implementation, all of which are currently implemented by the District. Two programs target indoor water use, two target outdoor use, and three target both. Three were given a preference for local implementation, three were given regional preference, and one was given no preference.

- **Device and Financial Incentive Based Conservation Programs.** Twenty-five device and financial incentive based programs were ranked as medium to high priority for potential future implementation, eleven of which would be new programs for the District. Eight programs target indoor water use, fifteen target outdoor use, and two target both. Eighteen were given a

preference for local implementation and three were given no preference. The potential new programs are identified as follows, in general order of priority:

  - Drip Irrigation Incentive for SFR
  - Incentivize Irrigation Equipment Upgrades - SFR
  - Landscape Conversion or Turf Removal - MFR and CII
  - Landscape Conversion or Turf Removal -SFR
  - Soil Moisture Sensor Rebate
  - Water Savings Incentive Program for CII
  - Incentivize Gray Water Systems for New CII Development
  - Incentivize Replacement of Inefficient Commercial and Industrial Equipment
  - Rain Sensor Rebate
  - Rotating Sprinkler Nozzle Giveaway
  - Rotating Sprinkler Nozzle Rebate

- **Policy and Regulation Based Conservation Programs.** Fourteen policy and regulation based programs were identified as highest priority for potential future implementation, nine of which are currently implemented by the District and five of which would be new programs. Three programs target indoor water use, eight target outdoor use, and three target both. All programs were given a preference for local implantation, except for "Waste Water Ordinance" (no preference). The potential new programs identified are as follows, in general order of priority:

  - Require Submetering of Landscaping for New MFR and Commercial Developments
  - Demand Offset/Water Neutral Policy for Large New Developments
  - Prohibit Once through Cooling Systems
  - Require <1.0 gal/flush Toilets in New Development
  - Require Rain Barrels in New Development

6.4. Evaluation of Future Water Conservation Programs

Based on the conservation screening process described in Sections 6.2 and 6.3 above, a suite of conservation programs to be considered for future implementation were evaluated. These programs were evaluated both individually and as components in three water conservation program scenarios, as shown in **Table 6-3a**. The three program scenarios represent three potential approaches or strategies for the District's future conservation programs, specifically:

- **Scenario A** represents a focus on programs that target outdoor water savings,
- **Scenario B** represents a more "business as usual" approach based on programs ranked most highly by the District, and
- **Scenario C** represents a focus on the programs that all nine Water Contractors collectively identified as highest priority.

Table 6-3a also identifies the customer sectors each program would target as well as whether the program focuses on indoor or outdoor water use, or both.

The benefits and costs associated with implementation of these programs were evaluated using the AWE model, using a series of assumptions documented in **Appendix B**.[24] Key assumptions and considerations related to the methodology used by the AWE model and in this analysis are provided below:

- Financial assumptions related to both costs to the utility and customer water rates were provided by the District.
- Financial assumptions related to energy costs to the customer were assumed based on typical PG&E rates (PG&E, 2020; PG&E and Marin Clean Energy, 2020).
- Water savings assumptions were based on a combination of District-specific water savings estimates per Section 5.3.2, AWE model default assumptions, assumptions developed for the District as a part of the 2015 conservation modeling, and water savings factors developed based on other published literature sources.
- Assumed rate of program implementation was based on historical participation levels by District customers in similar programs.
- For purposes of near-term conservation program analysis, it is assumed that all programs are active from 2021 through 2025; water savings projections beyond this period reflect cumulative savings achieved over time from implementation during this five-year period.
- Benefit-costs ratios are particularly sensitive to the assumed nominal rate of increase of the utility water cost.
- Lost revenue due to reduced water sales is not included as a cost.
- Additional program-specific considerations are provided as notes in the attached tables.

Table 6-3b presents a comparison of individual water conservation measures, and identifies the following information for each program:

- **Net present value of costs and benefits** – represents the present value over the 25-year period discounted to current 2020 dollars.
- **Benefit to cost ratio** – calculated as present value of costs divided by the present value of benefits.
- **Water Utility Costs** – costs that the District as a water utility will incur to operate the program including administrative costs.
- **Customer Costs** – costs customers will incur to implement a program in the Water Contractor's service area.
- **Utility Benefits** – the avoided cost to the District to produce the volume of water saved.
- **Customer Benefits** – the savings from reduced water/sewer utility bills and energy savings resulting from reduced use of hot water.
- **Total Water Utility Costs** – includes costs to the District for program implementation from 2021-2025.

[24] Alliance for Water Efficiency, Water Conservation Tracking Tool Version 3, released in July 2016.

- **Water Savings in 2025** – one-year estimated water savings in 2025.
- **Water Utility Cost of Water Saved for individual programs** – cost of water saved dividing by the lifetime water savings of that program.
- **Water Utility Cost of Water Saved for program scenarios** – weighted average of Water Utility Cost of Water Saved for the individual programs by the cumulative water savings through 2045.

This analysis estimates active program savings based on the AWE model, and does not include additional savings anticipated from passive savings (i.e., water savings associated with the natural replacement of less efficient water using fixtures and appliances due to both market shifts and increasing efficiency mandated by the building code and other regulatory requirements). Based on this analysis, and the assumptions presented in **Appendix B**, the benefit-cost ratios for the District range from 0.52 to 116.

Table 6-3c presents the results of the analysis of the three conservation program scenarios identified in **Table 6-3a**, and includes a summary of costs and benefits to the District and customers, estimated cumulative water savings through 2045 (based on assumed program implementation from 2021-2025), and the estimated cost of water saved to the District. Based on this, the approach of focusing water conservation measures on those ranked highest by the District (i.e., Scenario B) has a greater benefit to cost ratio than that of Scenarios A or C. The projected water savings associated with implementation of Scenario B is 584 AF by 2025 and 2,205 by 2045, at a cost of approximately $332/AF. The high benefit-cost ratio in this scenario is driven primarily by the CII Water Savings Incentive Program, which has a guaranteed rate of water savings per agency cost.

Table 6-1
Regional Prioritization of Conservation Measures and Programs
Marin Municipal Water District

Conservation Measure/Program	Prioritization (a)		Preference (b)		Current SMSWP Program	
	Regional	Local	Regional Program	Local Program		
RETAILER ACTIONS AND WATER RATES						
Install AMI for High Water Users and Large Landscape Accounts	2.5	4.7	11%	67%	No	✗
Install AMI in New Development	2.4	4.7	0%	67%	No	✗
Customer Water Loss Reduction (AMI Leak Detection)	2.4	4.4	0%	89%	No	✗
Install AMI for Existing Accounts	2.4	4.0	0%	86%	No	✗
Tiered Water Rates (Conservation Pricing)	2.0	3.6	0%	88%	No	✗
Water Budgeting/Monitoring for Large Landscape Accounts	2.5	3.4	0%	83%	No	✗
Water Budget Based Billing for Only Irrigation Customers	2.1	3.4	0%	86%	No	✗
Modification to or Implementation of Tiered Rate Conservation Pricing	2.0	3.4	0%	88%	No	✗
Establish Separate Pricing Structure for Irrigation Accounts	2.0	3.2	0%	83%	No	✗
Rate Structure Evaluation	2.4	3.1	0%	78%	No	✗
Increase Enforcement of State Water Waste Regulations	2.6	3.0	0%	86%	No	✗
Water Budget Based Billing for All Customers	2.3	2.4	0%	50%	No	✗
Increase Enforcement of Indoor Fixture Retrofit at Time of Sale	1.9	2.2	17%	67%	No	✗
Increase Enforcement of Customer Pressure Reducing Valve (PRV) Requirement	1.6	1.9	0%	40%	No	✗
Regional UHET and/or Urinal Bulk Purchase Program	1.9	1.7	75%	0%	No	✗
Average by Program Type	2.2	3.3				
PUBLIC OUTREACH AND EDUCATION						
QWEL Training (Qualified Water Efficient Landscaper)	4.3	2.0	89%	0%	Yes	✓
Public Outreach through Print & Electronic Media - Focused on Outdoor Irrigation	4.0	3.9	67%	0%	Yes	✓
Educational Workshops	4.0	3.2	63%	0%	Yes	✓
School Education Programs	4.0	3.1	78%	0%	Yes	✓

Table 6-1
Regional Prioritization of Conservation Measures and Programs
Marin Municipal Water District

Conservation Measure/Program	Prioritization (a)		Preference (b)		Current SMSWP Program	
	Regional	Local	Regional Program	Local Program		
Water Use Surveys/Audits - SFR	3.5	3.9	22%	44%	No	✗
Public Outreach through Print & Electronic Media - Focused on Indoor Conservation	3.6	3.3	57%	0%	Yes	✓
Garden tour	3.6	1.9	86%	0%	Yes	✓
Water Use Surveys/Audits - CII	3.0	3.4	38%	38%	No	✗
Water Use Surveys/Audits - MFR	2.8	3.3	29%	43%	No	✗
Promote Green Building and Certification	3.1	2.2	33%	17%	No	✗
Provide Support with Smart Irrigation Controller Setup	2.9	2.3	60%	0%	No	✗
Average by Program Type	3.5	3.0				
DEVICE-BASED AND FINANCIAL INCENTIVE PROGRAMS						
Landscape Conversion or Turf Removal - MFR and CII	3.9	4.6	11%	78%	No	✗
Landscape Conversion or Turf Removal -SFR	3.9	4.6	22%	67%	No	✗
High Efficiency Faucet Aerator / Showerhead Giveaway - Residential Customers	3.0	3.9	11%	44%	No	✗
Smart Irrigation Controller (Weather-Based Irrigation Controller) Rebates - Large Landscape	3.1	3.6	38%	38%	No	✗
Drip Irrigation Incentive for SFR	2.4	3.6	25%	50%	No	✗
High Efficiency Faucet Aerator / Showerhead Giveaway - CII Customers	2.9	3.4	14%	57%	No	✗
Drip Irrigation Incentive for MFR and CII	2.4	3.4	25%	50%	No	✗
High Efficiency Clothes Washer Rebate - Residential	3.3	3.3	44%	11%	Yes	✓
Smart Irrigation Controller (Weather-Based Irrigation Controller) Rebates - SFR	2.9	3.2	14%	57%	No	✗
Restaurant Spray Nozzle Rebates	3.1	2.8	50%	0%	No	✗
Incentivize Irrigation Equipment Upgrades - SFR	2.1	3.0	17%	50%	No	✗
Indoor Fixture Program For Schools	2.9	2.9	14%	71%	No	✗
Rotating Sprinkler Nozzle Rebate	2.9	2.9	40%	20%	No	✗

Table 6-1
Regional Prioritization of Conservation Measures and Programs
Marin Municipal Water District

Conservation Measure/Program	Prioritization (a)		Preference (b)		Current SMSWP Program	
	Regional	Local	Regional Program	Local Program		
High Efficiency Clothes Washer Rebate Program - CII	2.8	2.8	29%	29%	No	✗
Direct Install of Efficient Indoor Fixtures - Low Income Residential	2.8	2.6	60%	0%	No	✗
Indoor Fixture Program For Hotels & Motels	2.8	2.2	29%	43%	No	✗
Mulch rebate	2.6	2.7	33%	50%	No	✗
Rain Sensor Rebate	2.5	2.6	33%	50%	No	✗
Incentivize Submetering for Existing Customers - CII	2.4	2.6	25%	25%	No	✗
Incentivize Submetering for Existing Customers - MFR	2.4	2.6	25%	25%	No	✗
Incentivize Gray Water Retrofit for Existing SFR Customers	2.3	2.6	20%	60%	No	✗
Toilet Flapper Giveaway - SFR customers	2.1	2.6	40%	40%	No	✗
Rotating Sprinkler Nozzle Giveaway	2.5	2.1	60%	0%	No	✗
Incentivize Replacement of Inefficient Commercial and Industrial Equipment	2.4	2.4	33%	33%	No	✗
Soil Moisture Sensor Rebate	2.4	2.4	60%	20%	No	✗
High Efficiency Urinal (<0.25 gal/flush) Rebates - CII	2.4	2.4	25%	0%	No	✗
Incentivize Gray Water Systems for New CII Development	2.3	2.4	50%	25%	No	✗
Incentivize Irrigation Equipment Upgrades - Large Landscapes	1.9	2.4	20%	40%	No	✗
Direct Install of Efficient Indoor Fixtures - Residential	2.4	2.2	50%	0%	No	✗
High Efficiency Clothes Washer Install - Low Income Residential Customers	2.4	2.2	50%	0%	No	✗
Smart Irrigation Controller (Weather-Based Irrigation Controller) Giveaway - Large Landscape	2.4	2.0	80%	0%	No	✗
Smart Irrigation Controller (Weather-Based Irrigation Controller) Giveaway - SFR	2.4	2.0	60%	20%	No	✗
Incentivize Artificial Turf for Sports Fields	2.3	2.3	75%	0%	No	✗
UHET <1.0 gal/flush Rebate - Residential	2.1	2.3	50%	17%	No	✗
Water Savings Incentive Program for CII	2.1	2.2	40%	40%	No	✗

Table 6-1
Regional Prioritization of Conservation Measures and Programs
Marin Municipal Water District

Conservation Measure/Program	Prioritization (a)		Preference (b)		Current SMSWP Program	
	Regional	Local	Regional Program	Local Program		
Hot Water on Demand Pump System Rebate	2.0	2.2	60%	20%	No	✗
UHET Direct Installation - CII	2.1	1.8	40%	0%	No	✗
Plumber Initiated UHET and / or Urinal Retrofit Program	2.1	1.8	67%	0%	No	✗
Direct Install of Efficient Indoor Fixtures - Government Buildings	2.1	1.6	50%	0%	No	✗
Rain Barrel Rebate	1.9	2.1	40%	40%	No	✗
Incentivize Replacement of Pressure Reducing Valves (PRVs) with 60-70 psi PRVs	2.0	2.0	33%	33%	No	✗
Thermostatic Shut-Off Valve Showerheads/Tub Spouts Rebates	2.0	1.9	50%	0%	No	✗
Dipper Well Rebates	2.0	1.8	50%	0%	No	✗
Rain Sensor Giveaway	2.0	1.7	75%	0%	No	✗
Rebates for Conductivity Controllers on Cooling Towers	2.0	1.6	75%	0%	No	✗
Rainwater Catchment System Rebate for Large Landscapes	1.9	2.0	50%	25%	No	✗
Nonresidential Incentive for Self-closing or Metering Faucets	1.9	1.9	33%	33%	No	✗
Efficient (EnergyStar) Dishwasher Rebates	1.9	1.8	50%	0%	No	✗
Rain Barrel Giveaway	1.9	1.7	75%	0%	No	✗
UHET Direct Installation - Residential	1.9	1.7	50%	0%	No	✗
Autoclave (Steam-Sterilizer) Retrofit Rebates	1.9	1.7	67%	0%	No	✗
Connectionless Food Steamer Rebates	1.9	1.7	67%	0%	No	✗
Dry Vacuum Pumps	1.9	1.6	33%	0%	No	✗
Incentivize Cooling Tower Upgrades	1.9	1.6	50%	0%	No	✗
UHET <1.0 gal/flush Rebate - CII	1.8	1.8	60%	20%	No	✗
Soil Moisture Sensor Giveaway	1.8	1.7	67%	0%	No	✗
Direct Install of Efficient Indoor Fixtures - Commercial and Industrial	1.8	1.7	67%	0%	No	✗

Table 6-1
Regional Prioritization of Conservation Measures and Programs
Marin Municipal Water District

Conservation Measure/Program	Prioritization (a)		Preference (b)		Current SMSWP Program	
	Regional	Local	Regional Program	Local Program		
Swimming Pool and Hot Tub Cover Rebates	1.3	1.7	50%	25%	No	✗
Urinal Direct Installation - CII	1.5	1.4	50%	0%	No	✗
Tier 4 Exemption	1.3	1.4	25%	25%	No	✗
Incentivize Submetering of Cooling Towers for Existing Customers	1.3	1.4	50%	0%	No	✗
Average by Program Type	2.3	2.3				
POLICIES AND REGULATIONS						
Water Waste Ordinance	2.9	4.3	0%	63%	No	✗
Require Submetering of Landscaping for New MFR and Commercial Developments	2.8	4.0	0%	63%	No	✗
Require Water Efficiency Plan Reviews for New CII Development	2.5	3.7	14%	57%	No	✗
Require High Efficiency Clothes Washers in New Development	2.8	3.3	17%	67%	No	✗
Require Weather Adjusting Smart Irrigation Controllers, Rain Sensors, and/or Soil Moisture Sensors in New Development	2.4	3.1	0%	80%	No	✗
Require Irrigation Designers / Installers be Certified (QWEL)	3.0	2.9	40%	40%	No	✗
Demand Offset/Water Neutral Policy for Large New Developments	2.4	3.0	0%	83%	No	✗
Require Efficient (EnergyStar) Dishwashers in New Development	2.8	2.9	20%	60%	No	✗
Require <0.25 gal/flush Urinals in New Development	2.3	2.8	0%	67%	No	✗
Water Conserving Landscape and Irrigation Codes, More Stringent than MWELO	1.6	2.8	0%	67%	No	✗
Require Swimming Pool and Hot Tub Covers	2.0	2.7	40%	20%	No	✗
Require Submetering by Unit for New Commercial Developments	2.3	2.6	0%	50%	No	✗
Require Submetering of Landscaping for Existing MFR and Commercial Customers	2.4	2.4	0%	67%	No	✗
Require Hot Water on Demand / Structured Plumbing in New Residential Development	2.3	2.4	25%	50%	No	✗
Require Submetering by Unit for Existing Commercial Customers	2.1	2.4	0%	25%	No	✗

Table 6-1
Regional Prioritization of Conservation Measures and Programs
Marin Municipal Water District

Conservation Measure/Program	Prioritization (a)		Preference (b)		Current SMSWP Program	
	Regional	Local	Regional Program	Local Program		
Require Submetering for New MFR Developments	1.9	2.4	0%	50%	No	✗
Require Plumbing for Recycled Water in New MFR Development	2.0	2.3	0%	60%	No	✗
Require <1.0 gal/flush Toilets in New Development	2.0	2.3	0%	80%	No	✗
Require Submetering for New Mobile Home Park Developments	2.0	2.3	0%	40%	No	✗
Prohibit Once through Cooling Systems	2.0	2.2	0%	50%	No	✗
Require Plumbing for Recycled Water in New CII Development	1.9	2.2	0%	60%	No	✗
Require On-Site Water Reuse Systems (Grey Water or Black Water) for Large CII Developments	1.8	2.1	25%	50%	No	✗
Require Plumbing for Gray Water in New SFR Development	1.6	2.1	0%	75%	No	✗
Require Submetering of Cooling Towers for New Development	2.0	1.9	0%	33%	No	✗
Require Submetering of Existing MFR (and Mobile Home Park) Customers	1.9	1.9	0%	50%	No	✗
Restrict Landscape Irrigation to Designated Days/Times	1.6	1.8	33%	0%	No	✗
Require Rain Barrels in New Development	1.5	1.8	0%	67%	No	✗
Require Submetering of Cooling Towers for Existing Customers	1.8	1.6	0%	50%	No	✗
Require Cooling Tower Retrofits	1.5	1.4	0%	33%	No	✗
Average by Program Type	2.1	2.5				

Table 6-1
Regional Prioritization of Conservation Measures and Programs
Marin Municipal Water District

Abbreviations:

AMI = advanced metering infrastructure
CII = commercial, industrial, institutional
MFR = multi-family residential
MWELO = Model Water Efficient Landscape Ordinance
PRV = pressure reducing valve
SFR = single-family residential
SMSWP = Sonoma-Marin Saving Water Partnership
UHET = ultra high efficiency toilet

Notes:

(a) Each Water Contractor was asked to rank each conservation program or measure in terms of priority as a regionally-administered program, and as a locally-administered program, where 5 indicated highest priority and 1 indicated the lowest priority. Results are presented as an average of the responses of all nine Water Contractors.

(b) For each program a Water Contractor ranked as "3" or above, the Water Contractor was asked to indicate whether they would prefer the program to be administered regionally or locally. The results are presented as a percentage of the number of Water Contractors. Results of contractors who expressed "no preference" are not shown, and thus the total may not sum to 100% for a given measure.

Table 6-2
Prioritization of Conservation Measures and Programs
Marin Municipal Water District

Conservation Measure/Program	Prioritization (a)	Sector	Indoor	Outdoor	Primary End Use	Preference (b)	Local Program
RETAILER ACTIONS AND WATER RATES							
Establish Separate Pricing Structure for Irrigation Accounts	5	IRR		X	Irrigation	Locally	Yes, currently
Install AMI for High Water Users and Large Landscape Accounts	5	All		X	Water Loss	Locally	Yes, currently
Install AMI in New Development	5	All	X	X	Water Loss	Locally	Yes, currently
Modification to or Implementation of Tiered Rate Conservation Pricing	5	All	X	X	All	Locally	Yes, currently
Tiered Water Rates (Conservation Pricing)	5	All	X	X	All	Locally	Yes, currently
Water Budget Based Billing for Only Irrigation Customers	5	CII, IRR		X	Irrigation	Locally	Yes, currently
Customer Water Loss Reduction (AMI Leak Detection)	4	All	X	X	Water Loss	Locally	Yes, currently
Install AMI for Existing Accounts	4	All	X	X	Water Loss	Locally	Yes, currently
Water Budgeting/Monitoring for Large Landscape Accounts	4	IRR	X	X	Irrigation	Locally	Yes, currently
Increase Enforcement of State Water Waste Regulations	3	All		X	Irrigation	Locally	Yes, currently
Rate Structure Evaluation	3	All	X	X	All	Locally	Yes, currently
PUBLIC OUTREACH AND EDUCATION							
Water Use Surveys/Audits - CII	4	CII	X	X	All	Locally	Yes, currently
Water Use Surveys/Audits - MFR	4	MFR	X		All Indoor	Locally	Yes, currently
Water Use Surveys/Audits - SFR	4	SFR	X	X	All	Locally	Yes, currently
Educational Workshops	3	SFR		X	All Outdoor	No preference	Yes, currently
Public Outreach through Print & Electronic Media - Focused on Indoor Conservation	3	All		X	All Indoor	Regionally	Yes, currently
Public Outreach through Print & Electronic Media - Focused on Outdoor Irrigation	3	All	X		Irrigation	Regionally	Yes, currently
School Education Programs	3	SFR, MFR	X	X	All	Regionally	Yes, currently
DEVICE-BASED AND FINANCIAL INCENTIVE PROGRAMS							
High Efficiency Faucet Aerator / Showerhead Giveaway - CII Customers	5	CII	X		Faucet, Showerhead	Locally	Yes, currently
High Efficiency Faucet Aerator / Showerhead Giveaway - Residential Customers	5	SFR, MFR	X		Faucet, Showerhead	Locally	Yes, currently
Drip Irrigation Incentive for MFR and CII	4	MFR, CII		X	Irrigation	Locally	Yes, previously
Drip Irrigation Incentive for SFR	4	SFR		X	Irrigation	Locally	No

Table 6-2
Prioritization of Conservation Measures and Programs
Marin Municipal Water District

Conservation Measure/Program	Prioritization (a)	Sector	Indoor	Outdoor	Primary End Use	Preference (b)	Local Program
Incentivize Irrigation Equipment Upgrades - Large Landscapes	4	MFR, CII, IRR		X	Irrigation	Locally	Yes, previously
Incentivize Irrigation Equipment Upgrades - SFR	4	SFR		X	Irrigation	Locally	No
Landscape Conversion or Turf Removal - MFR and CII	4	MFR, CII		X	Irrigation	Locally	No
Landscape Conversion or Turf Removal -SFR	4	SFR		X	Irrigation	Locally	No
Smart Irrigation Controller (Weather-Based Irrigation Controller) Rebates - Large Landscape	4	MFR, CII		X	Irrigation	Locally	Yes, currently
Smart Irrigation Controller (Weather-Based Irrigation Controller) Rebates - SFR	4	SFR		X	Irrigation	Locally	Yes, currently
Soil Moisture Sensor Rebate	4	All		X	Irrigation	Locally	No
Water Savings Incentive Program for CII	4	CII	X		All Indoor	Locally	No
High Efficiency Clothes Washer Rebate - Residential	3	SFR, MFR	X		Clothes Washer	No preference	Yes, currently
High Efficiency Clothes Washer Rebate Program - CII	3	CII	X		Clothes Washer	Locally	Yes, currently
Incentivize Gray Water Retrofit for Existing SFR Customers	3	SFR		X	Irrigation / Gray Water	Locally	Yes, currently
Incentivize Gray Water Systems for New CII Development	3	CII	X	X	Irrigation / Gray Water	Locally	No
Incentivize Replacement of Inefficient Commercial and Industrial Equipment	3	CII	X		CII Equipment	Locally	No
Indoor Fixture Program For Hotels & Motels	3	CII	X		All Indoor	Locally	Yes, previously
Indoor Fixture Program For Schools	3	CII	X		All Indoor	Locally	Yes, previously
Rain Barrel Rebate	3	SFR		X	Irrigation	Locally	Yes, previously
Rain Sensor Rebate	3	All		X	Irrigation	Locally	No
Rainwater Catchment System Rebate for Large Landscapes	3	MFR, CII		X	Irrigation	Locally	Yes, previously
Rotating Sprinkler Nozzle Giveaway	3	All		X	Irrigation	No preference	No
Rotating Sprinkler Nozzle Rebate	3	All		X	Irrigation	No preference	No
Tier 4 Exemption	3	SFR	X	X	toilet, Faucet, Showerhead, clothes washer, irrigation	Locally	Yes, currently
POLICIES AND REGULATIONS							
Require <0.25 gal/flush Urinals in New Development	5	CII	X		Urinal	Locally	Yes, currently
Require High Efficiency Clothes Washers in New Development	5	SFR, MFR	X		Clothes Washer	Locally	Yes, currently

Table 6-2
Prioritization of Conservation Measures and Programs
Marin Municipal Water District

Conservation Measure/Program	Prioritization (a)	Sector	Indoor	Outdoor	Primary End Use	Preference (b)	Local Program
Require On-Site Water Reuse Systems (Grey Water or Black Water) for Large CII Developments	5	CII		X	Irrigation / Recycled Water	Locally	Yes, currently
Require Plumbing for Gray Water in New SFR Development	5	SFR		X	Irrigation / Gray Water	Locally	Yes, currently
Require Swimming Pool and Hot Tub Covers	5	SFR, MFR		X	Pool/Hot Tub	Locally	Yes, currently
Require Water Efficiency Plan Reviews for New CII Development	5	CII	X	X	All Indoor	Locally	Yes, currently
Require Weather Adjusting Smart Irrigation Controllers, Rain Sensors, and/or Soil Moisture Sensors in New Development	5	All		X	Irrigation	Locally	Yes, currently
Water Conserving Landscape and Irrigation Codes, More Stringent than MWELO	5	All		X	Irrigation	Locally	Yes, currently
Water Waste Ordinance	5	All		X	All Outdoor	No preference	Yes, currently
Require Submetering of Landscaping for New MFR and Commercial Developments	4	CII		X	Irrigation	Locally	No
Demand Offset/Water Neutral Policy for Large New Developments	3	All	X	X	All	Locally	No
Prohibit Once through Cooling Systems	3	CII	X	X	CII Equipment	Locally	No
Require <1.0 gal/flush Toilets in New Development	3	All	X		Toilet	Locally	No
Require Rain Barrels in New Development	3	SFR		X	Irrigation	Locally	No

Abbreviations:
AMI = advanced metering infrastructure
CII = commercial, industrial, institutional
COM = commercial
IRR = irrigation account
MFR = multi-family residential
MWELO = Model Water Efficient Landscape Ordinance
PRV = pressure reducing valve
SFR = single-family residential
SMSWP = Sonoma-Marin Saving Water Partnership
UHET = ultra high efficiency toilet

Notes:

(a) Each Water Contractor was asked to rank each conservation program or measure in terms of priority as a locally-administered program, where 5 indicated highest priority and 1 indicated the lowest priority.

(b) For each program a Water Contractor ranked as "3" or above, the Water Contractor was asked to indicate whether they would prefer the program to be administered regionally or locally. N/A indicates no preference given for programs given a ranking lower than three for both local and regional priority.

Table 6-3a
Conservation Program Scenarios
Marin Municipal Water District

Program	Sector	Indoor/ Outdoor	Program Scenario (a)		
			A) Outdoor Programs	B) Highly-Ranked Local Programs	C) Highly-Ranked Regional Programs
High Efficiency Clothes Washer Rebate - Residential	SFR, MFR	Indoor			X
High Efficiency Faucet Aerator / Showerhead Giveaway - Residential Customers	SFR, MFR	Indoor		X	X
Incentivize Irrigation Equipment Upgrades - Large Landscapes	MFR, CII, IRR	Outdoor	X	X	
Incentivize Irrigation Equipment Upgrades - SFR	SFR	Outdoor	X	X	
Landscape Conversion or Turf Removal - MFR and CII	MFR, CII	Outdoor	X	X	X
Landscape Conversion or Turf Removal -SFR	SFR	Outdoor	X	X	X
Restaurant Spray Nozzle Rebates	CII	Indoor			X
Smart Irrigation Controller (Weather-Based Irrigation Controller) Rebates - Large Landscape	MFR, CII	Outdoor	X	X	X
Smart Irrigation Controller (Weather-Based Irrigation Controller) Rebates - SFR	SFR	Outdoor	X	X	
Soil Moisture Sensor Rebate	All	Outdoor	X	X	
Water Savings Incentive Program for CII	CII	Indoor		X	
Water Use Surveys/Audits - CII	CII	Both	X		X
Water Use Surveys/Audits - MFR	MFR	Indoor		X	
Water Use Surveys/Audits - SFR	SFR	Both	X		X

Abbreviations

CII = Commercial, Industrial, and Institutional
MFR = multi-family residential
SFR = Single-family residential

Table 6-3a
Conservation Program Scenarios
Marin Municipal Water District

Notes

(a) Program scenarios represent three potential approaches to program selection. Scenario A represents a focus on outdoor water savings, Scenario B represents a more "business as usual" approach based on programs ranked most highly by Marin Municipal Water District, and Scenario C represents a focus on the programs all nine Water Contractors collectively identified as highest priority.

Table 6-3b
Costs and Savings of Potential Conservation Programs
Marin Municipal Water District

Program (a)	Sector	Indoor/ Outdoor	Note	Net Present Value of Benefits		Net Present Value of Cost		Benefit to Cost Ratio		Water Utility Costs 2021-2025 (b)	Water Savings in 2025 (AFY)	Water Utility Cost of Water Saved ($/AF)
				Water Utility	Customers	Water Utility	Customers	Water Utility	Customers			
High Efficiency Clothes Washer Rebate - Residential	SFR, MFR	Indoor	(c)	$433,978	$1,579,895	$323,234	$1,037,663	1.3	1.5	$295,425	18	$1,369
High Efficiency Faucet Aerator / Showerhead Giveaway - Residential Customers	SFR, MFR	Indoor		$530,195	$1,215,639	$155,152	$248,641	3.4	4.9	$141,804	56	$500
Incentivize Irrigation Equipment Upgrades - Large Landscapes	MFR, CII, IRR	Outdoor	(d)	$234,582	$650,198	$149,349	$57,442	1.6	11	$136,500	12	$1,137
Incentivize Irrigation Equipment Upgrades - SFR	SFR	Outdoor		$64,542	$145,132	$65,785	$50,604	1.0	2.9	$60,125	3.2	$1,820
Landscape Conversion or Turf Removal - MFR and CII	MFR, CII	Outdoor	(e)	$310,238	$774,891	$594,324	$457,172	0.52	1.7	$543,192	15	$3,421
Landscape Conversion or Turf Removal - SFR	SFR	Outdoor	(e)	$103,413	$232,537	$198,108	$152,391	0.52	1.5	$181,064	5.1	$3,421
Restaurant Spray Nozzle Rebates	CII	Indoor		$318,529	$1,218,458	$17,780	$13,677	18	89	$16,250	34	$95
Smart Irrigation Controller (Weather-Based Irrigation Controller) Rebates - Large Landscape	MFR, CII	Outdoor		$179,392	$497,227	$35,916	$18,662	5.0	27	$32,826	8.9	$358
Smart Irrigation Controller (Weather-Based Irrigation Controller) Rebates - SFR	SFR	Outdoor	(c)	$197,545	$444,206	$50,167	$34,895	3.9	13	$45,851	10	$454
Soil Moisture Sensor Rebate	All	Outdoor		$363,376	$784,437	$52,628	$60,724	6.9	13	$48,100	7.9	$284
Water Savings Incentive Program for CII	CII	Indoor		$2,964,596	$7,257,526	$25,584	$29,520	116	246	$23,383	92	$16
Water Use Surveys/Audits - CII	CII	Both		$388,829	$993,499	$470,477	$588,096	0.83	1.7	$430,000	41	$2,051
Water Use Surveys/Audits - MFR	MFR	Indoor		$388,829	$640,597	$470,477	$588,096	0.83	1.1	$430,000	41	$2,051
Water Use Surveys/Audits - SFR	SFR	Both		$874,527	$2,334,034	$842,200	$199,953	1.04	11.7	$769,743	93	$1,632

Abbreviations

AFY = acre-feet per year
CII = Commercial, Industrial, and Institutional
MFR = multi-family residential
MMWD = Marin Municipal Water District
SFR = Single-family residential
sq ft = square feet
WBIC = weather-based irrigation controller
$/AF = dollars per acre-foot

Table 6-3b
Costs and Savings of Potential Conservation Programs
Marin Municipal Water District

Notes
(a) Estimated water savings, benefits, and costs are calculated using the AWE model. Assumptions used are presented in Appendix B.
(b) For purposes of near-term conservation program analysis, it is assumed that all programs are active from 2021 through 2025.
(c) Program savings are based on MMWD-specific estimates, which are derived from participant water savings based on their water bills.
(d) Cost-effectiveness of this program is largely driven by the cost and type of equipment replaced. If the program was focused on certain equipment types, its cost-effectiveness would likely be increased.
(e) Evaluation of this program assumed a rebate amount of $1/square foot plus administrative cost. It is noted that a lower rebate would result in a benefit-cost ratio of greater than 1.

Table 6-3c
Comparison of Program Scenarios – Costs and Savings
Marin Municipal Water District

Scenario (a)	Present Value of Benefits		Present Value of Cost		Benefit to Cost Ratio		Cumulative Water Savings (AF)					Water Utility Cost of Water Saved ($/AF) (b)
	Water Utility	Customers	Water Utility	Customers	Water Utility	Customers	2025	2030	2035	2040	2045	
A) Outdoor Programs	$2,406,206	$6,081,271	$1,864,629	$1,162,765	1.3	5.2	603	1,047	1,164	1,203	1,219	$1,529
B) Highly-Ranked Local Programs	$4,637,641	$11,226,903	$732,689	$652,879	6.3	17	584	1,389	1,966	2,189	2,205	$332
C) Highly-Ranked Regional Programs	$2,828,862	$8,071,289	$2,042,867	$2,259,082	1.4	3.6	829	1,364	1,450	1,469	1,469	$1,390

Abbreviations
AF = acre-feet
$/AF = dollars per acre-foot

Notes
(a) For purposes of near-term conservation program analysis, it is assumed that all programs are active from 2021 through 2025. Cumulative water savings achieved beyond 2025 reflect the ongoing benefit of program implementation.
(b) The water utility cost is based on the cumulative savings achieved through 2045 cumulative water savings.

7. CONCLUSION

This report presents the results of demand analysis and projections, developed consistent with CWC § 10631(d)(4)(A), which requires that "Water use projections, where available, shall display and account for the water savings estimated to result from adopted codes, standards, ordinances, or transportation and land use plans identified by the urban water supplier, as applicable to the service area." The assumptions used as the bases for demand projections were developed in close coordination with the District and reflect a land-use based approach consistent with the District's community planning, using the best available information. It should be noted that all demand and conservation projections have limitations and should be considered estimates that require revisiting as factors that affect demands arise, such as significant economic or population shifts, extreme hydrological conditions, etc.

The methodology used to develop demand projections herein is also consistent with the CWC §10635(b)(4), requirement to consider climate change on projected demands.[25] California experienced a historic drought between 2011-2017. In 2014, Governor Brown issued Executive Order B-26-14 declaring a Drought State of Emergency and requested all Californians to voluntarily reduce water use by 20%. In 2015, the State Water Resources Control Board implemented emergency conservation regulations that, among other things, required water agencies to reduce their water use and prohibited certain types of water uses. As a result, the District experienced an overall decrease in demands during the historic drought, most significantly during 2014. The demand factors evaluated herein consider both the 2011-2013 period, in which customers increased their water use (in part due to the drought conditions, prior to the imposed restrictions), as well as the observed rebound in demand following the drought (2017-2019). Thus, the periods used to develop the demand projections reflect conditions representative of the hotter, drier weather expected as a result of climate change.

[25] CWC §10635(b)(4) requires that suppliers consider plausible changes on projected supplies and demands under climate change conditions specific to their five-year drought risk assessments. Section 4.5 of the draft 2020 UWMP Guidebook more generally recommends that consideration of climate change be incorporated into all demand projections.

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Appendix A

California Water Code Revisions per AB-1668, SB-606, and SB-664, Redlines prepared by DWR

SB-664 Water: urban water management planning. (2015-2016)

As Amends the Law Today **As Amends the Law on Nov 20, 2015**

SECTION 1. *Section 10632.5 is added to the Water Code, to read:*

10632.5. *(a) In addition to the requirements of paragraph (3) of subdivision (a) of Section 10632, beginning January 1, 2020, the plan shall include 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.*

(b) An urban water supplier shall update the seismic risk assessment and mitigation plan when updating its urban water management plan as required by Section 10621.

(c) An urban water supplier may comply with this section by submitting, pursuant to Section 10644, a copy of the most recent adopted local hazard mitigation plan or multihazard mitigation plan under the federal Disaster Mitigation Act of 2000 (Public Law 106-390) if the local hazard mitigation plan or multihazard mitigation plan addresses seismic risk.

AB-1668 Water management planning. (2017-2018)

As Amends the Law Today **As Amends the Law on Nov 08, 2018**

SECTION 1. Section 531.10 of the Water Code is amended to read:

531.10. (a) (1) An agricultural water supplier shall submit an annual report to the department that summarizes aggregated farm-gate delivery data, on a monthly or bimonthly basis, using best professional practices. The annual report for the prior year shall be submitted to the department by April 1 of each year. The annual report shall be organized by basin, as defined in Section 10721, within the service area of the agricultural water supplier, if applicable.

(2) The report, and any amendments to the report, submitted to the department pursuant to this subdivision shall be submitted electronically and shall include any standardized forms, tables, or displays specified by the department.

(3) The department shall post all reports on its Internet Web site in a manner that allows for comparisons across water suppliers. The department shall make the reports available for public viewing in a timely manner after it receives them.

(b) Nothing in this article shall be construed to require the implementation of water measurement programs or practices that are not locally cost effective.

(c) It is the intent of the Legislature that the requirements of this section shall complement and not affect the scope of authority granted to the department or the board by provisions of law other than this article.

SEC. 2. Section 1120 of the Water Code is amended to read:

1120. This chapter applies to any decision or order issued under this part or Section 275, Part 2 (commencing with Section 1200), Part 2 (commencing with Section 10500) of Division 6, Part 2.55 (commencing with Section 10608) of Division 6, or Chapter 11 (commencing with Section 10735) of Part 2.74 of Division 6, Article 7 (commencing with Section 13550) of Chapter 7 of Division 7, or the public trust doctrine.

SEC. 3. *Section 1846.5 is added to the Water Code, to read:*

1846.5. *(a) An urban retail water supplier who commits any of the violations identified in subdivision (b) may be liable in an amount not to exceed the following, as applicable:*

(1) If the violation occurs in a critically dry year immediately preceded by two or more consecutive below normal, dry, or critically dry years or during a period for which the Governor has issued a proclamation of a state of emergency under the California Emergency Services Act (Chapter 7 (commencing with Section 8550) of Division 1 of Title 2 of the Government Code) based on drought conditions, ten thousand dollars ($10,000) for each day in which the violation occurs.

(2) For all violations other than those described in paragraph (1), one thousand dollars ($1,000) for each day in which the violation occurs.

(b) Liability pursuant to this section may be imposed for any of the following violations:

(1) Violation of an order issued under Chapter 9 (commencing with Section 10609) of Part 2.55 of Division 6.

(2) Violation of a regulation issued under Chapter 9 (commencing with Section 10609) of Part 2.55 of Division 6, if the violation occurs after November 1, 2027.

(c) Civil liability may be imposed by the superior court. The Attorney General, upon the request of the board, shall petition the superior court to impose, assess, and recover those sums.

(d) Civil liability may be imposed administratively by the board pursuant to Section 1055.

SEC. 4. Section 10608.12 of the Water Code is amended to read:

10608.12. Unless the context otherwise requires, the following definitions govern the construction of this part:

(a) "Agricultural water supplier" means a water supplier, either publicly or privately owned, providing water to 10,000 or more irrigated acres, excluding recycled water. "Agricultural water supplier" includes a supplier or contractor for water, regardless of the basis of right, that distributes or sells water for ultimate resale to customers. "Agricultural water supplier" does not include the department.

(b) "Base daily per capita water use" means any of the following:

(1) The urban retail water supplier's estimate of its average gross water use, reported in gallons per capita per day and calculated over a continuous 10-year period ending no earlier than December 31, 2004, and no later than December 31, 2010.

(2) For an urban retail water supplier that meets at least 10 percent of its 2008 measured retail water demand through recycled water that is delivered within the service area of an urban retail water supplier or its urban wholesale water supplier, the urban retail water supplier may extend the calculation described in paragraph (1) up to an additional five years to a maximum of a continuous 15-year period ending no earlier than December 31, 2004, and no later than December 31, 2010.

(3) For the purposes of Section 10608.22, the urban retail water supplier's estimate of its average gross water use, reported in gallons per capita per day and calculated over a continuous five-year period ending no earlier than December 31, 2007, and no later than December 31, 2010.

(c) "Baseline commercial, industrial, and institutional water use" means an urban retail water supplier's base daily per capita water use for commercial, industrial, and institutional users.

(d) "CII water use" means water used by commercial water users, industrial water users, institutional water users, and large landscape water users.

(e) "Commercial water user" means a water user that provides or distributes a product or service.

(f) "Compliance daily per capita water use" means the gross water use during the final year of the reporting period, reported in gallons per capita per day.

(g) "Disadvantaged community" means a community with an annual median household income that is less than 80 percent of the statewide annual median household income.

(h) "Gross water use" means the total volume of water, whether treated or untreated, entering the distribution system of an urban retail water supplier, excluding all of the following:

(1) Recycled water that is delivered within the service area of an urban retail water supplier or its urban wholesale water supplier.

(2) The net volume of water that the urban retail water supplier places into long-term storage.

(3) The volume of water the urban retail water supplier conveys for use by another urban water supplier.

(4) The volume of water delivered for agricultural use, except as otherwise provided in subdivision (f) of Section 10608.24.

(i) "Industrial water user" means a water user that is primarily a manufacturer or processor of materials as defined by the North American Industry Classification System code sectors 31 to 33, inclusive, or an entity that is a water user primarily engaged in research and development.

(j) "Institutional water user" means a water user dedicated to public service. This type of user includes, among other users, higher education institutions, schools, courts, churches, hospitals, government facilities, and nonprofit research institutions.

(k) "Interim urban water use target" means the midpoint between the urban retail water supplier's base daily per capita water use and the urban retail water supplier's urban water use target for 2020.

(l) "Large landscape" means a nonresidential landscape as described in the performance measures for CII water use adopted pursuant to Section 10609.10.

(m) "Locally cost effective" means that the present value of the local benefits of implementing an agricultural efficiency water management practice is greater than or equal to the present value of the local cost of implementing that measure.

(n) "Performance measures" means actions to be taken by urban retail water suppliers that will result in increased water use efficiency by CII water users. Performance measures may include, but are not limited to, educating CII water users on best management practices, conducting water use audits, and preparing water management plans. Performance measures do not include process water.

(o) "Potable reuse" means direct potable reuse, indirect potable reuse for groundwater recharge, and reservoir water augmentation as those terms are defined in Section 13561.

(p) "Process water" means water used by industrial water users for producing a product or product content or water used for research and development. Process water includes, but is not limited to, continuous manufacturing processes, and water used for testing, cleaning, and maintaining equipment. Water used to cool machinery or buildings used in the manufacturing process or necessary to maintain product quality or chemical characteristics for product manufacturing or control rooms, data centers, laboratories, clean rooms, and other industrial facility units that are integral to the manufacturing or research and development process is process water. Water used in the manufacturing process that is necessary for complying with local, state, and federal health and safety laws, and is not incidental water, is process water. Process water does not mean incidental water uses.

(q) "Recycled water" means recycled water, as defined in subdivision (n) of Section 13050.

(r) "Regional water resources management" means sources of supply resulting from watershed-based planning for sustainable local water reliability or any of the following alternative sources of water:

(1) The capture and reuse of stormwater or rainwater.

(2) The use of recycled water.

(3) The desalination of brackish groundwater.

(4) The conjunctive use of surface water and groundwater in a manner that is consistent with the safe yield of the groundwater basin.

(s) "Reporting period" means the years for which an urban retail water supplier reports compliance with the urban water use targets.

(t) "Urban retail water supplier" means a water supplier, either publicly or privately owned, that directly provides potable municipal water to more than 3,000 end users or that supplies more than 3,000 acre-feet of potable water annually at retail for municipal purposes.

(u) "Urban water use objective" means an estimate of aggregate efficient water use for the previous year based on adopted water use efficiency standards and local service area characteristics for that year, as described in Section 10609.20.

(v) "Urban water use target" means the urban retail water supplier's targeted future daily per capita water use.

(w) "Urban wholesale water ~~supplier"~~ *supplier,"* means a water supplier, either publicly or privately owned, that provides more than 3,000 acre-feet of water annually at wholesale for potable municipal purposes.

SEC. 5. Section 10608.20 of the Water Code is amended to read:

10608.20. (a) (1) Each urban retail water supplier shall develop urban water use targets and an interim urban water use target by July 1, 2011. Urban retail water suppliers may elect to determine and report progress toward achieving these targets on an individual or regional basis, as provided in subdivision (a) of Section 10608.28, and may determine the targets on a fiscal year or calendar year basis.

(2) It is the intent of the Legislature that the urban water use targets described in paragraph (1) cumulatively result in a 20-percent reduction from the baseline daily per capita water use by December 31, 2020.

(b) An urban retail water supplier shall adopt one of the following methods for determining its urban water use target pursuant to subdivision (a):

(1) Eighty percent of the urban retail water supplier's baseline per capita daily water use.

(2) The per capita daily water use that is estimated using the sum of the following performance standards:

(A) For indoor residential water use, 55 gallons per capita daily water use as a provisional standard. Upon completion of the department's ~~2017~~ *2016* report to the Legislature pursuant to Section 10608.42, this standard may be adjusted by the Legislature by statute.

(B) For landscape irrigated through dedicated or residential meters or connections, water efficiency equivalent to the standards of the Model Water Efficient Landscape Ordinance set forth in Chapter 2.7 (commencing with Section 490) of Division 2 of Title 23 of the California Code of Regulations, as in effect the later of the year of the landscape's installation or 1992. An urban retail water supplier using the approach specified in this subparagraph shall use satellite imagery, site visits, or other best available technology to develop an accurate estimate of landscaped areas.

(C) For commercial, industrial, and institutional uses, a 10-percent reduction in water use from the baseline commercial, industrial, and institutional water use by 2020.

(3) Ninety-five percent of the applicable state hydrologic region target, as set forth in the state's draft 20x2020 Water Conservation Plan (dated April 30, 2009). If the service area of an urban water supplier includes more than one hydrologic region, the supplier shall apportion its service area to each region based on population or area.

(4) A method that shall be identified and developed by the department, through a public process, and reported to the Legislature no later than December 31, 2010. The method developed by the department shall identify per capita targets that cumulatively result in a statewide 20-percent reduction in urban daily per capita water use by December 31, 2020. In developing urban daily per capita water use targets, the department shall do all of the following:

(A) Consider climatic differences within the state.

(B) Consider population density differences within the state.

(C) Provide flexibility to communities and regions in meeting the targets.

(D) Consider different levels of per capita water use according to plant water needs in different regions.

(E) Consider different levels of commercial, industrial, and institutional water use in different regions of the state.

(F) Avoid placing an undue hardship on communities that have implemented conservation measures or taken actions to keep per capita water use low.

(c) If the department adopts a regulation pursuant to paragraph (4) of subdivision (b) that results in a requirement that an urban retail water supplier achieve a reduction in daily per capita water use that is greater than 20 percent by December 31, 2020, an urban retail water supplier that adopted the method described in paragraph (4) of subdivision (b) may limit its urban water use target to a reduction of not more than 20 percent by December 31, 2020, by adopting the method described in paragraph (1) of subdivision (b).

(d) The department shall update the method described in paragraph (4) of subdivision (b) and report to the Legislature by December 31, 2014. An urban retail water supplier that adopted the method described in paragraph (4) of subdivision (b) may adopt a new urban daily per capita water use target pursuant to this updated method.

(e) An urban retail water supplier shall include in its urban water management plan due in 2010 pursuant to Part 2.6 (commencing with Section 10610) the baseline daily per capita water use, urban water use target, interim urban water use target, and compliance daily per capita water use, along with the bases for determining those estimates, including references to supporting data.

(f) When calculating per capita values for the purposes of this chapter, an urban retail water supplier shall determine population using federal, state, and local population reports and projections.

(g) An urban retail water supplier may update its 2020 urban water use target in its 2015 urban water management plan required pursuant to Part 2.6 (commencing with Section 10610).

(h) (1) The department, through a public process and in consultation with the California Urban Water Conservation Council, shall develop technical methodologies and criteria for the consistent implementation of this part, including, but not limited to, both of the following:

(A) Methodologies for calculating base daily per capita water use, baseline commercial, industrial, and institutional water use, compliance daily per capita water use, gross water use, service area population, indoor residential water use, and landscaped area water use.

(B) Criteria for adjustments pursuant to subdivisions (d) and (e) of Section 10608.24.

(2) The department shall post the methodologies and criteria developed pursuant to this subdivision on its ~~internet website,~~ *Internet Web site,* and make written copies available, by October 1, 2010. An urban retail water supplier shall use the methods developed by the department in compliance with this part.

(i) (1) The department shall adopt regulations for implementation of the provisions relating to process water in accordance with Section 10608.12, subdivision (e) of Section 10608.24, and subdivision (d) of Section 10608.26.

(2) The initial adoption of a regulation authorized by this subdivision is deemed to address an emergency, for purposes of Sections 11346.1 and 11349.6 of the Government Code, and the department is hereby exempted for that purpose from the requirements of subdivision (b) of Section 11346.1 of the Government Code. After the initial adoption of an emergency regulation pursuant to this subdivision, the department shall not request approval from the Office of Administrative Law to readopt the regulation as an emergency regulation pursuant to Section 11346.1 of the Government Code.

(j) (1) An urban retail water supplier is granted an extension to July 1, 2011, for adoption of an urban water management plan pursuant to Part 2.6 (commencing with Section 10610) due in 2010 to allow the use of technical methodologies developed by the department pursuant to paragraph (4) of subdivision (b) and subdivision (h). An urban retail water supplier that adopts an urban water management plan due in 2010 that does not use the methodologies developed by the department pursuant to subdivision (h) shall amend the plan by July 1, 2011, to comply with this part.

(2) An urban wholesale water supplier whose urban water management plan prepared pursuant to Part 2.6 (commencing with Section 10610) was due and not submitted in 2010 is granted an extension to July 1, 2011, to permit coordination between an urban wholesale water supplier and urban retail water suppliers.

SEC. 6. Section 10608.48 of the Water Code is amended to read:

10608.48. (a) On or before July 31, 2012, an agricultural water supplier shall implement efficient water management practices pursuant to subdivisions (b) and (c).

(b) Agricultural water suppliers shall implement both of the following critical efficient management practices:

(1) Measure the volume of water delivered to customers with sufficient accuracy to comply with subdivision (a) of Section 531.10 and to implement paragraph (2).

(2) Adopt a pricing structure for water customers based at least in part on quantity delivered.

(c) Agricultural water suppliers shall implement additional efficient management practices, including, but not limited to, practices to accomplish all of the following, if the measures are locally cost effective and technically feasible:

(1) Facilitate alternative land use for lands with exceptionally high water duties or whose irrigation contributes to significant problems, including drainage.

(2) Facilitate use of available recycled water that otherwise would not be used beneficially, meets all health and safety criteria, and does not harm crops or soils.

(3) Facilitate the financing of capital improvements for on-farm irrigation systems.

(4) Implement an incentive pricing structure that promotes one or more of the following goals:

(A) More efficient water use at the farm level.

(B) Conjunctive use of groundwater.

(C) Appropriate increase of groundwater recharge.

(D) Reduction in problem drainage.

(E) Improved management of environmental resources.

(F) Effective management of all water sources throughout the year by adjusting seasonal pricing structures based on current conditions.

(5) Expand line or pipe distribution systems, and construct regulatory reservoirs to increase distribution system flexibility and capacity, decrease maintenance, and reduce seepage.

(6) Increase flexibility in water ordering by, and delivery to, water customers within operational limits.

(7) Construct and operate supplier spill and tailwater recovery systems.

(8) Increase planned conjunctive use of surface water and groundwater within the supplier service area.

(9) Automate canal control structures.

(10) Facilitate or promote customer pump testing and evaluation.

(11) Designate a water conservation coordinator who will develop and implement the water management plan and prepare progress reports.

(12) Provide for the availability of water management services to water users. These services may include, but are not limited to, all of the following:

(A) On-farm irrigation and drainage system evaluations.

(B) Normal year and real-time irrigation scheduling and crop evapotranspiration information.

(C) Surface water, groundwater, and drainage water quantity and quality data.

(D) Agricultural water management educational programs and materials for farmers, staff, and the public.

(13) Evaluate the policies of agencies that provide the supplier with water to identify the potential for institutional changes to allow more flexible water deliveries and storage.

(14) Evaluate and improve the efficiencies of the supplier’s pumps.

(d) Agricultural water suppliers shall include in the agricultural water management plans required pursuant to Part 2.8 (commencing with Section 10800) a report on which efficient water management practices have been implemented and are planned to be implemented, an estimate of the water use efficiency improvements that have occurred since the last report, and an estimate of the water use efficiency improvements estimated to occur five and 10 years in the future. If an agricultural water supplier determines that an efficient water management practice is not locally cost effective or technically feasible, the supplier shall submit information documenting that determination.

(e) The department shall require information about the implementation of efficient water management practices to be reported using a standardized form developed pursuant to Section 10608.52.

(f) An agricultural water supplier may meet the requirements of subdivisions (d) and (e) by submitting to the department a water conservation plan submitted to the United States Bureau of Reclamation that meets the requirements described in Section 10828.

(g) On or before December 31, 2013, December 31, 2016, and December 31, 2021, the department, in consultation with the board, shall submit to the Legislature a report on the agricultural efficient water management practices that have been implemented and are planned to be implemented and an assessment of the manner in which the implementation of those efficient water management practices has affected and will affect agricultural operations, including estimated water use efficiency improvements, if any.

(h) The department may update the efficient water management practices required pursuant to subdivision (c), in consultation with the Agricultural Water Management Council, the United States Bureau of Reclamation, and the board. All efficient water management practices for agricultural water use pursuant to this chapter shall be adopted or revised by the department only after the department conducts public hearings to allow participation of the diverse geographical areas and interests of the state.

(i) (1) The department shall adopt regulations that provide for a range of options that agricultural water suppliers may use or implement to comply with the measurement requirement in paragraph (1) of subdivision (b).

(2) The initial adoption of a regulation authorized by this subdivision is deemed to address an emergency, for purposes of Sections 11346.1 and 11349.6 of the Government Code, and the department is hereby exempted for that purpose from the requirements of subdivision (b) of Section 11346.1 of the Government Code. After the initial adoption of an emergency regulation pursuant to this subdivision, the department shall not request approval from the Office of Administrative Law to readopt the regulation as an emergency regulation pursuant to Section 11346.1 of the Government Code.

SEC. 7. *Chapter 9 (commencing with Section 10609) is added to Part 2.55 of Division 6 of the Water Code, to read:*

CHAPTER 9. Urban Water Use Objectives and Water Use Reporting

10609. *(a) The Legislature finds and declares that this chapter establishes a method to estimate the aggregate amount of water that would have been delivered the previous year by an urban retail water supplier if all that water had been used efficiently. This estimated aggregate water use is the urban retail water supplier's urban water use objective. The method is based on water use efficiency standards and local service area characteristics for that year. By comparing the amount of water actually used in the previous year with the urban water use objective, local urban water suppliers will be in a better position to help eliminate unnecessary use of water; that is, water used in excess of that needed to accomplish the intended beneficial use.*

(b) The Legislature further finds and declares all of the following:

(1) This chapter establishes standards and practices for the following water uses:

(A) Indoor residential use.

(B) Outdoor residential use.

(C) CII water use.

(D) Water losses.

(E) Other unique local uses and situations that can have a material effect on an urban water supplier's total water use.

(2) This chapter further does all of the following:

(A) Establishes a method to calculate each urban water use objective.

(B) Considers recycled water quality in establishing efficient irrigation standards.

(C) Requires the department to provide or otherwise identify data regarding the unique local conditions to support the calculation of an urban water use objective.

(D) Provides for the use of alternative sources of data if alternative sources are shown to be as accurate as, or more accurate than, the data provided by the department.

(E) Requires annual reporting of the previous year's water use with the urban water use objective.

(F) Provides a bonus incentive for the amount of potable recycled water used the previous year when comparing the previous year's water use with the urban water use objective, of up to 10 percent of the urban water use objective.

(3) This chapter requires the department and the board to solicit broad public participation from stakeholders and other interested persons in the development of the standards and the adoption of regulations pursuant to this chapter.

(4) This chapter preserves the Legislature's authority over long-term water use efficiency target setting and ensures appropriate legislative oversight of the implementation of this chapter by doing all of the following:

(A) Requiring the Legislative Analyst to conduct a review of the implementation of this act, including compliance with the adopted standards and regulations, accuracy of the data, use of alternate data, and other issues the Legislative Analyst deems appropriate.

(B) Stating legislative intent that the director of the department and the chairperson of the board appear before the appropriate Senate and Assembly policy committees to report on progress in implementing this chapter.

(C) Providing one-time-only authority to the department and board to adopt water use efficiency standards, except as explicitly provided in this chapter. Authorization to update the standards shall require separate legislation.

(c) It is the intent of the Legislature that the following principles apply to the development and implementation of long-term standards and urban water use objectives:

(1) Local urban retail water suppliers should have primary responsibility for meeting standards-based water use targets, and they shall retain the flexibility to develop their water supply portfolios, design and implement water conservation strategies, educate their customers, and enforce their rules.

(2) Long-term standards and urban water use objectives should advance the state's goals to mitigate and adapt to climate change.

(3) Long-term standards and urban water use objectives should acknowledge the shade, air quality, and heat-island reduction benefits provided to communities by trees through the support of water-efficient irrigation practices that keep trees healthy.

(4) The state should identify opportunities for streamlined reporting, eliminate redundant data submissions, and incentivize open access to data collected by urban and agricultural water suppliers.

10609.2. *(a) The board, in coordination with the department, shall adopt long-term standards for the efficient use of water pursuant to this chapter on or before June 30, 2022.*

(b) Standards shall be adopted for all of the following:

(1) Outdoor residential water use.

(2) Outdoor irrigation of landscape areas with dedicated irrigation meters in connection with CII water use.

(3) A volume for water loss.

(c) When adopting the standards under this section, the board shall consider the policies of this chapter and the proposed efficiency standards' effects on local wastewater management, developed and natural parklands, and urban tree health. The standards and potential effects shall be identified by May 30, 2022. The board shall allow for public comment on potential effects identified by the board under this subdivision.

(d) The long-term standards shall be set at a level designed so that the water use objectives, together with other demands excluded from the long-term standards such as CII indoor water use and CII outdoor water use not connected to a dedicated landscape meter, would exceed the statewide conservation targets required pursuant to Chapter 3 (commencing with Section 10608.16).

(e) The board, in coordination with the department, shall adopt by regulation variances recommended by the department pursuant to Section 10609.14 and guidelines and methodologies pertaining to the calculation of an urban retail water supplier's urban water use objective recommended by the department pursuant to Section 10609.16.

10609.4. *(a) (1) Until January 1, 2025, the standard for indoor residential water use shall be 55 gallons per capita daily.*

(2) Beginning January 1, 2025, and until January 1, 2030, the standard for indoor residential water use shall be the greater of 52.5 gallons per capita daily or a standard recommended pursuant to subdivision (b).

(3) Beginning January 1, 2030, the standard for indoor residential water use shall be the greater of 50 gallons per capita daily or a standard recommended pursuant to subdivision (b).

(b) (1) The department, in coordination with the board, shall conduct necessary studies and investigations and may jointly recommend to the Legislature a standard for indoor residential water use that more appropriately reflects best practices for indoor residential water use than the standard described in subdivision (a). A report on the results of the studies and investigations shall be made to the chairpersons of the relevant policy committees of each house of the Legislature by January 1, 2021, and shall include information necessary to support the recommended standard, if there is one. The studies and investigations shall also include an analysis of the benefits and impacts of how the changing standard for indoor residential water use will impact water and wastewater management, including potable water usage, wastewater, recycling and reuse systems, infrastructure, operations, and supplies.

(2) The studies, investigations, and report described in paragraph (1) shall include collaboration with, and input from, a broad group of stakeholders, including, but not limited to, environmental groups, experts in indoor plumbing, and water, wastewater, and recycled water agencies.

10609.6. *(a) (1) The department, in coordination with the board, shall conduct necessary studies and investigations and recommend, no later than October 1, 2021, standards for outdoor residential use for adoption by the board in accordance with this chapter.*

(2) (A) The standards shall incorporate the principles of the model water efficient landscape ordinance adopted by the department pursuant to the Water Conservation in Landscaping Act (Article 10.8 (commencing with Section 65591) of Chapter 3 of Division 1 of Title 7 of the Government Code).

(B) The standards shall apply to irrigable lands.

(C) The standards shall include provisions for swimming pools, spas, and other water features. Ornamental water features that are artificially supplied with water, including ponds, lakes, waterfalls, and fountains, shall be analyzed separately from swimming pools and spas.

(b) The department shall, by January 1, 2021, provide each urban retail water supplier with data regarding the area of residential irrigable lands in a manner that can reasonably be applied to the standards adopted pursuant to this section.

(c) The department shall not recommend standards pursuant to this section until it has conducted pilot projects or studies, or some combination of the two, to ensure that the data provided to local agencies are reasonably accurate for the data's intended uses, taking into consideration California's diverse landscapes and community characteristics.

10609.8. *(a) The department, in coordination with the board, shall conduct necessary studies and investigations and recommend, no later than October 1, 2021, standards for outdoor irrigation of landscape areas with dedicated irrigation meters or other means of calculating outdoor irrigation use in connection with CII water use for adoption by the board in accordance with this chapter.*

(b) The standards shall incorporate the principles of the model water efficient landscape ordinance adopted by the department pursuant to the Water Conservation in Landscaping Act (Article 10.8 (commencing with Section 65591) of Chapter 3 of Division 1 of Title 7 of the Government Code).

(c) The standards shall include an exclusion for water for commercial agricultural use meeting the definition of subdivision (b) of Section 51201 of the Government Code.

10609.9. *For purposes of Sections 10609.6 and 10609.8, "principles of the model water efficient landscape ordinance" means those provisions of the model water efficient landscape ordinance applicable to the establishment or determination of the amount of water necessary to efficiently irrigate both new and existing landscapes. These provisions include, but are not limited to, all of the following:*

(a) Evapotranspiration adjustment factors, as applicable.

(b) Landscape area.

(c) Maximum applied water allowance.

(d) Reference evapotranspiration.

(e) Special landscape areas, including provisions governing evapotranspiration adjustment factors for different types of water used for irrigating the landscape.

10609.10. *(a) The department, in coordination with the board, shall conduct necessary studies and investigations and recommend, no later than October 1, 2021, performance measures for CII water use for adoption by the board in accordance with this chapter.*

(b) Prior to recommending performance measures for CII water use, the department shall solicit broad public participation from stakeholders and other interested persons relating to all of the following:

(1) Recommendations for a CII water use classification system for California that address significant uses of water.

(2) Recommendations for setting minimum size thresholds for converting mixed CII meters to dedicated irrigation meters, and evaluation of, and recommendations for, technologies that could be used in lieu of requiring dedicated irrigation meters.

(3) Recommendations for CII water use best management practices, which may include, but are not limited to, water audits and water management plans for those CII customers that exceed a recommended size, volume of water use, or other threshold.

(c) Recommendations of appropriate performance measures for CII water use shall be consistent with the October 21, 2013, report to the Legislature by the Commercial, Industrial, and Institutional Task Force entitled "Water Use Best Management Practices," including the technical and financial feasibility recommendations provided in that report, and shall support the economic productivity of California's commercial, industrial, and institutional sectors.

(d) (1) The board, in coordination with the department, shall adopt performance measures for CII water use on or before June 30, 2022.

(2) Each urban retail water supplier shall implement the performance measures adopted by the board pursuant to paragraph (1).

10609.12. *The standards for water loss for urban retail water suppliers shall be the standards adopted by the board pursuant to subdivision (i) of Section 10608.34.*

10609.14. *(a) The department, in coordination with the board, shall conduct necessary studies and investigations and, no later than October 1, 2021, recommend for adoption by the board in accordance with this chapter appropriate variances for unique uses that can have a material effect on an urban retail water supplier's urban water use objective.*

(b) Appropriate variances may include, but are not limited to, allowances for the following:

(1) Significant use of evaporative coolers.

(2) Significant populations of horses and other livestock.

(3) Significant fluctuations in seasonal populations.

(4) Significant landscaped areas irrigated with recycled water having high levels of total dissolved solids.

(5) Significant use of water for soil compaction and dust control.

(6) Significant use of water to supplement ponds and lakes to sustain wildlife.

(7) Significant use of water to irrigate vegetation for fire protection.

(8) Significant use of water for commercial or noncommercial agricultural use.

(c) The department, in recommending variances for adoption by the board, shall also recommend a threshold of significance for each recommended variance.

(d) Before including any specific variance in calculating an urban retail water supplier's water use objective, the urban retail water supplier shall request and receive approval by the board for the inclusion of that variance.

(e) The board shall post on its Internet Web site all of the following:

(1) A list of all urban retail water suppliers with approved variances.

(2) The specific variance or variances approved for each urban retail water supplier.

(3) The data supporting approval of each variance.

10609.15. *To help streamline water data reporting, the department and the board shall do all of the following:*

(a) Identify urban water reporting requirements shared by both agencies, and post on each agency's Internet Web site how the data is used for planning, regulatory, or other purposes.

(b) Analyze opportunities for more efficient publication of urban water reporting requirements within each agency, and analyze how each agency can integrate various data sets in a publicly accessible location, identify priority actions, and implement priority actions identified in the analysis.

(c) Make appropriate data pertaining to the urban water reporting requirements that are collected by either agency available to the public according to the principles and requirements of the Open and Transparent Water Data Act (Part 4.9 (commencing with Section 12400)).

10609.16. *The department, in coordination with the board, shall conduct necessary studies and investigations and recommend, no later than October 1, 2021, guidelines and methodologies for the board to adopt that identify how an urban retail water supplier calculates its urban water use objective. The guidelines and methodologies shall address, as necessary, all of the following:*

(a) Determining the irrigable lands within the urban retail water supplier's service area.

(b) Updating and revising methodologies described pursuant to subparagraph (A) of paragraph (1) of subdivision (h) of Section 10608.20, as appropriate, including methodologies for calculating the population in an urban retail water supplier's service area.

(c) Using landscape area data provided by the department or alternative data.

(d) Incorporating precipitation data and climate data into estimates of a urban retail water supplier's outdoor irrigation budget for its urban water use objective.

(e) Estimating changes in outdoor landscape area and population, and calculating the urban water use objective, for years when updated landscape imagery is not available from the department.

(f) Determining acceptable levels of accuracy for the supporting data, the urban water use objective, and compliance with the urban water use objective.

10609.18. *The department and the board shall solicit broad public participation from stakeholders and other interested persons in the development of the standards and the adoption of regulations pursuant to this chapter. The board shall hold at least one public meeting before taking any action on any standard or variance recommended by the department.*

SEC. 8. *Chapter 10 (commencing with Section 10609.40) is added to Part 2.55 of Division 6 of the Water Code, to read:*

CHAPTER 10. Countywide Drought and Water Shortage Contingency Plans

10609.40. *The Legislature finds and declares both of the following:*

(a) Small water suppliers and rural communities are often not covered by established water shortage planning requirements. Currently, most counties do not address water shortages or do so minimally in their general plan or the local hazard mitigation plan.

(b) The state should provide guidance to improve drought planning for small water suppliers and rural communities.

10609.42. *(a) No later than January 1, 2020, the department, in consultation with the board and other relevant state and local agencies and stakeholders, shall use available data to identify small water suppliers and rural communities that may be at risk of drought and water shortage vulnerability. The department shall notify counties and groundwater sustainability agencies of those suppliers or communities that may be at risk within its jurisdiction, and may make the information publicly accessible on its Internet Web site.*

(b) The department shall, in consultation with the board, by January 1, 2020, propose to the Governor and the Legislature recommendations and guidance relating to the development and implementation of countywide drought and water shortage contingency plans to address the planning needs of small water suppliers and rural communities. The department shall recommend how these plans can be included in county local hazard

mitigation plans or otherwise integrated with complementary existing planning processes. The guidance from the department shall outline goals of the countywide drought and water shortage contingency plans and recommend components including, but not limited to, all of the following:

(1) Assessment of drought vulnerability.

(2) Actions to reduce drought vulnerability.

(3) Response, financing, and local communication and outreach planning efforts that may be implemented in times of drought.

(4) Data needs and reporting.

(5) Roles and responsibilities of interested parties and coordination with other relevant water management planning efforts.

(c) In formulating the proposal, the department shall utilize a public process involving state agencies, cities, counties, small communities, small water suppliers, and other stakeholders.

SEC. 9. Section 10801 of the Water Code is amended to read:

10801. The Legislature finds and declares all of the following:

(a) The waters of the state are a limited and renewable resource.

(b) The California Constitution requires that water in the state be used in a reasonable and beneficial manner.

(c) The efficient use of agricultural water supplies is of great statewide concern.

(d) There is a great amount of reuse of delivered water, both inside and outside the water service areas of agricultural water suppliers.

(e) Significant noncrop beneficial uses are associated with agricultural water use, including the preservation and enhancement of fish and wildlife resources.

(f) Significant opportunities exist in some areas, through improved irrigation water management, to conserve water or to reduce the quantity of highly saline or toxic drainage water.

(g) Changes in water management practices should be carefully planned and implemented to minimize adverse effects on other beneficial uses currently being served.

(h) Agricultural water suppliers that receive water from the federal Central Valley Project are required by federal law to prepare and implement water conservation plans.

(i) Agricultural water users applying for a permit to appropriate water from the board are required to prepare and implement water conservation plans.

SEC. 10. Section 10802 of the Water Code is amended to read:

10802. The Legislature finds and declares that all of the following are the policies of the state:

(a) The efficient use of water shall be pursued actively to protect both the people of the state and the state's water resources.

(b) The efficient use of agricultural water supplies shall be an important criterion in public decisions with regard to water.

(c) Agricultural water suppliers shall be required to prepare water management plans to achieve greater efficiency in the use of water.

SEC. 11. Section 10814 of the Water Code is amended to read:

10814. "Person" has the same meaning as defined in Section 10614.

SEC. 12. Section 10817 of the Water Code is amended to read:

10817. "Water use efficiency" means the efficient management of water resources for beneficial uses, preventing waste, or accomplishing additional benefits with the same amount of water.

SEC. 13. Section 10820 of the Water Code is amended to read:

10820. (a) (1) Except as provided in paragraph (2), an agricultural water supplier shall prepare and adopt an agricultural water management plan in the manner set forth in this chapter on or before December 31, 2012, and shall update that plan on December 31, 2015.

(2) (A) The agricultural water management plan shall be updated on or before April 1, 2021, and thereafter on or before April 1 in the years ending in six and one. The plan shall satisfy the requirements of Section 10826.

(B) An agricultural water supplier shall submit its plan to the department no later than 30 days after the adoption of the plan. The plan shall be submitted electronically and shall include any standardized forms, tables, or displays specified by the department.

(b) (1) The department shall review each plan that is due pursuant to paragraph (2) of subdivision (a). The department may coordinate its review with the Department of Food and Agriculture and the board.

(2) The department shall notify an agricultural water supplier that it is not in compliance with this part if the department determines that actions are required to comply with the requirements of this part or if a supplier fails to update a plan as provided in paragraph (2) of subdivision (a). The department shall identify the specific deficiencies and the supplier shall have 120 days to remedy an identified deficiency. The department may provide additional time to remedy a deficiency if it finds that a supplier is making substantial progress toward remedying the deficiency. An agricultural water supplier that fails to submit corrective actions or a completed plan shall not be in compliance with this part.

(3) If the department has not received a plan or the department has determined that the plan submitted does not comply with the requirements of this part, and a revised plan has not been submitted, the department may undertake the following actions:

(A) Contract with a state academic institution or qualified entity to prepare or complete an agricultural water management plan on behalf of the supplier. The costs and expenses related to preparation or completion of a plan, including the costs of the contract and contract administration, shall be recoverable by the department from the supplier.

(B) If a supplier does not provide data necessary for the preparation or completion of a plan to the department or the contracting entity as determined by the department in accordance with subparagraph (A), the department may assess a fine of one thousand dollars ($1,000) per day, not to exceed twenty-five thousand dollars ($25,000), until data is made available.

(4) (A) A plan prepared or completed pursuant to paragraph (3) shall be deemed the adopted plan for the supplier.

(B) Any action to challenge or invalidate the adequacy of the plan prepared or completed pursuant to paragraph (3) shall be brought against the supplier for whom the plan was prepared.

(c) Every supplier that becomes an agricultural water supplier after December 31, 2012, shall prepare and adopt an agricultural water management plan within one year after the date it has become an agricultural water supplier.

(d) A water supplier that indirectly provides water to customers for agricultural purposes shall not prepare a plan pursuant to this part without the consent of each agricultural water supplier that directly provides that water to its customers.

SEC. 14. Section 10825 of the Water Code is amended to read:

10825. (a) It is the intent of the Legislature in enacting this part to allow levels of water management planning commensurate with the numbers of customers served and the volume of water supplied.

(b) This part does not require the implementation of water use efficiency programs or practices that are not locally cost effective.

SEC. 15. Section 10826 of the Water Code is amended to read:

10826. An agricultural water management plan shall be adopted in accordance with this chapter. The plan shall do all of the following:

(a) Describe the agricultural water supplier and the service area, including all of the following:

(1) Size of the service area.

(2) Location of the service area and its water management facilities.

(3) Terrain and soils.

(4) Climate.

(5) Operating rules and regulations.

(6) Water delivery measurements or calculations.

(7) Water rate schedules and billing.

(8) Water shortage allocation policies.

(b) Describe the quantity and quality of water resources of the agricultural water supplier, including all of the following:

(1) Surface water supply.

(2) Groundwater supply.

(3) Other water supplies, including recycled water.

(4) Source water quality monitoring practices.

(5) Water uses within the agricultural water supplier's service area, including all of the following:

(A) Agricultural.

(B) Environmental.

(C) Recreational.

(D) Municipal and industrial.

(E) Groundwater recharge, including estimated flows from deep percolation from irrigation and seepage.

(c) Include an annual water budget based on the quantification of all inflow and outflow components for the service area of the agricultural water supplier. Components of inflow shall include surface inflow, groundwater pumping in the service area, and effective precipitation. Components of outflow shall include surface outflow, deep percolation, and evapotranspiration. An agricultural water supplier shall report the annual water budget on a water-year basis. The department shall provide tools and resources to assist agricultural water suppliers in developing and quantifying components necessary to develop a water budget.

(d) Include an analysis, based on available information, of the effect of climate change on future water supplies.

(e) Describe previous water management activities.

(f) Identify water management objectives based on the water budget to improve water system efficiency or to meet other water management objectives. The agricultural water supplier shall identify, prioritize, and implement actions to reduce water loss, improve water system management, and meet other water management objectives identified in the plan.

(g) Include in the plan information regarding efficient water management practices required pursuant to Section 10608.48.

(h) Quantify the efficiency of agricultural water use within the service area of the agricultural water supplier using the appropriate method or methods from among the four water use efficiency quantification methods developed by the department in the May 8, 2012, report to the Legislature entitled "A Proposed Methodology for

Quantifying the Efficiency of Agricultural Water Use." The agricultural water supplier shall account for all water uses, including crop water use, agronomic water use, environmental water use, and recoverable surface flows.

SEC. 16. *Section 10826.2 is added to the Water Code, to read:*

10826.2. *As part of its agricultural water management plan, each agricultural water supplier shall develop a drought plan for periods of limited water supply describing the actions of the agricultural water supplier for drought preparedness and management of water supplies and allocations during drought conditions. The drought plan shall contain both of the following:*

(a) Resilience planning, including all of the following:

(1) Data, indicators, and information needed to determine the water supply availability and levels of drought severity.

(2) Analyses and identification of potential vulnerability to drought.

(3) A description of the opportunities and constraints for improving drought resilience planning, including all of the following:

(A) The availability of new technology or information.

(B) The ability of the agricultural water supplier to obtain or use additional water supplies during drought conditions.

(C) A description of other actions planned for implementation to improve drought resilience.

(b) Drought response planning, including all of the following:

(1) Policies and a process for declaring a water shortage and for implementing water shortage allocations and related response actions.

(2) Methods and procedures for the enforcement or appeal of, or exemption from, triggered shortage response actions.

(3) Methods and procedures for monitoring and evaluation of the effectiveness of the drought plan.

(4) Communication protocols and procedures to inform and coordinate customers, the public, interested parties, and local, regional, and state government.

(5) A description of the potential impacts on the revenues, financial condition, and planned expenditures of the agricultural water supplier during drought conditions that reduce water allocations, and proposed measures to overcome those impacts, including reserve-level policies.

SEC. 17. Section 10843 of the Water Code is amended to read:

10843. (a) An agricultural water supplier shall submit to the entities identified in subdivision (b) a copy of its plan no later than 30 days after review of the plan pursuant to subdivision (b) of Section 10820.

(b) An agricultural water supplier shall submit a copy of its plan to each of the following entities:

(1) The department.

(2) Any city, county, or city and county within which the agricultural water supplier provides water supplies.

(3) Any groundwater management entity within which jurisdiction the agricultural water supplier extracts or provides water supplies.

(4) The California State Library.

SEC. 18. Section 10845 of the Water Code is amended to read:

10845. (a) The department shall prepare and submit to the Legislature, on or before April 30, 2022, and thereafter in the years ending in seven and years ending in two, a report summarizing the status of the plans adopted pursuant to this part.

(b) The report prepared by the department shall identify the outstanding elements of any plan adopted pursuant to this part. The report shall include an evaluation of the effectiveness of this part in promoting efficient agricultural water management practices and recommendations relating to proposed changes to this part, as appropriate.

(c) The department shall provide a copy of the report to each agricultural water supplier that has submitted its plan to the department. The department shall also prepare reports and provide data for any legislative hearing designed to consider the effectiveness of plans submitted pursuant to this part.

(d) This section does not authorize the department, in preparing the report, to approve, disapprove, or critique individual plans submitted pursuant to this part.

SEC. 19. Section 10910 of the Water Code is amended to read:

10910. (a) Any city or county that determines that a project, as defined in Section 10912, is subject to the California Environmental Quality Act (Division 13 (commencing with Section 21000) of the Public Resources Code) under Section 21080 of the Public Resources Code shall comply with this part.

(b) The city or county, at the time that it determines whether an environmental impact report, a negative declaration, or a mitigated negative declaration is required for any project subject to the California Environmental Quality Act pursuant to Section 21080.1 of the Public Resources Code, shall identify any water system whose service area includes the project site and any water system adjacent to the project site that is, or may become as a result of supplying water to the project identified pursuant to this subdivision, a public water system, as defined in Section 10912, that may supply water for the project. If the city or county is not able to identify any public water system that may supply water for the project, the city or county shall prepare the water assessment required by this part after consulting with any entity serving domestic water supplies whose service area includes the project site, the local agency formation commission, and any public water system adjacent to the project site.

(c) (1) The city or county, at the time it makes the determination required under Section 21080.1 of the Public Resources Code, shall request each public water system identified pursuant to subdivision (b) to determine whether the projected water demand associated with a proposed project was included as part of the most recently adopted urban water management plan adopted pursuant to Part 2.6 (commencing with Section 10610).

(2) If the projected water demand associated with the proposed project was accounted for in the most recently adopted urban water management plan, the public water system may incorporate the requested information from the urban water management plan in preparing the elements of the assessment required to comply with subdivisions (d), (e), (f), and (g).

(3) If the projected water demand associated with the proposed project was not accounted for in the most recently adopted urban water management plan, or the public water system has no urban water management plan, the water supply assessment for the project shall include a discussion with regard to whether the public water system’s total projected water supplies available during normal, single dry, and multiple dry water years during a 20-year projection will meet the projected water demand associated with the proposed project, in addition to the public water system’s existing and planned future uses, including agricultural and manufacturing uses.

(4) If the city or county is required to comply with this part pursuant to subdivision (b), the water supply assessment for the project shall include a discussion with regard to whether the total projected water supplies, determined to be available by the city or county for the project during normal, single dry, and multiple dry water years during a 20-year projection, will meet the projected water demand associated with the proposed project, in addition to existing and planned future uses, including agricultural and manufacturing uses.

(d) (1) The assessment required by this section shall include an identification of any existing water supply entitlements, water rights, or water service contracts relevant to the identified water supply for the proposed project, and a description of the quantities of water received in prior years by the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), under the existing water supply entitlements, water rights, or water service contracts.

(2) An identification of existing water supply entitlements, water rights, or water service contracts held by the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), shall be demonstrated by providing information related to all of the following:

(A) Written contracts or other proof of entitlement to an identified water supply.

(B) Copies of a capital outlay program for financing the delivery of a water supply that has been adopted by the public water system.

(C) Federal, state, and local permits for construction of necessary infrastructure associated with delivering the water supply.

(D) Any necessary regulatory approvals that are required in order to be able to convey or deliver the water supply.

(e) If no water has been received in prior years by the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), under the existing water supply entitlements, water rights, or water service contracts, the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), shall also include in its water supply assessment pursuant to subdivision (c), an identification of the other public water systems or water service contractholders that receive a water supply or have existing water supply entitlements, water rights, or water service contracts, to the same source of water as the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), has identified as a source of water supply within its water supply assessments.

(f) If a water supply for a proposed project includes groundwater, the following additional information shall be included in the water supply assessment:

(1) A review of any information contained in the urban water management plan relevant to the identified water supply for the proposed project.

(2) (A) A description of any groundwater basin or basins from which the proposed project will be supplied.

(B) For those basins for which a court or the board has adjudicated the rights to pump groundwater, a copy of the order or decree adopted by the court or the board and a description of the amount of groundwater the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), has the legal right to pump under the order or decree.

(C) For a basin that has not been adjudicated that is a basin designated as high- or medium-priority pursuant to Section 10722.4, information regarding the following:

(i) Whether the department has identified the basin as being subject to critical conditions of overdraft pursuant to Section 12924.

(ii) If a groundwater sustainability agency has adopted a groundwater sustainability plan or has an approved alternative, a copy of that alternative or plan.

(D) For a basin that has not been adjudicated that is a basin designated as low- or very low priority pursuant to Section 10722.4, information as to whether the department has identified the basin or basins as overdrafted or has projected that the basin will become overdrafted if present management conditions continue, in the most current bulletin of the department that characterizes the condition of the groundwater basin, and a detailed description by the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), of the efforts being undertaken in the basin or basins to eliminate the long-term overdraft condition.

(3) A detailed description and analysis of the amount and location of groundwater pumped by the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), for the past five years from any groundwater basin from which the proposed project will be supplied. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.

(4) A detailed description and analysis of the amount and location of groundwater that is projected to be pumped by the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), from any basin from which the proposed project will be supplied. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.

(5) An analysis of the sufficiency of the groundwater from the basin or basins from which the proposed project will be supplied to meet the projected water demand associated with the proposed project. A water supply assessment shall not be required to include the information required by this paragraph if the public water system

determines, as part of the review required by paragraph (1), that the sufficiency of groundwater necessary to meet the initial and projected water demand associated with the project was addressed in the description and analysis required by subparagraph (D) of paragraph (4) of subdivision (b) of Section 10631.

(g) (1) Subject to paragraph (2), the governing body of each public water system shall submit the assessment to the city or county not later than 90 days from the date on which the request was received. The governing body of each public water system, or the city or county if either is required to comply with this act pursuant to subdivision (b), shall approve the assessment prepared pursuant to this section at a regular or special meeting.

(2) Prior to the expiration of the 90-day period, if the public water system intends to request an extension of time to prepare and adopt the assessment, the public water system shall meet with the city or county to request an extension of time, which shall not exceed 30 days, to prepare and adopt the assessment.

(3) If the public water system fails to request an extension of time, or fails to submit the assessment notwithstanding the extension of time granted pursuant to paragraph (2), the city or county may seek a writ of mandamus to compel the governing body of the public water system to comply with the requirements of this part relating to the submission of the water supply assessment.

(h) Notwithstanding any other provision of this part, if a project has been the subject of a water supply assessment that complies with the requirements of this part, no additional water supply assessment shall be required for subsequent projects that were part of a larger project for which a water supply assessment was completed and that has complied with the requirements of this part and for which the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), has concluded that its water supplies are sufficient to meet the projected water demand associated with the proposed project, in addition to the existing and planned future uses, including, but not limited to, agricultural and industrial uses, unless one or more of the following changes occurs:

(1) Changes in the project that result in a substantial increase in water demand for the project.

(2) Changes in the circumstances or conditions substantially affecting the ability of the public water system, or the city or county if either is required to comply with this part pursuant to subdivision (b), to provide a sufficient supply of water for the project.

(3) Significant new information becomes available that was not known and could not have been known at the time when the assessment was prepared.

(i) For the purposes of this section, hauled water is not considered as a source of water.

SEC. 20. *This act shall become operative only if Senate Bill 606 of the 2017–18 Regular Session is enacted and becomes effective.*

SB-606 Water management planning. (2017-2018)

As Amends the Law Today | **As Amends the Law on Nov 08, 2018**

SECTION 1. Section 350 of the Water Code is amended to read:

350. The governing body of a distributor of a public water supply, whether publicly or privately owned and including a mutual water company, shall declare a water shortage emergency condition to prevail within the area served by such distributor 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 that there would be insufficient water for human consumption, sanitation, and fire protection.

SEC. 2. Section 377 of the Water Code is amended to read:

377. (a) From and after the publication or posting of any ordinance or resolution pursuant to Section 376, a violation of a requirement of a water conservation program adopted pursuant to Section 376 is a misdemeanor. A person convicted under this subdivision shall be punished by imprisonment in the county jail for not more than 30 days, or by a fine not exceeding one thousand dollars ($1,000), or by both.

(b) A court or public entity may hold a person civilly liable in an amount not to exceed ten thousand dollars ($10,000) for a violation of any of the following:

(1) An ordinance or resolution adopted pursuant to Section 376.

(2) A regulation adopted by the board under Section 1058.5 or Chapter 9 (commencing with Section 10609) of Part 2.55 of Division 6, unless the board regulation provides that it cannot be enforced under this section or provides for a lesser applicable maximum penalty.

(c) Commencing on the 31st day after the public entity notified a person of a violation described in subdivision (b), the person additionally may be civilly liable in an amount not to exceed ten thousand dollars ($10,000) plus five hundred dollars ($500) for each additional day on which the violation continues.

(d) Remedies prescribed in this section are cumulative and not alternative, except that no liability shall be recoverable under this section for any violation of paragraph (2) of subdivision (b) if the board has filed a complaint pursuant to Section 1846 alleging the same violation.

(e) A public entity may administratively impose the civil liability described in subdivisions (b) and (c) after providing notice and an opportunity for a hearing. The public entity shall initiate a proceeding under this subdivision by a complaint issued pursuant to Section 377.5. The public entity shall issue the complaint at least 30 days before the hearing on the complaint and the complaint shall state the basis for the proposed civil liability order.

(f) (1) In determining the amount of civil liability to assess, a court or public entity shall take into consideration all relevant circumstances, including, but not limited to, the nature and persistence of the violation, the extent of the harm caused by the violation, the length of time over which the violation occurs, and any corrective action taken by the violator.

(2) The civil liability calculated pursuant to paragraph (1) for the first violation of subdivision (b) by a residential water user shall not exceed one thousand dollars ($1,000) except in extraordinary situations where the court or public entity finds all of the following:

(A) The residential user had actual notice of the requirement found to be violated.

(B) The conduct was intentional.

(C) The amount of water involved was substantial.

(g) Civil liability imposed pursuant to this section shall be paid to the public entity and expended solely for the purposes of this chapter.

(h) An order setting administrative civil liability shall become effective and final upon issuance of the order and payment shall be made. Judicial review of any final order shall be pursuant to Section 1094.5 of the Code of Civil Procedure.

(i) In addition to the remedies prescribed in this section, a public entity may enforce water use limitations established by an ordinance or resolution adopted pursuant to this chapter, or as otherwise authorized by law, by a volumetric penalty in an amount established by the public entity.

SEC. 3. Section 1058.5 of the Water Code is amended to read:

1058.5. (a) This section applies to any emergency regulation adopted by the board for which the board makes both of the following findings:

(1) The emergency regulation is adopted to prevent the waste, unreasonable use, unreasonable method of use, or unreasonable method of diversion, of water, to promote water recycling or water conservation, to require curtailment of diversions when water is not available under the diverter's priority of right, or in furtherance of any of the foregoing, to require reporting of diversion or use or the preparation of monitoring reports.

(2) The emergency regulation is adopted in response to conditions which exist, or are threatened, in a critically dry year immediately preceded by two or more consecutive below normal, dry, or critically dry years or during a period for which the Governor has issued a proclamation of a state of emergency under the California Emergency Services Act (Chapter 7 (commencing with Section 8550) of Division 1 of Title 2 of the Government Code) based on drought conditions.

(b) Notwithstanding Sections 11346.1 and 11349.6 of the Government Code, any findings of emergency adopted by the board, in connection with the adoption of an emergency regulation under this section, are not subject to review by the Office of Administrative Law.

(c) An emergency regulation adopted by the board under this section may remain in effect for up to one year, as determined by the board, and is deemed repealed immediately upon a finding by the board that due to changed conditions it is no longer necessary for the regulation to remain in effect. An emergency regulation adopted by the board under this section may be renewed if the board determines that the conditions specified in paragraph (2) of subdivision (a) are still in effect.

(d) In addition to any other applicable civil or criminal penalties, any person or entity ~~that~~ *who* violates a regulation adopted by the board pursuant to this section is guilty of an infraction punishable by a fine of up to five hundred dollars ($500) for each day in which the violation occurs.

(e) (1) Notwithstanding subdivision (b) of Section 1551 or subdivision (e) of Section 1848, a civil liability imposed under Chapter 12 (commencing with Section 1825) of Part 2 of Division 2 by the board or a court for a violation of an emergency conservation regulation adopted pursuant to this section shall be deposited, and separately accounted for, in the Water Rights Fund. Funds deposited in accordance with this subdivision shall be available, upon appropriation, for water conservation activities and programs.

(2) For purposes of this subdivision, an "emergency conservation regulation" means an emergency regulation that requires an end user of water, a water retailer, or a water wholesaler to conserve water or report to the board on water conservation. Water conservation includes restrictions or limitations on particular uses of water or a reduction in the amount of water used or served, but does not include curtailment of diversions when water is not available under the diverter's priority of right or reporting requirements related to curtailments.

SEC. 4. Section 1120 of the Water Code is amended to read:

1120. This chapter applies to any decision or order issued under this part or Section 275, Part 2 (commencing with Section 1200), Part 2 (commencing with Section 10500) of Division 6, Part 2.55 (commencing with Section 10608) of Division 6, or Chapter 11 (commencing with Section 10735) of Part 2.74 of Division 6, Article 7 (commencing with Section 13550) of Chapter 7 of Division 7, or the public trust doctrine.

SEC. 5. Section 10608.12 of the Water Code is amended to read:

10608.12. Unless the context otherwise requires, the following definitions govern the construction of this part:

(a) "Agricultural water supplier" means a water supplier, either publicly or privately owned, providing water to 10,000 or more irrigated acres, excluding recycled water. "Agricultural water supplier" includes a supplier or contractor for water, regardless of the basis of right, that distributes or sells water for ultimate resale to customers. "Agricultural water supplier" does not include the department.

(b) "Base daily per capita water use" means any of the following:

(1) The urban retail water supplier's estimate of its average gross water use, reported in gallons per capita per day and calculated over a continuous 10-year period ending no earlier than December 31, 2004, and no later than December 31, 2010.

(2) For an urban retail water supplier that meets at least 10 percent of its 2008 measured retail water demand through recycled water that is delivered within the service area of an urban retail water supplier or its urban wholesale water supplier, the urban retail water supplier may extend the calculation described in paragraph (1) up to an additional five years to a maximum of a continuous 15-year period ending no earlier than December 31, 2004, and no later than December 31, 2010.

(3) For the purposes of Section 10608.22, the urban retail water supplier's estimate of its average gross water use, reported in gallons per capita per day and calculated over a continuous five-year period ending no earlier than December 31, 2007, and no later than December 31, 2010.

(c) "Baseline commercial, industrial, and institutional water use" means an urban retail water supplier's base daily per capita water use for commercial, industrial, and institutional users.

(d) "CII water use" means water used by commercial water users, industrial water users, institutional water users, and large landscape water users.

(e) "Commercial water user" means a water user that provides or distributes a product or service.

(f) "Compliance daily per capita water use" means the gross water use during the final year of the reporting period, reported in gallons per capita per day.

(g) "Disadvantaged community" means a community with an annual median household income that is less than 80 percent of the statewide annual median household income.

(h) "Gross water use" means the total volume of water, whether treated or untreated, entering the distribution system of an urban retail water supplier, excluding all of the following:

(1) Recycled water that is delivered within the service area of an urban retail water supplier or its urban wholesale water supplier.

(2) The net volume of water that the urban retail water supplier places into long-term storage.

(3) The volume of water the urban retail water supplier conveys for use by another urban water supplier.

(4) The volume of water delivered for agricultural use, except as otherwise provided in subdivision (f) of Section 10608.24.

(i) "Industrial water user" means a water user that is primarily a manufacturer or processor of materials as defined by the North American Industry Classification System code sectors 31 to 33, inclusive, or an entity that is a water user primarily engaged in research and development.

(j) "Institutional water user" means a water user dedicated to public service. This type of user includes, among other users, higher education institutions, schools, courts, churches, hospitals, government facilities, and nonprofit research institutions.

(k) "Interim urban water use target" means the midpoint between the urban retail water supplier's base daily per capita water use and the urban retail water supplier's urban water use target for 2020.

(l) "Large landscape" means a nonresidential landscape as described in the performance measures for CII water use adopted pursuant to Section 10609.10.

(m) "Locally cost effective" means that the present value of the local benefits of implementing an agricultural efficiency water management practice is greater than or equal to the present value of the local cost of implementing that measure.

(n) "Performance measures" means actions to be taken by urban retail water suppliers that will result in increased water use efficiency by CII water users. Performance measures may include, but are not limited to, educating CII water users on best management practices, conducting water use audits, and preparing water management plans. Performance measures do not include process water.

(o) "Potable reuse" means direct potable reuse, indirect potable reuse for groundwater recharge, and reservoir water augmentation as those terms are defined in Section 13561.

(p) "Process water" means water used by industrial water users for producing a product or product content or water used for research and development. Process water includes, but is not limited to, continuous manufacturing processes, and water used for testing, cleaning, and maintaining equipment. Water used to cool machinery or buildings used in the manufacturing process or necessary to maintain product quality or chemical characteristics for product manufacturing or control rooms, data centers, laboratories, clean rooms, and other industrial facility units that are integral to the manufacturing or research and development process is process water. Water used in the manufacturing process that is necessary for complying with local, state, and federal health and safety laws, and is not incidental water, is process water. Process water does not mean incidental water uses.

(q) "Recycled water" means recycled water, as defined in subdivision (n) of Section 13050.

(r) "Regional water resources management" means sources of supply resulting from watershed-based planning for sustainable local water reliability or any of the following alternative sources of water:

(1) The capture and reuse of stormwater or rainwater.

(2) The use of recycled water.

(3) The desalination of brackish groundwater.

(4) The conjunctive use of surface water and groundwater in a manner that is consistent with the safe yield of the groundwater basin.

(s) "Reporting period" means the years for which an urban retail water supplier reports compliance with the urban water use targets.

(t) "Urban retail water supplier" means a water supplier, either publicly or privately owned, that directly provides potable municipal water to more than 3,000 end users or that supplies more than 3,000 acre-feet of potable water annually at retail for municipal purposes.

(u) "Urban water use objective" means an estimate of aggregate efficient water use for the previous year based on adopted water use efficiency standards and local service area characteristics for that year, as described in Section 10609.20.

(v) "Urban water use target" means the urban retail water supplier's targeted future daily per capita water use.

(w) "Urban wholesale water ~~supplier"~~ *supplier,"* means a water supplier, either publicly or privately owned, that provides more than 3,000 acre-feet of water annually at wholesale for potable municipal purposes.

SEC. 6. Section 10608.20 of the Water Code is amended to read:

10608.20. (a) (1) Each urban retail water supplier shall develop urban water use targets and an interim urban water use target by July 1, 2011. Urban retail water suppliers may elect to determine and report progress toward achieving these targets on an individual or regional basis, as provided in subdivision (a) of Section 10608.28, and may determine the targets on a fiscal year or calendar year basis.

(2) It is the intent of the Legislature that the urban water use targets described in paragraph (1) cumulatively result in a 20-percent reduction from the baseline daily per capita water use by December 31, 2020.

(b) An urban retail water supplier shall adopt one of the following methods for determining its urban water use target pursuant to subdivision (a):

(1) Eighty percent of the urban retail water supplier's baseline per capita daily water use.

(2) The per capita daily water use that is estimated using the sum of the following performance standards:

(A) For indoor residential water use, 55 gallons per capita daily water use as a provisional standard. Upon completion of the department's ~~2017~~ *2016* report to the Legislature pursuant to Section 10608.42, this standard may be adjusted by the Legislature by statute.

(B) For landscape irrigated through dedicated or residential meters or connections, water efficiency equivalent to the standards of the Model Water Efficient Landscape Ordinance set forth in Chapter 2.7 (commencing with Section 490) of Division 2 of Title 23 of the California Code of Regulations, as in effect the later of the year of the landscape's installation or 1992. An urban retail water supplier using the approach specified in this subparagraph shall use satellite imagery, site visits, or other best available technology to develop an accurate estimate of landscaped areas.

(C) For commercial, industrial, and institutional uses, a 10-percent reduction in water use from the baseline commercial, industrial, and institutional water use by 2020.

(3) Ninety-five percent of the applicable state hydrologic region target, as set forth in the state's draft 20x2020 Water Conservation Plan (dated April 30, 2009). If the service area of an urban water supplier includes more than one hydrologic region, the supplier shall apportion its service area to each region based on population or area.

(4) A method that shall be identified and developed by the department, through a public process, and reported to the Legislature no later than December 31, 2010. The method developed by the department shall identify per capita targets that cumulatively result in a statewide 20-percent reduction in urban daily per capita water use by December 31, 2020. In developing urban daily per capita water use targets, the department shall do all of the following:

(A) Consider climatic differences within the state.

(B) Consider population density differences within the state.

(C) Provide flexibility to communities and regions in meeting the targets.

(D) Consider different levels of per capita water use according to plant water needs in different regions.

(E) Consider different levels of commercial, industrial, and institutional water use in different regions of the state.

(F) Avoid placing an undue hardship on communities that have implemented conservation measures or taken actions to keep per capita water use low.

(c) If the department adopts a regulation pursuant to paragraph (4) of subdivision (b) that results in a requirement that an urban retail water supplier achieve a reduction in daily per capita water use that is greater than 20 percent by December 31, 2020, an urban retail water supplier that adopted the method described in paragraph (4) of subdivision (b) may limit its urban water use target to a reduction of not more than 20 percent by December 31, 2020, by adopting the method described in paragraph (1) of subdivision (b).

(d) The department shall update the method described in paragraph (4) of subdivision (b) and report to the Legislature by December 31, 2014. An urban retail water supplier that adopted the method described in paragraph (4) of subdivision (b) may adopt a new urban daily per capita water use target pursuant to this updated method.

(e) An urban retail water supplier shall include in its urban water management plan due in 2010 pursuant to Part 2.6 (commencing with Section 10610) the baseline daily per capita water use, urban water use target, interim urban water use target, and compliance daily per capita water use, along with the bases for determining those estimates, including references to supporting data.

(f) When calculating per capita values for the purposes of this chapter, an urban retail water supplier shall determine population using federal, state, and local population reports and projections.

(g) An urban retail water supplier may update its 2020 urban water use target in its 2015 urban water management plan required pursuant to Part 2.6 (commencing with Section 10610).

(h) (1) The department, through a public process and in consultation with the California Urban Water Conservation Council, shall develop technical methodologies and criteria for the consistent implementation of this part, including, but not limited to, both of the following:

(A) Methodologies for calculating base daily per capita water use, baseline commercial, industrial, and institutional water use, compliance daily per capita water use, gross water use, service area population, indoor residential water use, and landscaped area water use.

(B) Criteria for adjustments pursuant to subdivisions (d) and (e) of Section 10608.24.

(2) The department shall post the methodologies and criteria developed pursuant to this subdivision on its ~~internet website,~~ *Internet Web site,* and make written copies available, by October 1, 2010. An urban retail water supplier shall use the methods developed by the department in compliance with this part.

(i) (1) The department shall adopt regulations for implementation of the provisions relating to process water in accordance with Section 10608.12, subdivision (e) of Section 10608.24, and subdivision (d) of Section 10608.26.

(2) The initial adoption of a regulation authorized by this subdivision is deemed to address an emergency, for purposes of Sections 11346.1 and 11349.6 of the Government Code, and the department is hereby exempted for that purpose from the requirements of subdivision (b) of Section 11346.1 of the Government Code. After the initial adoption of an emergency regulation pursuant to this subdivision, the department shall not request approval from the Office of Administrative Law to readopt the regulation as an emergency regulation pursuant to Section 11346.1 of the Government Code.

(j) (1) An urban retail water supplier is granted an extension to July 1, 2011, for adoption of an urban water management plan pursuant to Part 2.6 (commencing with Section 10610) due in 2010 to allow the use of technical methodologies developed by the department pursuant to paragraph (4) of subdivision (b) and subdivision (h). An urban retail water supplier that adopts an urban water management plan due in 2010 that does not use the methodologies developed by the department pursuant to subdivision (h) shall amend the plan by July 1, 2011, to comply with this part.

(2) An urban wholesale water supplier whose urban water management plan prepared pursuant to Part 2.6 (commencing with Section 10610) was due and not submitted in 2010 is granted an extension to July 1, 2011, to permit coordination between an urban wholesale water supplier and urban retail water suppliers.

SEC. 7. *Section 10608.35 is added to the Water Code, to read:*

10608.35. *(a) The department, in coordination with the board, shall conduct necessary studies and investigations and make a recommendation to the Legislature, by January 1, 2020, on the feasibility of developing and enacting water loss reporting requirements for urban wholesale water suppliers.*

(b) The studies and investigations shall include an evaluation of the suitability of applying the processes and requirements of Section 10608.34 to urban wholesale water suppliers.

(c) In conducting necessary studies and investigations and developing its recommendation, the department shall solicit broad public participation from stakeholders and other interested persons.

SEC. 8. *Section 10609.20 is added to the Water Code, immediately following Section 10609.18, to read:*

10609.20. *(a) Each urban retail water supplier shall calculate its urban water use objective no later than November 1, 2023, and by November 1 every year thereafter.*

(b) The calculation shall be based on the urban retail water supplier's water use conditions for the previous calendar or fiscal year.

(c) Each urban water supplier's urban water use objective shall be composed of the sum of the following:

(1) Aggregate estimated efficient indoor residential water use.

(2) Aggregate estimated efficient outdoor residential water use.

(3) Aggregate estimated efficient outdoor irrigation of landscape areas with dedicated irrigation meters or equivalent technology in connection with CII water use.

(4) Aggregate estimated efficient water losses.

(5) Aggregate estimated water use in accordance with variances, as appropriate.

(d) (1) An urban retail water supplier that delivers water from a groundwater basin, reservoir, or other source that is augmented by potable reuse water may adjust its urban water use objective by a bonus incentive calculated pursuant to this subdivision.

(2) The water use objective bonus incentive shall be the volume of its potable reuse delivered to residential water users and to landscape areas with dedicated irrigation meters in connection with CII water use, on an acre-foot basis.

(3) The bonus incentive pursuant to paragraph (1) shall be limited in accordance with one of the following:

(A) The bonus incentive shall not exceed 15 percent of the urban water supplier's water use objective for any potable reuse water produced at an existing facility.

(B) The bonus incentive shall not exceed 10 percent of the urban water supplier's water use objective for any potable reuse water produced at any facility that is not an existing facility.

(4) For purposes of this subdivision, "existing facility" means a facility that meets all of the following:

(A) The facility has a certified environmental impact report, mitigated negative declaration, or negative declaration on or before January 1, 2019.

(B) The facility begins producing and delivering potable reuse water on or before January 1, 2022.

(C) The facility uses microfiltration and reverse osmosis technologies to produce the potable reuse water.

(e) (1) The calculation of the urban water use objective shall be made using landscape area and other data provided by the department and pursuant to the standards, guidelines, and methodologies adopted by the board. The department shall provide data to the urban water supplier at a level of detail sufficient to allow the urban water supplier to verify its accuracy at the parcel level.

(2) Notwithstanding paragraph (1), an urban retail water supplier may use alternative data in calculating the urban water use objective if the supplier demonstrates to the department that the alternative data are equivalent, or superior, in quality and accuracy to the data provided by the department. The department may provide technical assistance to an urban retail water supplier in evaluating whether the alternative data are appropriate for use in calculating the supplier's urban water use objective.

SEC. 9. *Section 10609.22 is added to the Water Code, to read:*

10609.22. *(a) An urban retail water supplier shall calculate its actual urban water use no later than November 1, 2023, and by November 1 every year thereafter.*

(b) The calculation shall be based on the urban retail water supplier's water use for the previous calendar or fiscal year.

(c) Each urban water supplier's urban water use shall be composed of the sum of the following:

(1) Aggregate residential water use.

(2) Aggregate outdoor irrigation of landscape areas with dedicated irrigation meters in connection with CII water use.

(3) Aggregate water losses.

SEC. 10. *Section 10609.24 is added to the Water Code, to read:*

10609.24. *(a) An urban retail water supplier shall submit a report to the department no later than November 1, 2023, and by November 1 every year thereafter. The report shall include all of the following:*

(1) The urban water use objective calculated pursuant to Section 10609.20 along with relevant supporting data.

(2) The actual urban water use calculated pursuant to Section 10609.22 along with relevant supporting data.

(3) Documentation of the implementation of the performance measures for CII water use.

(4) A description of the progress made towards meeting the urban water use objective.

(b) The department shall post the reports and information on its Internet Web site.

(c) The board may issue an information order or conservation order to, or impose civil liability on, an entity or individual for failure to submit a report required by this section.

SEC. 11. *Section 10609.26 is added to the Water Code, to read:*

10609.26. *(a) (1) On and after November 1, 2023, the board may issue informational orders pertaining to water production, water use, and water conservation to an urban retail water supplier that does not meet its urban water use objective required by this chapter. Informational orders are intended to obtain information on supplier activities, water production, and conservation efforts in order to identify technical assistance needs and assist urban water suppliers in meeting their urban water use objectives.*

(2) In determining whether to issue an informational order, the board shall consider the degree to which the urban retail water supplier is not meeting its urban water use objective, information provided in the report required by Section 10609.24, and actions the urban retail water supplier has implemented or will implement in order to help meet the urban water use objective.

(3) The board shall share information received pursuant to this subdivision with the department.

(4) An urban water supplier may request technical assistance from the department. The technical assistance may, to the extent available, include guidance documents, tools, and data.

(b) On and after November 1, 2024, the board may issue a written notice to an urban retail water supplier that does not meet its urban water use objective required by this chapter. The written notice may warn the urban retail water supplier that it is not meeting its urban water use objective described in Section 10609.20 and is not making adequate progress in meeting the urban water use objective, and may request that the urban retail water supplier address areas of concern in its next annual report required by Section 10609.24. In deciding whether to issue a written notice, the board may consider whether the urban retail water supplier has received an informational order, the degree to which the urban retail water supplier is not meeting its urban water use objective, information provided in the report required by Section 10609.24, and actions the urban retail water supplier has implemented or will implement in order to help meet its urban water use objective.

(c) (1) On and after November 1, 2025, the board may issue a conservation order to an urban retail water supplier that does not meet its urban water use objective. A conservation order may consist of, but is not limited to, referral to the department for technical assistance, requirements for education and outreach, requirements for local enforcement, and other efforts to assist urban retail water suppliers in meeting their urban water use objective.

(2) In issuing a conservation order, the board shall identify specific deficiencies in an urban retail water supplier's progress towards meeting its urban water use objective, and identify specific actions to address the deficiencies.

(3) The board may request that the department provide an urban retail water supplier with technical assistance to support the urban retail water supplier's actions to remedy the deficiencies.

(d) A conservation order issued in accordance with this chapter may include requiring actions intended to increase water-use efficiency, but shall not curtail or otherwise limit the exercise of a water right, nor shall it require the imposition of civil liability pursuant to Section 377.

SEC. 12. *Section 10609.28 is added to the Water Code, to read:*

10609.28. *The board may issue a regulation or informational order requiring a wholesale water supplier, an urban retail water supplier, or a distributor of a public water supply, as that term is used in Section 350, to provide a monthly report relating to water production, water use, or water conservation.*

SEC. 13. *Section 10609.30 is added to the Water Code, to read:*

10609.30. *On or before January 10, 2024, the Legislative Analyst shall provide to the appropriate policy committees of both houses of the Legislature and the public a report evaluating the implementation of the water use efficiency standards and water use reporting pursuant to this chapter. The board and the department shall provide the Legislative Analyst with the available data to complete this report.*

(a) The report shall describe all of the following:

(1) The rate at which urban retail water users are complying with the standards, and factors that might facilitate or impede their compliance.

(2) The accuracy of the data and estimates being used to calculate urban water use objectives.

(3) Indications of the economic impacts, if any, of the implementation of this chapter on urban water suppliers and urban water users, including CII water users.

(4) The frequency of use of the bonus incentive, the volume of water associated with the bonus incentive, value to urban water suppliers of the bonus incentive, and any implications of the use of the bonus incentive on water use efficiency.

(5) The early indications of how implementing this chapter might impact the efficiency of statewide urban water use.

(6) Recommendations, if any, for improving statewide urban water use efficiency and the standards and practices described in this chapter.

(7) Any other issues the Legislative Analyst deems appropriate.

SEC. 14. *Section 10609.32 is added to the Water Code, to read:*

10609.32. *It is the intent of the Legislature that the chairperson of the board and the director of the department appear before the appropriate policy committees of both houses of the Legislature on or around January 1, 2026, and report on the implementation of the water use efficiency standards and water use reporting pursuant to this chapter. It is the intent of the Legislature that the topics to be covered include all of the following:*

(a) The rate at which urban retail water suppliers are complying with the standards, and factors that might facilitate or impede their compliance.

(b) What enforcement actions have been taken, if any.

(c) The accuracy of the data and estimates being used to calculate urban water use objectives.

(d) Indications of the economic impacts, if any, of the implementation of this chapter on urban water suppliers and urban water users, including CII water users.

(e) The frequency of use of the bonus incentive, the volume of water associated with the bonus incentive, value to urban water suppliers of the bonus incentive, and any implications of the use of the bonus incentive on water use efficiency.

(f) An assessment of how implementing this chapter is affecting the efficiency of statewide urban water use.

SEC. 15. *Section 10609.34 is added to the Water Code, to read:*

10609.34. *Notwithstanding Section 15300.2 of Title 14 of the California Code of Regulations, an action of the board taken under this chapter shall be deemed to be a Class 8 action, within the meaning of Section 15308 of Title 14 of the California Code of Regulations, provided that the action does not involve relaxation of existing water conservation or water use standards.*

SEC. 16. *Section 10609.36 is added to the Water Code, to read:*

10609.36. *(a) Nothing in this chapter shall be construed to determine or alter water rights. Sections 1010 and 1011 apply to water conserved through implementation of this chapter.*

(b) Nothing in this chapter shall be construed to authorize the board to update or revise water use efficiency standards authorized by this chapter except as explicitly provided in this chapter. Authorization to update the standards beyond that explicitly provided in this chapter shall require separate legislation.

(c) Nothing in this chapter shall be construed to limit or otherwise affect the use of recycled water as seawater barriers for groundwater salinity management.

SEC. 17. *Section 10609.38 is added to the Water Code, to read:*

10609.38. The board may waive the requirements of this chapter for a period of up to five years for any urban retail water supplier whose water deliveries are significantly affected by changes in water use as a result of damage from a disaster such as an earthquake or fire. In establishing the period of a waiver, the board shall take into consideration the breadth of the damage and the time necessary for the damaged areas to recover from the disaster.

SEC. 18. Section 10610.2 of the Water Code is amended to read:

10610.2. (a) The Legislature finds and declares all of the following:

(1) The waters of the state are a limited and renewable resource subject to ever-increasing demands.

(2) The conservation and efficient use of urban water supplies are of statewide concern; however, the planning for that use and the implementation of those plans can best be accomplished at the local level.

(3) A long-term, reliable supply of water is essential to protect the productivity of California's businesses and economic climate, and increasing long-term water conservation among Californians, improving water use efficiency within the state's communities and agricultural production, and strengthening local and regional drought planning are critical to California's resilience to drought and climate change.

(4) As part of its long-range planning activities, every urban water supplier should make every effort to ensure the appropriate level of reliability in its water service sufficient to meet the needs of its various categories of customers during normal, dry, and multiple dry water years now and into the foreseeable future, and every urban water supplier should collaborate closely with local land-use authorities to ensure water demand forecasts are consistent with current land-use planning.

(5) Public health issues have been raised over a number of contaminants that have been identified in certain local and imported water supplies.

(6) Implementing effective water management strategies, including groundwater storage projects and recycled water projects, may require specific water quality and salinity targets for meeting groundwater basins water quality objectives and promoting beneficial use of recycled water.

(7) Water quality regulations are becoming an increasingly important factor in water agencies' selection of raw water sources, treatment alternatives, and modifications to existing treatment facilities.

(8) Changes in drinking water quality standards may also impact the usefulness of water supplies and may ultimately impact supply reliability.

(9) The quality of source supplies can have a significant impact on water management strategies and supply reliability.

(b) This part is intended to provide assistance to water agencies in carrying out their long-term resource planning responsibilities to ensure adequate water supplies to meet existing and future demands for water.

SEC. 19. Section 10610.4 of the Water Code is amended to read:

10610.4. The Legislature finds and declares that it is the policy of the state as follows:

(a) The management of urban water demands and efficient use of water shall be actively pursued to protect both the people of the state and their water resources.

(b) The management of urban water demands and efficient use of urban water supplies shall be a guiding criterion in public decisions.

(c) Urban water suppliers shall be required to develop water management plans to achieve the efficient use of available supplies and strengthen local drought planning.

SEC. 20. Section 10612 of the Water Code is amended and renumbered to read:

~~**10612.**~~ *10611.3.* ~~"Drought risk assessment"~~ *"Customer"* means a ~~method that examines water shortage risks based on the driest five-year historic sequence for the agency's water supply, as described in subdivision (b) of Section 10635.~~ *purchaser of water from a water supplier who uses the water for municipal purposes, including residential, commercial, governmental, and industrial uses.*

SEC. 21. *Section 10612 is added to the Water Code, to read:*

10612. *"Drought risk assessment" means a method that examines water shortage risks based on the driest five-year historic sequence for the agency's water supply, as described in subdivision (b) of Section 10635.*

SEC. 22. *Section 10617.5 is added to the Water Code, to read:*

10617.5. *"Water shortage contingency plan" means a document that incorporates the provisions detailed in subdivision (a) of Section 10632 and is subsequently adopted by an urban water supplier pursuant to this article.*

SEC. 23. *Section 10618 is added to the Water Code, to read:*

10618. *"Water supply and demand assessment" means a method that looks at current year and one or more dry year supplies and demands for determining water shortage risks, as described in Section 10632.1.*

SEC. 24. Section 10620 of the Water Code is amended to read:

10620. (a) Every urban water supplier shall prepare and adopt an urban water management plan in the manner set forth in Article 3 (commencing with Section 10640).

(b) Every person that becomes an urban water supplier shall adopt an urban water management plan within one year after it has become an urban water supplier.

(c) An urban water supplier indirectly providing water shall not include planning elements in its water management plan as provided in Article 2 (commencing with Section 10630) that would be applicable to urban water suppliers or public agencies directly providing water, or to their customers, without the consent of those suppliers or public agencies.

(d) (1) An urban water supplier may satisfy the requirements of this part by participation in areawide, regional, watershed, or basinwide urban water management planning where those plans will reduce preparation costs and contribute to the achievement of conservation, efficient water use, and improved local drought resilience.

(2) Notwithstanding paragraph (1), each urban water supplier shall develop its own water shortage contingency plan, but an urban water supplier may incorporate, collaborate, and otherwise share information with other urban water suppliers or other governing entities participating in an areawide, regional, watershed, or basinwide urban water management plan, an agricultural management plan, or groundwater sustainability plan development.

(3) Each urban water supplier shall coordinate the preparation of its plan with other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practicable.

(e) The urban water supplier may prepare the plan with its own staff, by contract, or in cooperation with other governmental agencies.

(f) An urban water supplier shall describe in the plan water management tools and options used by that entity that will maximize resources and minimize the need to import water from other regions.

SEC. 25. Section 10621 of the Water Code is amended to read:

10621. (a) Each urban water supplier shall update its plan at least once every five years on or before July 1, in years ending in six and one, incorporating updated and new information from the five years preceding each update.

(b) Every urban water supplier required to prepare a plan pursuant to this part shall, at least 60 days before the public hearing on the plan required by Section 10642, notify any city or county within which the supplier provides water supplies that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan. The urban water supplier may consult with, and obtain comments from, any city or county that receives notice pursuant to this subdivision.

(c) An urban water supplier regulated by the Public Utilities Commission shall include its most recent plan and water shortage contingency plan as part of the supplier's general rate case filings.

(d) The amendments to, or changes in, the plan shall be adopted and filed in the manner set forth in Article 3 (commencing with Section 10640).

(e) Each urban water supplier shall update and submit its 2015 plan to the department by July 1, 2016.

(f) *(1)* Each urban water supplier shall update and submit its 2020 plan to the department by July 1, 2021.

(2) By January 1, 2024, each urban retail water supplier shall adopt and submit to the department a supplement to the adopted 2020 plan that includes information required pursuant to subparagraph (B) of paragraph (1) of subdivision (e) of Section 10631. This supplement is not an update or an amendment to the plan and, therefore, an urban water supplier is not required to comply with the public notice, hearing, and adoption requirements of Section 10642 before submitting the information to the department.

SEC. 26. Section 10630 of the Water Code is amended to read:

10630. It is the intention of the Legislature, in enacting this part, to permit levels of water management planning commensurate with the numbers of customers served and the volume of water supplied, while accounting for impacts from climate change.

SEC. 27. *Section 10630.5 is added to the Water Code, to read:*

10630.5. *Each plan shall include a simple lay description of how much water the agency has on a reliable basis, how much it needs for the foreseeable future, what the agency's strategy is for meeting its water needs, the challenges facing the agency, and any other information necessary to provide a general understanding of the agency's plan.*

SEC. 28. Section 10631 of the Water Code is amended to read:

10631. A plan shall be adopted in accordance with this chapter that shall do all of the following:

(a) Describe the service area of the supplier, including current and projected population, climate, and other social, economic, and demographic factors affecting the supplier's water management planning. The projected population estimates shall be based upon data from the state, regional, or local service agency population projections within the service area of the urban water supplier and shall be in five-year increments to 20 years or as far as data is available. The description shall include the current and projected land uses within the existing or anticipated service area affecting the supplier's water management planning. Urban water suppliers shall coordinate with local or regional land use authorities to determine the most appropriate land use information, including, where appropriate, land use information obtained from local or regional land use authorities, as developed pursuant to Article 5 (commencing with Section 65300) of Chapter 3 of Division 1 of Title 7 of the Government Code.

(b) Identify and quantify, to the extent practicable, the existing and planned sources of water available to the supplier over the same five-year increments described in subdivision (a), providing supporting and related information, including all of the following:

(1) A detailed discussion of anticipated supply availability under a normal water year, single dry year, and droughts lasting at least five years, as well as more frequent and severe periods of drought, as described in the drought risk assessment. For each source of water supply, consider any information pertinent to the reliability analysis conducted pursuant to Section 10635, including changes in supply due to climate change.

(2) When multiple sources of water supply are identified, a description of the management of each supply in correlation with the other identified supplies.

(3) For any planned sources of water supply, a description of the measures that are being undertaken to acquire and develop those water supplies.

(4) If groundwater is identified as an existing or planned source of water available to the supplier, all of the following information:

(A) The current version of any groundwater sustainability plan or alternative adopted pursuant to Part 2.74 (commencing with Section 10720), any groundwater management plan adopted by the urban water supplier, including plans adopted pursuant to Part 2.75 (commencing with Section 10750), or any other specific authorization for groundwater management for basins underlying the urban water supplier's service area.

(B) A description of any groundwater basin or basins from which the urban water supplier pumps groundwater. For basins that a court or the board has adjudicated the rights to pump groundwater, a copy of the order or decree adopted by the court or the board and a description of the amount of groundwater the urban water supplier has the legal right to pump under the order or decree. For a basin that has not been adjudicated, information as to whether the department has identified the basin as a high- or medium-priority basin in the most current official departmental bulletin that characterizes the condition of the groundwater basin, and a detailed description of the efforts being undertaken by the urban water supplier to coordinate with groundwater sustainability agencies or groundwater management agencies listed in subdivision (c) of Section 10723 to maintain or achieve sustainable groundwater conditions in accordance with a groundwater sustainability plan or alternative adopted pursuant to Part 2.74 (commencing with Section 10720).

(C) A detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water supplier for the past five years. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.

(D) A detailed description and analysis of the amount and location of groundwater that is projected to be pumped by the urban water supplier. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.

(c) Describe the opportunities for exchanges or transfers of water on a short-term or long-term basis.

(d) (1) For an urban retail water supplier, quantify, to the extent records are available, past and current water use, over the same five-year increments described in subdivision (a), and projected water use, based upon information developed pursuant to subdivision (a), identifying the uses among water use sectors, including, but not necessarily limited to, all of the following:

(A) Single-family residential.

(B) Multifamily.

(C) Commercial.

(D) Industrial.

(E) Institutional and governmental.

(F) Landscape.

(G) Sales to other agencies.

(H) Saline water intrusion barriers, groundwater recharge, or conjunctive use, or any combination thereof.

(I) Agricultural.

(J) Distribution system water loss.

(2) The water use projections shall be in the same five-year increments described in subdivision (a).

(3) (A) The distribution system water loss shall be quantified for each of the five years preceding the plan update, in accordance with rules adopted pursuant to Section 10608.34.

(B) The distribution system water loss quantification shall be reported in accordance with a worksheet approved or developed by the department through a public process. The water loss quantification worksheet shall be based on the water system balance methodology developed by the American Water Works Association.

(C) In the plan due July 1, 2021, and in each update thereafter, data shall be included to show whether the urban retail water supplier met the distribution loss standards enacted by the board pursuant to Section 10608.34.

(4) (A) Water use projections, where available, shall display and account for the water savings estimated to result from adopted codes, standards, ordinances, or transportation and land use plans identified by the urban water supplier, as applicable to the service area.

(B) To the extent that an urban water supplier reports the information described in subparagraph (A), an urban water supplier shall do both of the following:

(i) Provide citations of the various codes, standards, ordinances, or transportation and land use plans utilized in making the projections.

(ii) Indicate the extent that the water use projections consider savings from codes, standards, ordinances, or transportation and land use plans. Water use projections that do not account for these water savings shall be noted of that fact.

(e) Provide a description of the supplier's water demand management measures. This description shall include all of the following:

(1) (A) For an urban retail water supplier, as defined in Section 10608.12, a narrative description that addresses the nature and extent of each water demand management measure implemented over the past five years. The narrative shall describe the water demand management measures that the supplier plans to implement to achieve its water use targets pursuant to Section 10608.20.

(B) For the supplement required of urban retail water suppliers by paragraph (2) of subdivision (f) of Section 10621, a narrative that describes the water demand management measures that the supplier plans to implement to achieve its urban water use objective by January 1, 2027, pursuant to Chapter 9 (commencing with Section 10609) of Part 2.55.

~~(B)~~ *(C)* The narrative pursuant to this paragraph shall include descriptions of the following water demand management measures:

(i) Water waste prevention ordinances.

(ii) Metering.

(iii) Conservation pricing.

(iv) Public education and outreach.

(v) Programs to assess and manage distribution system real loss.

(vi) Water conservation program coordination and staffing support.

(vii) Other demand management measures that have a significant impact on water use as measured in gallons per capita per day, including innovative measures, if implemented.

(2) For an urban wholesale water supplier, as defined in Section 10608.12, a narrative description of the items in clauses (ii), (iv), (vi), and (vii) of subparagraph ~~(B)~~ *(C)* of paragraph (1), and a narrative description of its distribution system asset management and wholesale supplier assistance programs.

(f) Include a description of all water supply projects and water supply programs that may be undertaken by the urban water supplier to meet the total projected water use, as established pursuant to subdivision (a) of Section 10635. The urban water supplier shall include a detailed description of expected future projects and programs that the urban water supplier may implement to increase the amount of the water supply available to the urban water supplier in normal and single-dry water years and for a period of drought lasting five consecutive water years. The description shall identify specific projects and include a description of the increase in water supply that is expected to be available from each project. The description shall include an estimate with regard to the implementation timeline for each project or program.

(g) Describe the opportunities for development of desalinated water, including, but not limited to, ocean water, brackish water, and groundwater, as a long-term supply.

(h) An urban water supplier that relies upon a wholesale agency for a source of water shall provide the wholesale agency with water use projections from that agency for that source of water in five-year increments to 20 years or as far as data is available. The wholesale agency shall provide information to the urban water supplier for inclusion in the urban water supplier's plan that identifies and quantifies, to the extent practicable, the existing and planned sources of water as required by subdivision (b), available from the wholesale agency to the urban water supplier over the same five-year increments, and during various water-year types in accordance with subdivision (f). An urban water supplier may rely upon water supply information provided by the wholesale agency in fulfilling the plan informational requirements of subdivisions (b) and (f).

SEC. 29. Section 10631.2 of the Water Code is amended to read:

10631.2. (a) In addition to the requirements of Section 10631, an urban water management plan shall include any of the following information that the urban water supplier can readily obtain:

(1) An estimate of the amount of energy used to extract or divert water supplies.

(2) An estimate of the amount of energy used to convey water supplies to the water treatment plants or distribution systems.

(3) An estimate of the amount of energy used to treat water supplies.

(4) An estimate of the amount of energy used to distribute water supplies through its distribution systems.

(5) An estimate of the amount of energy used for treated water supplies in comparison to the amount used for nontreated water supplies.

(6) An estimate of the amount of energy used to place water into or withdraw from storage.

(7) Any other energy-related information the urban water supplier deems appropriate.

(b) The department shall include in its guidance for the preparation of urban water management plans a methodology for the voluntary calculation or estimation of the energy intensity of urban water systems. The department may consider studies and calculations conducted by the Public Utilities Commission in developing the methodology.

(c) The Legislature finds and declares that energy use is only one factor in water supply planning and shall not be considered independently of other factors.

SEC. 30. Section 10631.7 of the Water Code is repealed.

SEC. 31. Section 10632 of the Water Code is repealed.

~~**10632.** (a) Every urban water supplier shall prepare and adopt a water shortage contingency plan as part of its urban water management plan that consists of each of the following elements:~~

~~(1) The analysis of water supply reliability conducted pursuant to Section 10635.~~

~~(2) The procedures used in conducting an annual water supply and demand assessment that include, at a minimum, both of the following:~~

~~(A) The written decisionmaking process that an urban water supplier will use each year to determine its water supply reliability.~~

~~(B) The key data inputs and assessment methodology used to evaluate the urban water supplier's water supply reliability for the current year and one dry year, including all of the following:~~

~~(i) Current year unconstrained demand, considering weather, growth, and other influencing factors, such as policies to manage current supplies to meet demand objectives in future years, as applicable.~~

~~(ii) Current year available supply, considering hydrological and regulatory conditions in the current year and one dry year. The annual supply and demand assessment may consider more than one dry year solely at the discretion of the urban water supplier.~~

~~(iii) Existing infrastructure capabilities and plausible constraints.~~

~~(iv) A defined set of locally applicable evaluation criteria that are consistently relied upon for each annual water supply and demand assessment.~~

~~(v) A description and quantification of each source of water supply.~~

~~(3) (A) Six standard water shortage levels corresponding to progressive ranges of up to 10, 20, 30, 40, and 50 percent shortages and greater than 50 percent shortage. Urban water suppliers shall define these shortage levels based on the suppliers' water supply conditions, including percentage reductions in water supply, changes in groundwater levels, changes in surface elevation or level of subsidence, or other changes in hydrological or other local conditions indicative of the water supply available for use. Shortage levels shall also apply to catastrophic interruption of water supplies, including, but not limited to, a regional power outage, an earthquake, and other potential emergency events.~~

~~(B) An urban water supplier with an existing water shortage contingency plan that uses different water shortage levels may comply with the requirement in subparagraph (A) by developing and including a cross-reference relating its existing categories to the six standard water shortage levels.~~

~~(4) Shortage response actions that align with the defined shortage levels and include, at a minimum, all of the following:~~

~~(A) Locally appropriate supply augmentation actions.~~

~~(B) Locally appropriate demand reduction actions to adequately respond to shortages.~~

~~(C) Locally appropriate operational changes.~~

~~(D) Additional, mandatory prohibitions against specific water use practices that are in addition to state-mandated prohibitions and appropriate to the local conditions.~~

~~(E) For each action, an estimate of the extent to which the gap between supplies and demand will be reduced by implementation of the action.~~

~~(5) Communication protocols and procedures to inform customers, the public, interested parties, and local, regional, and state governments, regarding, at a minimum, all of the following:~~

~~(A) Any current or predicted shortages as determined by the annual water supply and demand assessment described pursuant to Section 10632.1.~~

~~(B) Any shortage response actions triggered or anticipated to be triggered by the annual water supply and demand assessment described pursuant to Section 10632.1.~~

~~(C) Any other relevant communications.~~

~~(6) For an urban retail water supplier, customer compliance, enforcement, appeal, and exemption procedures for triggered shortage response actions as determined pursuant to Section 10632.2.~~

~~(7) (A) A description of the legal authorities that empower the urban water supplier to implement and enforce its shortage response actions specified in paragraph (4) that may include, but are not limited to, statutory authorities, ordinances, resolutions, and contract provisions.~~

~~(B) A statement that an urban water supplier shall declare a water shortage emergency in accordance with Chapter 3 (commencing with Section 350) of Division 1.~~

~~(C) A statement that an urban water supplier shall coordinate with any city or county within which it provides water supply services for the possible proclamation of a local emergency, as defined in Section 8558 of the Government Code.~~

~~(8) A description of the financial consequences of, and responses for, drought conditions, including, but not limited to, all of the following:~~

~~(A) A description of potential revenue reductions and expense increases associated with activated shortage response actions described in paragraph (4).~~

~~(B) A description of mitigation actions needed to address revenue reductions and expense increases associated with activated shortage response actions described in paragraph (4).~~

~~(C) A description of the cost of compliance with Chapter 3.3 (commencing with Section 365) of Division 1.~~

~~(9) For an urban retail water supplier, monitoring and reporting requirements and procedures that ensure appropriate data is collected, tracked, and analyzed for purposes of monitoring customer compliance and to meet state reporting requirements.~~

~~(10) Reevaluation and improvement procedures for systematically monitoring and evaluating the functionality of the water shortage contingency plan in order to ensure shortage risk tolerance is adequate and appropriate water shortage mitigation strategies are implemented as needed.~~

~~(b) For purposes of developing the water shortage contingency plan pursuant to subdivision (a), an urban water supplier shall analyze and define water features that are artificially supplied with water, including ponds, lakes,~~

~~waterfalls, and fountains, separately from swimming pools and spas, as defined in subdivision (a) of Section 115921 of the Health and Safety Code.~~

~~(c) The urban water supplier shall make available the water shortage contingency plan prepared pursuant to this article to its customers and any city or county within which it provides water supplies no later than 30 days after adoption of the water shortage contingency plan.~~

SEC. 32. *Section 10632 is added to the Water Code, to read:*

10632. *(a) Every urban water supplier shall prepare and adopt a water shortage contingency plan as part of its urban water management plan that consists of each of the following elements:*

(1) The analysis of water supply reliability conducted pursuant to Section 10635.

(2) The procedures used in conducting an annual water supply and demand assessment that include, at a minimum, both of the following:

(A) The written decisionmaking process that an urban water supplier will use each year to determine its water supply reliability.

(B) The key data inputs and assessment methodology used to evaluate the urban water supplier's water supply reliability for the current year and one dry year, including all of the following:

(i) Current year unconstrained demand, considering weather, growth, and other influencing factors, such as policies to manage current supplies to meet demand objectives in future years, as applicable.

(ii) Current year available supply, considering hydrological and regulatory conditions in the current year and one dry year. The annual supply and demand assessment may consider more than one dry year solely at the discretion of the urban water supplier.

(iii) Existing infrastructure capabilities and plausible constraints.

(iv) A defined set of locally applicable evaluation criteria that are consistently relied upon for each annual water supply and demand assessment.

(v) A description and quantification of each source of water supply.

(3) (A) Six standard water shortage levels corresponding to progressive ranges of up to 10, 20, 30, 40, and 50 percent shortages and greater than 50 percent shortage. Urban water suppliers shall define these shortage levels based on the suppliers' water supply conditions, including percentage reductions in water supply, changes in groundwater levels, changes in surface elevation or level of subsidence, or other changes in hydrological or other local conditions indicative of the water supply available for use. Shortage levels shall also apply to catastrophic interruption of water supplies, including, but not limited to, a regional power outage, an earthquake, and other potential emergency events.

(B) An urban water supplier with an existing water shortage contingency plan that uses different water shortage levels may comply with the requirement in subparagraph (A) by developing and including a cross-reference relating its existing categories to the six standard water shortage levels.

(4) Shortage response actions that align with the defined shortage levels and include, at a minimum, all of the following:

(A) Locally appropriate supply augmentation actions.

(B) Locally appropriate demand reduction actions to adequately respond to shortages.

(C) Locally appropriate operational changes.

(D) Additional, mandatory prohibitions against specific water use practices that are in addition to state-mandated prohibitions and appropriate to the local conditions.

(E) For each action, an estimate of the extent to which the gap between supplies and demand will be reduced by implementation of the action.

(5) Communication protocols and procedures to inform customers, the public, interested parties, and local, regional, and state governments, regarding, at a minimum, all of the following:

(A) Any current or predicted shortages as determined by the annual water supply and demand assessment described pursuant to Section 10632.1.

(B) Any shortage response actions triggered or anticipated to be triggered by the annual water supply and demand assessment described pursuant to Section 10632.1.

(C) Any other relevant communications.

(6) For an urban retail water supplier, customer compliance, enforcement, appeal, and exemption procedures for triggered shortage response actions as determined pursuant to Section 10632.2.

(7) (A) A description of the legal authorities that empower the urban water supplier to implement and enforce its shortage response actions specified in paragraph (4) that may include, but are not limited to, statutory authorities, ordinances, resolutions, and contract provisions.

(B) A statement that an urban water supplier shall declare a water shortage emergency in accordance with Chapter 3 (commencing with Section 350) of Division 1.

(C) A statement that an urban water supplier shall coordinate with any city or county within which it provides water supply services for the possible proclamation of a local emergency, as defined in Section 8558 of the Government Code.

(8) A description of the financial consequences of, and responses for, drought conditions, including, but not limited to, all of the following:

(A) A description of potential revenue reductions and expense increases associated with activated shortage response actions described in paragraph (4).

(B) A description of mitigation actions needed to address revenue reductions and expense increases associated with activated shortage response actions described in paragraph (4).

(C) A description of the cost of compliance with Chapter 3.3 (commencing with Section 365) of Division 1.

(9) For an urban retail water supplier, monitoring and reporting requirements and procedures that ensure appropriate data is collected, tracked, and analyzed for purposes of monitoring customer compliance and to meet state reporting requirements.

(10) Reevaluation and improvement procedures for systematically monitoring and evaluating the functionality of the water shortage contingency plan in order to ensure shortage risk tolerance is adequate and appropriate water shortage mitigation strategies are implemented as needed.

(b) For purposes of developing the water shortage contingency plan pursuant to subdivision (a), an urban water supplier shall analyze and define water features that are artificially supplied with water, including ponds, lakes, waterfalls, and fountains, separately from swimming pools and spas, as defined in subdivision (a) of Section 115921 of the Health and Safety Code.

(c) The urban water supplier shall make available the water shortage contingency plan prepared pursuant to this article to its customers and any city or county within which it provides water supplies no later than 30 days after adoption of the water shortage contingency plan.

SEC. 33. *Section 10632.1 is added to the Water Code, to read:*

10632.1. *An urban water supplier shall conduct an annual water supply and demand assessment pursuant to subdivision (a) of Section 10632 and, on or before June 1 of each year, submit an annual water shortage assessment report to the department with information for anticipated shortage, triggered shortage response actions, compliance and enforcement actions, and communication actions consistent with the supplier's water shortage contingency plan. An urban water supplier that relies on imported water from the State Water Project or the Bureau of Reclamation shall submit its annual water supply and demand assessment within 14 days of receiving its final allocations, or by June 1 of each year, whichever is later.*

SEC. 34. *Section 10632.2 is added to the Water Code, to read:*

10632.2. *An urban water supplier shall follow, where feasible and appropriate, the prescribed procedures and implement determined shortage response actions in its water shortage contingency plan, as identified in subdivision (a) of Section 10632, or reasonable alternative actions, provided that descriptions of the alternative*

actions are submitted with the annual water shortage assessment report pursuant to Section 10632.1. Nothing in this section prohibits an urban water supplier from taking actions not specified in its water shortage contingency plan, if needed, without having to formally amend its urban water management plan or water shortage contingency plan.

SEC. 35. *Section 10632.3 is added to the Water Code, to read:*

10632.3. *It is the intent of the Legislature that, upon proclamation by the Governor of a state of emergency under the California Emergency Services Act (Chapter 7 (commencing with Section 8550) of Division 1 of Title 2 of the Government Code) based on drought conditions, the board defer to implementation of locally adopted water shortage contingency plans to the extent practicable.*

SEC. 36. Section 10635 of the Water Code is amended to read:

10635. (a) Every urban water supplier shall include, as part of its urban water management plan, an assessment of the reliability of its water service to its customers during normal, dry, and multiple dry water years. This water supply and demand assessment shall compare the total water supply sources available to the water supplier with the long-term total projected water use over the next 20 years, in five-year increments, for a normal water year, a single dry water year, and a drought lasting five consecutive water years. The water service reliability assessment shall be based upon the information compiled pursuant to Section 10631, including available data from state, regional, or local agency population projections within the service area of the urban water supplier.

(b) Every urban water supplier shall include, as part of its urban water management plan, a drought risk assessment for its water service to its customers as part of information considered in developing the demand management measures and water supply projects and programs to be included in the urban water management plan. The urban water supplier may conduct an interim update or updates to this drought risk assessment within the five-year cycle of its urban water management plan update. The drought risk assessment shall include each of the following:

(1) A description of the data, methodology, and basis for one or more supply shortage conditions that are necessary to conduct a drought risk assessment for a drought period that lasts five consecutive water years, starting from the year following when the assessment is conducted.

(2) A determination of the reliability of each source of supply under a variety of water shortage conditions. This may include a determination that a particular source of water supply is fully reliable under most, if not all, conditions.

(3) A comparison of the total water supply sources available to the water supplier with the total projected water use for the drought period.

(4) Considerations of the historical drought hydrology, plausible changes on projected supplies and demands under climate change conditions, anticipated regulatory changes, and other locally applicable criteria.

(c) The urban water supplier shall provide that portion of its urban water management plan prepared pursuant to this article to any city or county within which it provides water supplies no later than 60 days after the submission of its urban water management plan.

(d) Nothing in this article is intended to create a right or entitlement to water service or any specific level of water service.

(e) Nothing in this article is intended to change existing law concerning an urban water supplier’s obligation to provide water service to its existing customers or to any potential future customers.

SEC. 37. Section 10640 of the Water Code is amended to read:

10640. (a) Every urban water supplier required to prepare a plan pursuant to this part shall prepare its plan pursuant to Article 2 (commencing with Section 10630). The supplier shall likewise periodically review the plan as required by Section 10621, and any amendments or changes required as a result of that review shall be adopted pursuant to this article.

(b) Every urban water supplier required to prepare a water shortage contingency plan shall prepare a water shortage contingency plan pursuant to Section 10632. The supplier shall likewise periodically review the water

shortage contingency plan as required by paragraph (10) of subdivision (a) of Section 10632 and any amendments or changes required as a result of that review shall be adopted pursuant to this article.

SEC. 38. Section 10641 of the Water Code is amended to read:

10641. An urban water supplier required to prepare a plan or a water shortage contingency plan may consult with, and obtain comments from, any public agency or state agency or any person who has special expertise with respect to water demand management methods and techniques.

SEC. 39. Section 10642 of the Water Code is amended to read:

10642. Each urban water supplier shall encourage the active involvement of diverse social, cultural, and economic elements of the population within the service area prior to and during the preparation of both the plan and the water shortage contingency plan. Prior to adopting either, the urban water supplier shall make both the plan and the water shortage contingency plan available for public inspection and shall hold a public hearing or hearings thereon. Prior to any of these hearings, notice of the time and place of the hearing shall be published within the jurisdiction of the publicly owned water supplier pursuant to Section 6066 of the Government Code. The urban water supplier shall provide notice of the time and place of a hearing to any city or county within which the supplier provides water supplies. Notices by a local public agency pursuant to this section shall be provided pursuant to Chapter 17.5 (commencing with Section 7290) of Division 7 of Title 1 of the Government Code. A privately owned water supplier shall provide an equivalent notice within its service area. After the hearing or hearings, the plan or water shortage contingency plan shall be adopted as prepared or as modified after the hearing or hearings.

SEC. 40. Section 10644 of the Water Code is amended to read:

10644. (a) (1) An urban water supplier shall submit to the department, the California State Library, and any city or county within which the supplier provides water supplies a copy of its plan no later than 30 days after adoption. Copies of amendments or changes to the plans shall be submitted to the department, the California State Library, and any city or county within which the supplier provides water supplies within 30 days after adoption.

(2) The plan, or amendments to the plan, submitted to the department pursuant to paragraph (1) shall be submitted electronically and shall include any standardized forms, tables, or displays specified by the department.

(b) If an urban water supplier revises its water shortage contingency plan, the supplier shall submit to the department a copy of its water shortage contingency plan prepared pursuant to subdivision (a) of Section 10632 no later than 30 days after adoption, in accordance with protocols for submission and using electronic reporting tools developed by the department.

(c) (1) (A) Notwithstanding Section 10231.5 of the Government Code, the department shall prepare and submit to the Legislature, on or before July 1, in the years ending in seven and two, a report summarizing the status of the plans and water shortage contingency plans adopted pursuant to this part. The report prepared by the department shall identify the exemplary elements of the individual plans and water shortage contingency plans. The department shall provide a copy of the report to each urban water supplier that has submitted its plan and water shortage contingency plan to the department. The department shall also prepare reports and provide data for any legislative hearings designed to consider the effectiveness of plans and water shortage contingency plans submitted pursuant to this part.

(B) The department shall prepare and submit to the board, on or before September 30 of each year, a report summarizing the submitted water supply and demand assessment results along with appropriate reported water shortage conditions and the regional and statewide analysis of water supply conditions developed by the department. As part of the report, the department shall provide a summary and, as appropriate, urban water supplier specific information regarding various shortage response actions implemented as a result of annual supplier-specific water supply and demand assessments performed pursuant to Section 10632.1.

(C) The department shall submit the report to the Legislature for the 2015 plans by July 1, 2017, and the report to the Legislature for the 2020 plans and water shortage contingency plans by July 1, 2022.

(2) A report to be submitted pursuant to subparagraph (A) of paragraph (1) shall be submitted in compliance with Section 9795 of the Government Code.

(d) The department shall make available to the public the standard the department will use to identify exemplary water demand management measures.

SEC. 41. Section 10645 of the Water Code is amended to read:

10645. (a) Not later than 30 days after filing a copy of its plan with the department, the urban water supplier and the department shall make the plan available for public review during normal business hours.

(b) Not later than 30 days after filing a copy of its water shortage contingency plan with the department, the urban water supplier and the department shall make the plan available for public review during normal business hours.

SEC. 42. Section 10650 of the Water Code is amended to read:

10650. Any actions or proceedings, other than actions by the board, to attack, review, set aside, void, or annul the acts or decisions of an urban water supplier on the grounds of noncompliance with this part shall be commenced as follows:

(a) An action or proceeding alleging failure to adopt a plan or a water shortage contingency plan shall be commenced within 18 months after that adoption is required by this part.

(b) Any action or proceeding alleging that a plan or water shortage contingency plan, or action taken pursuant to either, does not comply with this part shall be commenced within 90 days after filing of the plan or water shortage contingency plan or an amendment to either pursuant to Section 10644 or the taking of that action.

SEC. 43. Section 10651 of the Water Code is amended to read:

10651. In any action or proceeding to attack, review, set aside, void, or annul a plan or a water shortage contingency plan, or an action taken pursuant to either by an urban water supplier on the grounds of noncompliance with this part, the inquiry shall extend only to whether there was a prejudicial abuse of discretion. Abuse of discretion is established if the supplier has not proceeded in a manner required by law or if the action by the water supplier is not supported by substantial evidence.

SEC. 44. Section 10653 of the Water Code is amended to read:

10653. The adoption of a plan shall satisfy any requirements of state law, regulation, or order, including those of the board and the Public Utilities Commission, for the preparation of water management plans, water shortage contingency plans, or conservation plans; provided, that if the board or the Public Utilities Commission requires additional information concerning water conservation, drought response measures, or financial conditions to implement its existing authority, nothing in this part shall be deemed to limit the board or the commission in obtaining that information. The requirements of this part shall be satisfied by any urban water demand management plan that complies with analogous federal laws or regulations after the effective date of this part, and which substantially meets the requirements of this part, or by any existing urban water management plan which includes the contents of a plan required under this part.

SEC. 45. Section 10654 of the Water Code is amended to read:

10654. An urban water supplier may recover in its rates the costs incurred in preparing its urban water management plan, its drought risk assessment, its water supply and demand assessment, and its water shortage contingency plan and implementing the reasonable water conservation measures included in either of the plans.

SEC. 46. Section 10656 of the Water Code is amended to read:

10656. An urban water supplier is not eligible for a water grant or loan awarded or administered by the state unless the urban water supplier complies with this part.

SEC. 47. *Section 10657 is added to the Water Code, to read:*

10657. *The department may adopt regulations regarding the definitions of water, water use, and reporting periods, and may adopt any other regulations deemed necessary or desirable to implement this part. In developing regulations pursuant to this section, the department shall solicit broad public participation from stakeholders and other interested persons.*

SEC. 48. *This act shall become operative only if Assembly Bill 1668 of the 2017–18 Regular Session is enacted and becomes effective.*

Appendix B

AWE Model Assumptions

AWE CONSERVATION TRACKING TOOL: COMMON ASSUMPTIONS WORKSHEET

Getting Started: On this worksheet you enter information the tracking tool needs to operate. This includes specifying whether to use English or Metric units, setting up customer classes, specifying the first year for forecasts, entering forecasted population, housing, and customer accounts, setting financial assumptions, providing information needed to calculate water and energy savings due to appliance and plumbing standards for toilets, clothes washers, and dishwashers, and providing information needed to calculate water savings for landscape conservation measures included in the conservation measure

Scenario '"Empty" loaded into model on 7/27/2

State	CA	Model will use CA plumbing standards
Volume Units	Acre-Feet (AF)	Flow Units Will Be: MGD

Population, Housing, and Account Forecasts

new WU data - DU scaled based on ABAG Pop, 2025-2045 Sector scaled based on ABAG Pop and Employment, 2020 sectors based on pop only

Enter Starting Year for Forecasts: 2010

Population & Housing	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**
Population	183,716	191,575	191,269	197,939	201,987	204,750	208,324	211,961
Single Family Dwelling Units	55,038	55,291	55,202	57,127	58,296	59,093	60,125	61,174
Multi Family Dwelling Units	26,036	26,338	26,296	27,213	27,769	28,149	28,640	29,140
Number of Accounts								
Single Family	51,241	51,474	51,392	52,410	53,482	54,214	55,160	56,123
Multi Family	3,778	3,801	3,795	3,857	3,936	3,990	4,060	4,130
CII	3,479	3,476	3,470	3,495	3,553	3,581	3,589	3,597
Irrigation	838	850	849	866	881	888	890	892
Other	479	442	441	495	503	507	508	509
Not in use								
Not in use								
Not in use								
Not in use								

Business/Industrial + Institutional = CII

Financial Assumptions

These inputs are used by the tracking tool to standardize costs and benefits, calculate present values, and estimate utility and customer benefits of conservation.

Dollar Base Year	2019
Annual Inflation Rate	3.0%
Nominal Interest Rate	2.3%

Utility Rates in 2010	**Average Class Rate (2019 Dollars)**				**Annual Rate of Increase**			
	Water	Sewer	Electricity	Gas	Water	Sewer	Electricity	Gas

Customer Class	($/Thou Gal)	($/Thou Gal)	($/KWh)	($/Therm)	(%/Yr)	(%/Yr)	(%/Yr)	(%/Yr)
Single Family	$10.36		$0.28	$2.00	4.0%		3.0%	3.0%
Multi Family	$7.42		$0.28	$2.00	4.0%		3.0%	3.0%
CII	$11.51		$0.24	$0.80	4.0%		3.0%	3.0%
Irrigation	$12.77		$0.31		4.0%		3.0%	3.0%
Other					4.0%		3.0%	3.0%
Not in use								
Not in use								
Not in use								
Not in use								

Information Needed to Calculate Water/Energy Savings from Plumbing/Appliance Standards

These inputs are used by the tracking tool to estimate water and energy savings for national toilet and showerhead standards, which first took effect in 1994, and clothes washer and dishwasher appliance standards, which first included maximum allowable water factors in 2011 and 2010, respectively. Toilet standards took effect in 1992 in California and Texas.

	Single Family	Multi Family
Persons per household	2.4	2.40
Full Baths/Dwelling Unit	2.01	1.68
Half Baths/Dwelling Unit	0.24	0.59
Dwellling Units in 1992	50,156	23,953

Population in 1990 164,249

Information Needed to Calculate Water Savings for Landscape Measures in Library

Average landscape water use for residential and non-residential sites is used by the model to calculate water savings for various landscape conservation measures included in the program library. Average landscape water use is calculated using the following equation. Alternatively, you can use your own landscape water use estimate by selecting the "Use My Own Estimate" option.

$$use\ per\ site = \left(\frac{1}{irr.eff.}\right) \times (ET_0 \times K_L - R_e)\ \times Area \times C_v, where$$

$irr.eff. = typical\ irrigation\ efficiency$
$ET_0 = reference\ evapotranspiration$
$K_L = landscape\ coefficient\ (\%\ of ET_0\ needed\ by\ crop)$
$R_e = effective\ rainfall\ (\%\ of\ annual\ rainfall\ contributing\ to\ plant\ water\ requirement)$
$C_v = coefficient\ that\ converts\ water\ use\ to\ appropriate\ volume\ units\ (gal\ for\ english\ units, M^3 for\ metric\ units)$

○ Use my own landscape water use estimates ◉ Use model's landscape water use calculator

Reference ET in/yr 45.20

Avg Annual Rainfall	in/yr	47.41
Effective Rainfall	%	25%

Landscape Water Requirement Coefficient (K_L)

Turf	% of ET_0	80%
Other than turf	% of ET_0	40%

		Residential	Non Residential
Avg Landscape Area Per Site	ft^2		
Avg Turf Area (% of Total)	%		
Avg Irrigation Efficiency (%)	%	75%	75%

Irrigation Requirement		Residential	Non Residential
Turf Area	in/ft^2/yr	32	32
Other	in/ft^2/yr	8	8

Avg Landscape Water Use Per Site		Residential	Non Residential
Turf Area	Gal/Yr	0	0
Other	Gal/Yr	0	0
Total	Gal/Yr	**0**	**0**

AWE CONSERVATION TRACKING TOOL: ENTER UTILITY AVOIDED COSTS WORKSHEET

Enter utility avoided costs: The primary benefit of conservation to the utility and its ratepayers is avoiding future water supply and wastewater costs. A utility avoids cost by not having to purchase (or otherwise acquire), transport, treat and distribute water supply, and by not having to collect, treat, and dispose of wastewater. The variable costs of these activities are major components of avoided cost. Conservation, if done at sufficient scale, may also allow the utility to defer or even entirely avoid future expansion of system capacity. This can be a major source of benefit in some cases.

The tracking tool comes with a calculator you can use to estimate your avoided costs. Alternatively, you can enter you own avoided cost estimates by selecting

Scenario '"Empty" loaded into model on 7/27/2016 5:44:04 PM

Download CUWCC Avoided Cost & Environmental Benefits Models

○ Use my own avoided cost estimates ◉ Use model's avoided cost calculator

Tracking Tool Utility Avoided Cost Calculator

Water and Wastewater System Variable Costs (2019 Dollars)

	Water		Wastewater	
	$/AF	Nominal Increase	$/AF	Nominal Increase
Water purchase	$1,151	5.0%	NA	NA
Energy	$115	3.0%		
Chemicals	$50	3.0%		
Other variable cost				
Total	**$1,316**	**4.8%**	**$0**	**0.0%**

Variable Cost Forecast

Variable Cost	Units	2010	2015	2020	2025	2030	2035	2040	2045	2040-2045 Ann Grwth %
Water Supply	$/AF	$1,316	$1,435	$1,564	$1,705	$1,858	$2,026	$2,208	$2,407	1.7%
Wastewater	$/AF	$0	$0	$0	$0	$0	$0	$0	$0	0.0%

AWE CONSERVATION TRACKING TOOL: DEFINE CONSERVATION ACTIVITIES WORKSHEET

Define conservation activities: Click the Define/Edit/Delete button to setup and edit conservation activities. You can use the form to define your own activities or import activities from the tracking tool's library. Once imported, library activities can be customized. Conservation activity specifications are stored in a table on this worksheet. This table is hidden by default. You can unhide the table by clicking the "Show Activities Table" button. You can edit activities directly in the table if you find this easier than using the form. HOWEVER, DO NOT DELETE TABLE ROWS. ONLY USE THE FORM TO DELETE CONSERVATION ACTIVITIES.

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NOTE: You can define activities in the table rather than using the form. BUT ONLY USE THE FORM TO DELETE ACTIVITIES.

Activity ID	Activity Name	Class	Savings, Per Unit (gpy)	Savings, Annual Rate of Decay (%)	Savings, Peak Period (% of Annual Savings)	Savings, Useful Life (yrs)	Savings, Participant Free Riders (% of Participants)	Utility Costs, Year Denominated	Utility Costs, Initial Fixed ($)	Utility Costs, Initial Variable ($/unit)	Utility Costs, Years of Follow-up (yrs)	Utility Costs, Follow-up Fixed ($/yr)	Utility Costs, Follow-up Variable ($/unit/yr)	Participant Costs, Year Denominated	Participant Costs, Initial ($)	Participant Costs, Years of On-going (yrs)	Participant Costs, On-going ($/Yr)	Participant Savings, Sewer (gpy)	Participant Savings, Gas (Therms/Gal)	Participant Savings, Electricity (KWh/Gal)	Plumbing Code, Year Effective	Plumbing Code, Unit Savings (gpy)	Plumbing Code, Natural Replacement Rate NRR (%)
1	High Efficiency Clothes Washer Rebate - Residentia	Single Family	4,276	0%	0%	15	0%	2019		$195.00				2019	$626.00			5,000.00	0.0035	0.0036	2011	3500	7.14%
2	Water Use Surveys/Audits - SFR	Single Family	12,373	20%	68%	5	0%	2019		$210.60				2019	$50.00			4,949.20	0.0010	0.0000	0	0	0.00%
3	Landscape Conversion or Turf Removal -SFR	Single Family	12	0%	80%	10	0%	2019		$1.30				2019	$1.00			0.00	0.0000	0.0000	0	0	0.00%
4	Smart Irrigation Controller (Weather-Based Irrigation	Single Family	17,258	0%	70%	10	0%	2019		$247.84				2019	$172.39			0.00	0.0000	0.0000	0	0	0.00%
5	Water Use Surveys/Audits - CII	CII	93,521	20%		5	0%	2019		$2,000.00				2019	$2,500.00								
6	Incentivize Irrigation Equipment Upgrades - Large La	Irrigation	36,108	0%		10	0%	2019		$1,300.00				2019	$500.00								
7	Smart Irrigation Controller (Weather-Based Irrigation	Irrigation	96,645	0%	70%	10	0%	2019		$1,094.21				2019	$568.54			0.00	0.0000	0.0000	0	0	0.00%
8	Water Use Surveys/Audits - MFR	Multi Family	93,521	20%		5	0%	2019		$2,000.00				2019	$2,500.00								
9	High Efficiency Faucet Aerator / Showerhead Giveav	Single Family	4,013	0%		5		2019		$31.20				2019	$50.00								
10	Incentivize Irrigation Equipment Upgrades - SFR	Single Family	5,639	0%		10		2019		$325.00				2019	$250.00								
11	Landscape Conversion or Turf Removal - MFR and C	CII	12	0%		10		2019		$1.30				2019	$1.00								
12	Soil Moisture Sensor Rebate	Single Family	13,964	0%		20		2019		$260.00				2019	$300.00								
13	Water Savings Incentive Program for CII	CII	5,995,666	0%		15		2019		$4,676.62				2019	$5,396.10								
14	Restaurant Spray Nozzle Rebates	CII	43,830	0%		5	0%	2019		$65.00				2020	$50.00			43,830.00	0.0083				
15																							
16																							

AWE CONSERVATION TRACKING

Enter annual conservation activity: Use this worksheet to enter the annual activity levels for the conservation activities you defined on the 4. Define Activities worksheet. You can enter activity through the end of your forecast period, but this is not required. It is okay to enter activity for shorter periods. You also can start an activity in

Enter Annual Conservation Activity

Activity ID	Class	Activity Name	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
1	Single Family	High Efficiency Clothes Washer Rebate - Res	303	303	303	303	303																				
2	Single Family	Water Use Surveys/Audits - SFR	731	731	731	731	731																				
3	Single Family	Landscape Conversion or Turf Removal -SFR	27856	27856	27856	27856	27856																				
4	Single Family	Smart Irrigation Controller (Weather-Based Ir	37	37	37	37	37																				
5	CII	Water Use Surveys/Audits - CII	43	43	43	43	43																				
6	Irrigation	Incentivize Irrigation Equipment Upgrades - L	21	21	21	21	21																				
7	Irrigation	Smart Irrigation Controller (Weather-Based Ir	6	6	6	6	6																				
8	Multi Family	Water Use Surveys/Audits - MFR	43	43	43	43	43																				
9	Single Family	High Efficiency Faucet Aerator / Showerhead	909	909	909	909	909																				
10	Single Family	Incentivize Irrigation Equipment Upgrades - S	37	37	37	37	37																				
11	CII	Landscape Conversion or Turf Removal - MF	83568	83568	83568	83568	83568																				
12	Single Family	Soil Moisture Sensor Rebate	37	37	37	37	37																				
13	CII	Water Savings Incentive Program for CII	1	1	1	1	1																				
14	CII	Restaurant Spray Nozzle Rebates	50	50	50	50	50																				

Annual Program Overhead Cost (2019 dollars)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
Enter additional program cost not included in activity definitions																									

Model calculation tables below this line. Do not delete or modify.

Effective Conservation Activity

Activity ID	Class	Activity Name	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
1	Single Family	High Efficiency Clothes Washer Rebate - Res	303	606	909	1,212	1,515	1,515	1,515	1,515	1,515	1,515	1,515	1,515	1,515	1,515	1,515	1,212	909	606	303	0	0	0	0	0	0
2	Single Family	Water Use Surveys/Audits - SFR	731	1,316	1,784	2,158	2,457	1,726	1,142	674	299	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	Single Family	Landscape Conversion or Turf Removal -SFR	27,856	55,712	83,568	111,424	139,280	139,280	139,280	139,280	139,280	139,280	111,424	83,568	55,712	27,856	0	0	0	0	0	0	0	0	0	0	0
4	Single Family	Smart Irrigation Controller (Weather-Based Ir	37	74	111	148	185	185	185	185	185	185	148	111	74	37	0	0	0	0	0	0	0	0	0	0	0
5	CII	Water Use Surveys/Audits - CII	43	77	105	127	145	102	67	40	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	Irrigation	Incentivize Irrigation Equipment Upgrades - L	21	42	63	84	105	105	105	105	105	105	84	63	42	21	0	0	0	0	0	0	0	0	0	0	0
7	Irrigation	Smart Irrigation Controller (Weather-Based Ir	6	12	18	24	30	30	30	30	30	30	24	18	12	6	0	0	0	0	0	0	0	0	0	0	0
8	Multi Family	Water Use Surveys/Audits - MFR	43	77	105	127	145	102	67	40	18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	Single Family	High Efficiency Faucet Aerator / Showerhead	909	1,818	2,727	3,636	4,545	3,636	2,727	1,818	909	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	Single Family	Incentivize Irrigation Equipment Upgrades - S	37	74	111	148	185	185	185	185	185	185	148	111	74	37	0	0	0	0	0	0	0	0	0	0	0
11	CII	Landscape Conversion or Turf Removal - MF	83,568	167,136	250,704	334,272	417,840	417,840	417,840	417,840	417,840	417,840	334,272	250,704	167,136	83,568	0	0	0	0	0	0	0	0	0	0	0
12	Single Family	Soil Moisture Sensor Rebate	37	74	111	148	185	185	185	185	185	185	185	185	185	185	185	185	185	185	185	185	148	111	74	37	0
13	CII	Water Savings Incentive Program for CII	1	2	3	4	5	5	5	5	5	5	5	5	5	5	5	4	3	2	1	0	0	0	0	0	0
14	CII	Restaurant Spray Nozzle Rebates	50	100	150	200	250	200	150	100	50	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Gross Water Savings (AF)

Activity ID	Class	Activity Name	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
1	Single Family	High Efficiency Clothes Washer Rebate - Res	4.0	8.0	11.9	15.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	15.9	11.9	8.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0
2	Single Family	Water Use Surveys/Audits - SFR	27.8	50.0	67.7	81.9	93.3	65.6	43.3	25.6	11.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	Single Family	Landscape Conversion or Turf Removal -SFR	1.0	2.1	3.1	4.1	5.1	5.1	5.1	5.1	5.1	5.1	4.1	3.1	2.1	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	Single Family	Smart Irrigation Controller (Weather-Based Ir	2.0	3.9	5.9	7.8	9.8	9.8	9.8	9.8	9.8	9.8	7.8	5.9	3.9	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	CII	Water Use Surveys/Audits - CII	12.3	22.2	30.1	36.4	41.5	29.1	19.3	11.4	5.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	Irrigation	Incentivize Irrigation Equipment Upgrades - L	2.3	4.7	7.0	9.3	11.6	11.6	11.6	11.6	11.6	11.6	9.3	7.0	4.7	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	Irrigation	Smart Irrigation Controller (Weather-Based Ir	1.8	3.6	5.3	7.1	8.9	8.9	8.9	8.9	8.9	8.9	7.1	5.3	3.6	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	Multi Family	Water Use Surveys/Audits - MFR	12.3	22.2	30.1	36.4	41.5	29.1	19.3	11.4	5.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	Single Family	High Efficiency Faucet Aerator / Showerhead	11.2	22.4	33.6	44.8	56.0	44.8	33.6	22.4	11.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	Single Family	Incentivize Irrigation Equipment Upgrades - S	0.6	1.3	1.9	2.6	3.2	3.2	3.2	3.2	3.2	3.2	2.6	1.9	1.3	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	CII	Landscape Conversion or Turf Removal - MF	3.1	6.2	9.2	12.3	15.4	15.4	15.4	15.4	15.4	15.4	12.3	9.2	6.2	3.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	Single Family	Soil Moisture Sensor Rebate	1.6	3.2	4.8	6.3	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	6.3	4.8	3.2	1.6	0.0
13	CII	Water Savings Incentive Program for CII	18.4	36.8	55.2	73.6	92.0	92.0	92.0	92.0	92.0	92.0	92.0	92.0	92.0	92.0	92.0	73.6	55.2	36.8	18.4	0.0	0.0	0.0	0.0	0.0	0.0
14	CII	Restaurant Spray Nozzle Rebates	6.7	13.5	20.2	26.9	33.6	26.9	20.2	13.5	6.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total Gross Water Savings		**105.1**	**199.8**	**286.0**	**365.6**	**439.7**	**369.4**	**309.5**	**258.0**	**213.3**	**173.9**	**163.0**	**152.2**	**141.4**	**130.6**	**119.8**	**97.4**	**75.1**	**52.7**	**30.3**	**7.9**	**6.3**	**4.8**	**3.2**	**1.6**	**0.0**

Peak Gross Water Savings (AF)

Activity ID	Class	Activity Name	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
1	Single Family	High Efficiency Clothes Washer Rebate - Res	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	Single Family	Water Use Surveys/Audits - SFR	18.9	34.0	46.1	55.7	63.4	44.6	29.5	17.4	7.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	Single Family	Landscape Conversion or Turf Removal -SFR	0.8	1.6	2.5	3.3	4.1	4.1	4.1	4.1	4.1	4.1	3.3	2.5	1.6	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

4	Single Family	Smart Irrigation Controller (Weather-Based Ir	1.4	2.7	4.1	5.5	6.9	6.9	6.9	6.9	6.9	6.9	5.5	4.1	2.7	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	CII	Water Use Surveys/Audits - CII	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	Irrigation	Incentivize Irrigation Equipment Upgrades - L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	Irrigation	Smart Irrigation Controller (Weather-Based Ir	1.2	2.5	3.7	5.0	6.2	6.2	6.2	6.2	6.2	6.2	5.0	3.7	2.5	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	Multi Family	Water Use Surveys/Audits - MFR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	Single Family	High Efficiency Faucet Aerator / Showerhead	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	Single Family	Incentivize Irrigation Equipment Upgrades - S	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	CII	Landscape Conversion or Turf Removal - MF	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	Single Family	Soil Moisture Sensor Rebate	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	CII	Water Savings Incentive Program for CII	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	CII	Restaurant Spray Nozzle Rebates	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total Gross Water Savings		**22.3**	**40.9**	**56.4**	**69.5**	**80.6**	**61.8**	**46.7**	**34.6**	**24.9**	**17.2**	**13.8**	**10.3**	**6.9**	**3.4**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

Off Peak Gross Water Savings (AF)

Activity ID	Class	Activity Name	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
1	Single Family	High Efficiency Clothes Washer Rebate - Res	4.0	8.0	11.9	15.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	19.9	15.9	11.9	8.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0
2	Single Family	Water Use Surveys/Audits - SFR	8.9	16.0	21.7	26.2	29.9	21.0	13.9	8.2	3.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	Single Family	Landscape Conversion or Turf Removal -SFR	0.2	0.4	0.6	0.8	1.0	1.0	1.0	1.0	1.0	1.0	0.8	0.6	0.4	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	Single Family	Smart Irrigation Controller (Weather-Based Ir	0.6	1.2	1.8	2.4	2.9	2.9	2.9	2.9	2.9	2.9	2.4	1.8	1.2	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	CII	Water Use Surveys/Audits - CII	12.3	22.2	30.1	36.4	41.5	29.1	19.3	11.4	5.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	Irrigation	Incentivize Irrigation Equipment Upgrades - L	2.3	4.7	7.0	9.3	11.6	11.6	11.6	11.6	11.6	11.6	9.3	7.0	4.7	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	Irrigation	Smart Irrigation Controller (Weather-Based Ir	0.5	1.1	1.6	2.1	2.7	2.7	2.7	2.7	2.7	2.7	2.1	1.6	1.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	Multi Family	Water Use Surveys/Audits - MFR	12.3	22.2	30.1	36.4	41.5	29.1	19.3	11.4	5.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	Single Family	High Efficiency Faucet Aerator / Showerhead	11.2	22.4	33.6	44.8	56.0	44.8	33.6	22.4	11.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	Single Family	Incentivize Irrigation Equipment Upgrades - S	0.6	1.3	1.9	2.6	3.2	3.2	3.2	3.2	3.2	3.2	2.6	1.9	1.3	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	CII	Landscape Conversion or Turf Removal - MF	3.1	6.2	9.2	12.3	15.4	15.4	15.4	15.4	15.4	15.4	12.3	9.2	6.2	3.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	Single Family	Soil Moisture Sensor Rebate	1.6	3.2	4.8	6.3	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	6.3	4.8	3.2	1.6	0.0
13	CII	Water Savings Incentive Program for CII	18.4	36.8	55.2	73.6	92.0	92.0	92.0	92.0	92.0	92.0	92.0	92.0	92.0	92.0	92.0	73.6	55.2	36.8	18.4	0.0	0.0	0.0	0.0	0.0	0.0
14	CII	Restaurant Spray Nozzle Rebates	6.7	13.5	20.2	26.9	33.6	26.9	20.2	13.5	6.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total Gross Water Savings		**82.8**	**158.9**	**229.7**	**296.1**	**359.1**	**307.6**	**262.8**	**223.4**	**188.3**	**156.7**	**149.3**	**141.9**	**134.6**	**127.2**	**119.8**	**97.4**	**75.1**	**52.7**	**30.3**	**7.9**	**6.3**	**4.8**	**3.2**	**1.6**	**0.0**

Active Water Savings (AF)

Activity ID	Class	Activity Name	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
1	Single Family	High Efficiency Clothes Washer Rebate - Res	4.0	7.7	11.2	14.6	17.7	16.7	15.8	14.9	14.1	13.3	12.7	12.0	11.4	10.8	10.3	8.1	5.9	3.8	1.9	0.0	0.0	0.0	0.0	0.0	0.0
2	Single Family	Water Use Surveys/Audits - SFR	27.8	50.0	67.7	81.9	93.3	65.6	43.3	25.6	11.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	Single Family	Landscape Conversion or Turf Removal -SFR	1.0	2.1	3.1	4.1	5.1	5.1	5.1	5.1	5.1	5.1	4.1	3.1	2.1	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	Single Family	Smart Irrigation Controller (Weather-Based Ir	2.0	3.9	5.9	7.8	9.8	9.8	9.8	9.8	9.8	9.8	7.8	5.9	3.9	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	CII	Water Use Surveys/Audits - CII	12.3	22.2	30.1	36.4	41.5	29.1	19.3	11.4	5.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	Irrigation	Incentivize Irrigation Equipment Upgrades - L	2.3	4.7	7.0	9.3	11.6	11.6	11.6	11.6	11.6	11.6	9.3	7.0	4.7	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	Irrigation	Smart Irrigation Controller (Weather-Based Ir	1.8	3.6	5.3	7.1	8.9	8.9	8.9	8.9	8.9	8.9	7.1	5.3	3.6	1.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	Multi Family	Water Use Surveys/Audits - MFR	12.3	22.2	30.1	36.4	41.5	29.1	19.3	11.4	5.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	Single Family	High Efficiency Faucet Aerator / Showerhead	11.2	22.4	33.6	44.8	56.0	44.8	33.6	22.4	11.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	Single Family	Incentivize Irrigation Equipment Upgrades - S	0.6	1.3	1.9	2.6	3.2	3.2	3.2	3.2	3.2	3.2	2.6	1.9	1.3	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	CII	Landscape Conversion or Turf Removal - MF	3.1	6.2	9.2	12.3	15.4	15.4	15.4	15.4	15.4	15.4	12.3	9.2	6.2	3.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	Single Family	Soil Moisture Sensor Rebate	1.6	3.2	4.8	6.3	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	6.3	4.8	3.2	1.6	0.0
13	CII	Water Savings Incentive Program for CII	18.4	36.8	55.2	73.6	92.0	92.0	92.0	92.0	92.0	92.0	92.0	92.0	92.0	92.0	92.0	73.6	55.2	36.8	18.4	0.0	0.0	0.0	0.0	0.0	0.0
14	CII	Restaurant Spray Nozzle Rebates	6.7	13.5	20.2	26.9	33.6	26.9	20.2	13.5	6.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total Active Water Savings		**105.1**	**199.5**	**285.3**	**364.2**	**437.6**	**366.2**	**305.4**	**253.0**	**207.5**	**167.3**	**155.8**	**144.4**	**133.0**	**121.6**	**110.3**	**89.6**	**69.0**	**48.6**	**28.2**	**7.9**	**6.3**	**4.8**	**3.2**	**1.6**	**0.0**

Peak Active Water Savings (AF)

Activity ID	Class	Activity Name	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
1	Single Family	High Efficiency Clothes Washer Rebate - Res	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	Single Family	Water Use Surveys/Audits - SFR	18.9	34.0	46.1	55.7	63.4	44.6	29.5	17.4	7.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	Single Family	Landscape Conversion or Turf Removal -SFR	0.8	1.6	2.5	3.3	4.1	4.1	4.1	4.1	4.1	4.1	3.3	2.5	1.6	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	Single Family	Smart Irrigation Controller (Weather-Based Ir	1.4	2.7	4.1	5.5	6.9	6.9	6.9	6.9	6.9	6.9	5.5	4.1	2.7	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	CII	Water Use Surveys/Audits - CII	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	Irrigation	Incentivize Irrigation Equipment Upgrades - L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	Irrigation	Smart Irrigation Controller (Weather-Based Ir	1.2	2.5	3.7	5.0	6.2	6.2	6.2	6.2	6.2	6.2	5.0	3.7	2.5	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	Multi Family	Water Use Surveys/Audits - MFR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	Single Family	High Efficiency Faucet Aerator / Showerhead	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	Single Family	Incentivize Irrigation Equipment Upgrades - S	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	CII	Landscape Conversion or Turf Removal - MF	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	Single Family	Soil Moisture Sensor Rebate	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	CII	Water Savings Incentive Program for CII	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	CII	Restaurant Spray Nozzle Rebates	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total Active Water Savings		**22.3**	**40.9**	**56.4**	**69.5**	**80.6**	**61.8**	**46.7**	**34.6**	**24.9**	**17.2**	**13.8**	**10.3**	**6.9**	**3.4**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

Off Peak Active Water Savings (AF)

Activity ID	Class	Activity Name	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
1	Single Family	High Efficiency Clothes Washer Rebate - Res	4.0	7.7	11.2	14.6	17.7	16.7	15.8	14.9	14.1	13.3	12.7	12.0	11.4	10.8	10.3	8.1	5.9	3.8	1.9	0.0	0.0	0.0	0.0	0.0	0.0
2	Single Family	Water Use Surveys/Audits - SFR	8.9	16.0	21.7	26.2	29.9	21.0	13.9	8.2	3.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	Single Family	Landscape Conversion or Turf Removal -SFR	0.2	0.4	0.6	0.8	1.0	1.0	1.0	1.0	1.0	1.0	0.8	0.6	0.4	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	Single Family	Smart Irrigation Controller (Weather-Based Ir	0.6	1.2	1.8	2.4	2.9	2.9	2.9	2.9	2.9	2.9	2.4	1.8	1.2	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	CII	Water Use Surveys/Audits - CII	12.3	22.2	30.1	36.4	41.5	29.1	19.3	11.4	5.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

6	Irrigation	Incentivize Irrigation Equipment Upgrades - L	2.3	4.7	7.0	9.3	11.6	11.6	11.6	11.6	11.6	11.6	9.3	7.0	4.7	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	Irrigation	Smart Irrigation Controller (Weather-Based Ir	0.5	1.1	1.6	2.1	2.7	2.7	2.7	2.7	2.7	2.7	2.1	1.6	1.1	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	Multi Family	Water Use Surveys/Audits - MFR	12.3	22.2	30.1	36.4	41.5	29.1	19.3	11.4	5.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	Single Family	High Efficiency Faucet Aerator / Showerhead	11.2	22.4	33.6	44.8	56.0	44.8	33.6	22.4	11.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	Single Family	Incentivize Irrigation Equipment Upgrades - S	0.6	1.3	1.9	2.6	3.2	3.2	3.2	3.2	3.2	3.2	2.6	1.9	1.3	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	CII	Landscape Conversion or Turf Removal - MF	3.1	6.2	9.2	12.3	15.4	15.4	15.4	15.4	15.4	15.4	12.3	9.2	6.2	3.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	Single Family	Soil Moisture Sensor Rebate	1.6	3.2	4.8	6.3	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	7.9	6.3	4.8	3.2	1.6	0.0
13	CII	Water Savings Incentive Program for CII	18.4	36.8	55.2	73.6	92.0	92.0	92.0	92.0	92.0	92.0	92.0	92.0	92.0	92.0	92.0	73.6	55.2	36.8	18.4	0.0	0.0	0.0	0.0
14	CII	Restaurant Spray Nozzle Rebates	6.7	13.5	20.2	26.9	33.6	26.9	20.2	13.5	6.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total Active Water Savings		**82.8**	**158.7**	**229.0**	**294.8**	**356.9**	**304.4**	**258.7**	**218.5**	**182.6**	**150.1**	**142.1**	**134.0**	**126.1**	**118.1**	**110.3**	**89.6**	**69.0**	**48.6**	**28.2**	**7.9**	**6.3**	**4.8**	**3.2**	**1.6**	**0.0**

Passive Water Savings (AF)

Activity ID	Class	Activity Name	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
1	Single Family	High Efficiency Clothes Washer Rebate - Res	0.0	0.2	0.7	1.3	2.2	3.2	4.1	5.0	5.8	6.5	7.2	7.9	8.5	9.0	9.5	7.8	6.0	4.1	2.1	0.0	0.0	0.0	0.0	0.0	0.0
2	Single Family	Water Use Surveys/Audits - SFR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	Single Family	Landscape Conversion or Turf Removal -SFR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	Single Family	Smart Irrigation Controller (Weather-Based Ir	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	CII	Water Use Surveys/Audits - CII	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	Irrigation	Incentivize Irrigation Equipment Upgrades - L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	Irrigation	Smart Irrigation Controller (Weather-Based Ir	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	Multi Family	Water Use Surveys/Audits - MFR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	Single Family	High Efficiency Faucet Aerator / Showerhead	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	Single Family	Incentivize Irrigation Equipment Upgrades - S	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	CII	Landscape Conversion or Turf Removal - MF	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	Single Family	Soil Moisture Sensor Rebate	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	CII	Water Savings Incentive Program for CII	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	CII	Restaurant Spray Nozzle Rebates	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total Passive Water Savings		**0.0**	**0.2**	**0.7**	**1.3**	**2.2**	**3.2**	**4.1**	**5.0**	**5.8**	**6.5**	**7.2**	**7.9**	**8.5**	**9.0**	**9.5**	**7.8**	**6.0**	**4.1**	**2.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

Peak Passive Water Savings (AF)

Activity ID	Class	Activity Name	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
1	Single Family	High Efficiency Clothes Washer Rebate - Res	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	Single Family	Water Use Surveys/Audits - SFR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	Single Family	Landscape Conversion or Turf Removal -SFR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	Single Family	Smart Irrigation Controller (Weather-Based Ir	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	CII	Water Use Surveys/Audits - CII	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	Irrigation	Incentivize Irrigation Equipment Upgrades - L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	Irrigation	Smart Irrigation Controller (Weather-Based Ir	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	Multi Family	Water Use Surveys/Audits - MFR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	Single Family	High Efficiency Faucet Aerator / Showerhead	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	Single Family	Incentivize Irrigation Equipment Upgrades - S	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	CII	Landscape Conversion or Turf Removal - MF	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	Single Family	Soil Moisture Sensor Rebate	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	CII	Water Savings Incentive Program for CII	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	CII	Restaurant Spray Nozzle Rebates	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total Passive Water Savings		**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

Off Peak Passive Water Savings (AF)

Activity ID	Class	Activity Name	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
1	Single Family	High Efficiency Clothes Washer Rebate - Res	0.0	0.2	0.7	1.3	2.2	3.2	4.1	5.0	5.8	6.5	7.2	7.9	8.5	9.0	9.5	7.8	6.0	4.1	2.1	0.0	0.0	0.0	0.0	0.0	0.0
2	Single Family	Water Use Surveys/Audits - SFR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	Single Family	Landscape Conversion or Turf Removal -SFR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	Single Family	Smart Irrigation Controller (Weather-Based Ir	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	CII	Water Use Surveys/Audits - CII	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	Irrigation	Incentivize Irrigation Equipment Upgrades - L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	Irrigation	Smart Irrigation Controller (Weather-Based Ir	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	Multi Family	Water Use Surveys/Audits - MFR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	Single Family	High Efficiency Faucet Aerator / Showerhead	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	Single Family	Incentivize Irrigation Equipment Upgrades - S	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	CII	Landscape Conversion or Turf Removal - MF	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	Single Family	Soil Moisture Sensor Rebate	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	CII	Water Savings Incentive Program for CII	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	CII	Restaurant Spray Nozzle Rebates	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total Passive Water Savings		**0.0**	**0.2**	**0.7**	**1.3**	**2.2**	**3.2**	**4.1**	**5.0**	**5.8**	**6.5**	**7.2**	**7.9**	**8.5**	**9.0**	**9.5**	**7.8**	**6.0**	**4.1**	**2.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

Customer Water Bill Savings (2019 dollars)

Activity ID	Class	Activity Name	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
1	Single Family	High Efficiency Clothes Washer Rebate - Res	$14,959	$29,331	$43,158	$56,479	$69,331	$66,034	$62,953	$60,074	$57,384	$54,872	$52,527	$50,339	$48,297	$46,393	$44,619	$35,149	$25,975	$17,073	$8,422	$0	$0	$0	$0	$0	$0
2	Single Family	Water Use Surveys/Audits - SFR	$104,427	$189,830	$259,873	$317,516	$365,152	$259,067	$173,003	$103,111	$46,281	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3	Single Family	Landscape Conversion or Turf Removal -SFR	$3,859	$7,795	$11,809	$15,901	$20,073	$20,271	$20,472	$20,675	$20,879	$21,086	$17,036	$12,903	$8,687	$4,387	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
4	Single Family	Smart Irrigation Controller (Weather-Based Ir	$7,372	$14,891	$22,558	$30,375	$38,344	$38,724	$39,107	$39,494	$39,885	$40,280	$32,543	$24,649	$16,595	$8,380	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
5	CII	Water Use Surveys/Audits - CII	$51,573	$93,751	$128,343	$156,812	$180,337	$127,945	$85,441	$50,923	$22,857	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
6	Irrigation	Incentivize Irrigation Equipment Upgrades - L	$10,791	$21,796	$33,018	$44,460	$56,125	$56,681	$57,242	$57,809	$58,381	$58,959	$47,634	$36,079	$24,291	$12,266	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0

7	Irrigation	Smart Irrigation Controller (Weather-Based Ir	$8,252	$16,668	$25,250	$34,000	$42,921	$43,346	$43,775	$44,208	$44,646	$45,088	$36,427	$27,591	$18,576	$9,380	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
8	Multi Family	Water Use Surveys/Audits - MFR	$33,254	$60,450	$82,754	$101,110	$116,280	$82,498	$55,091	$32,835	$14,738	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
9	Single Family	High Efficiency Faucet Aerator / Showerhead	$42,116	$85,067	$128,863	$173,518	$219,045	$176,971	$134,042	$90,246	$45,570	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
10	Single Family	Incentivize Irrigation Equipment Upgrades - S	$2,409	$4,865	$7,370	$9,924	$12,528	$12,652	$12,777	$12,904	$13,031	$13,160	$10,633	$8,053	$5,422	$2,738	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
11	CII	Landscape Conversion or Turf Removal - MF	$12,861	$25,976	$39,350	$52,986	$66,889	$67,551	$68,220	$68,895	$69,577	$70,266	$56,769	$42,998	$28,949	$14,618	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
12	Single Family	Soil Moisture Sensor Rebate	$5,965	$12,048	$18,252	$24,576	$31,025	$31,332	$31,642	$31,955	$32,271	$32,591	$32,914	$33,239	$33,569	$33,901	$34,236	$34,575	$34,918	$35,263	$35,613	$35,965	$29,057	$22,008	$14,818	$7,482	$0	
13	CII	Water Savings Incentive Program for CII	$76,893	$155,308	$235,269	$316,797	$399,916	$403,876	$407,874	$411,912	$415,990	$420,108	$424,267	$428,468	$432,709	$436,993	$441,319	$356,551	$270,060	$181,823	$91,811	$0	$0	$0	$0	$0	$0	$0
14	CII	Restaurant Spray Nozzle Rebates	$28,105	$56,767	$85,994	$115,794	$146,175	$118,098	$89,450	$60,224	$30,410	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	Total Wastewater Savings		**$402,839**	**$774,545**	**$1,121,860**	**$1,450,248**	**$1,764,141**	**$1,505,045**	**$1,281,090**	**$1,085,265**	**$911,901**	**$756,411**	**$710,750**	**$664,320**	**$617,096**	**$569,055**	**$520,175**	**$426,275**	**$330,953**	**$234,159**	**$135,846**	**$35,965**	**$29,057**	**$22,008**	**$14,818**	**$7,482**	**$0**

Wastewater Savings (AF)

Activity ID	Class	Activity Name	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
1	Single Family	High Efficiency Clothes Washer Rebate - Res	4.6	9.0	13.2	17.0	20.7	19.5	18.4	17.4	16.5	15.6	14.8	14.0	13.3	12.7	12.1	9.4	6.9	4.5	2.2	0.0	0.0	0.0	0.0	0.0	0.0
2	Single Family	Water Use Surveys/Audits - SFR	11.1	20.0	27.1	32.8	37.3	26.2	17.3	10.2	4.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	Single Family	Landscape Conversion or Turf Removal -SFR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	Single Family	Smart Irrigation Controller (Weather-Based Ir	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	CII	Water Use Surveys/Audits - CII	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	Irrigation	Incentivize Irrigation Equipment Upgrades - L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	Irrigation	Smart Irrigation Controller (Weather-Based Ir	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	Multi Family	Water Use Surveys/Audits - MFR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	Single Family	High Efficiency Faucet Aerator / Showerhead	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	Single Family	Incentivize Irrigation Equipment Upgrades - S	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	CII	Landscape Conversion or Turf Removal - MF	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	Single Family	Soil Moisture Sensor Rebate	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	CII	Water Savings Incentive Program for CII	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	CII	Restaurant Spray Nozzle Rebates	6.7	13.5	20.2	26.9	33.6	26.9	20.2	13.5	6.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total Wastewater Savings		**22.5**	**42.5**	**60.4**	**76.7**	**91.7**	**72.7**	**56.0**	**41.1**	**27.8**	**15.6**	**14.8**	**14.0**	**13.3**	**12.7**	**12.1**	**9.4**	**6.9**	**4.5**	**2.2**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

Customer Sewer Bill Savings (2019 dollars)

Activity ID	Class	Activity Name	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
1	Single Family	High Efficiency Clothes Washer Rebate - Res	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2	Single Family	Water Use Surveys/Audits - SFR	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3	Single Family	Landscape Conversion or Turf Removal -SFR	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
4	Single Family	Smart Irrigation Controller (Weather-Based Ir	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
5	CII	Water Use Surveys/Audits - CII	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
6	Irrigation	Incentivize Irrigation Equipment Upgrades - L	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
7	Irrigation	Smart Irrigation Controller (Weather-Based Ir	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
8	Multi Family	Water Use Surveys/Audits - MFR	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
9	Single Family	High Efficiency Faucet Aerator / Showerhead	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
10	Single Family	Incentivize Irrigation Equipment Upgrades - S	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
11	CII	Landscape Conversion or Turf Removal - MF	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
12	Single Family	Soil Moisture Sensor Rebate	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
13	CII	Water Savings Incentive Program for CII	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
14	CII	Restaurant Spray Nozzle Rebates	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	Total Wastewater Savings		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

Customer Electricity Savings (KWh)

Activity ID	Class	Activity Name	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
1	Single Family	High Efficiency Clothes Washer Rebate - Res	4,664.3	9,055.8	13,194.2	17,097.4	20,782.2	19,600.1	18,502.4	17,483.1	16,536.6	15,657.7	14,841.6	14,083.8	13,380.1	12,726.7	12,120.0	9,454.0	6,917.9	4,502.5	2,199.2	0.0	0.0	0.0	0.0	0.0	0.0
2	Single Family	Water Use Surveys/Audits - SFR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	Single Family	Landscape Conversion or Turf Removal -SFR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	Single Family	Smart Irrigation Controller (Weather-Based Ir	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	CII	Water Use Surveys/Audits - CII	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	Irrigation	Incentivize Irrigation Equipment Upgrades - L	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	Irrigation	Smart Irrigation Controller (Weather-Based Ir	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	Multi Family	Water Use Surveys/Audits - MFR	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	Single Family	High Efficiency Faucet Aerator / Showerhead	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
10	Single Family	Incentivize Irrigation Equipment Upgrades - S	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	CII	Landscape Conversion or Turf Removal - MF	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
12	Single Family	Soil Moisture Sensor Rebate	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13	CII	Water Savings Incentive Program for CII	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	CII	Restaurant Spray Nozzle Rebates	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Total Electricity Savings		**4,664.3**	**9,055.8**	**13,194.2**	**17,097.4**	**20,782.2**	**19,600.1**	**18,502.4**	**17,483.1**	**16,536.6**	**15,657.7**	**14,841.6**	**14,083.8**	**13,380.1**	**12,726.7**	**12,120.0**	**9,454.0**	**6,917.9**	**4,502.5**	**2,199.2**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**

Customer Electricity Bill Savings (2019 dollars)

Activity ID	Class	Activity Name	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
1	Single Family	High Efficiency Clothes Washer Rebate - Res	$1,298	$2,519	$3,670	$4,756	$5,781	$5,452	$5,147	$4,863	$4,600	$4,356	$4,129	$3,918	$3,722	$3,540	$3,372	$2,630	$1,924	$1,253	$612	$0	$0	$0	$0	$0	$0
2	Single Family	Water Use Surveys/Audits - SFR	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3	Single Family	Landscape Conversion or Turf Removal -SFR	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
4	Single Family	Smart Irrigation Controller (Weather-Based Ir	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
5	CII	Water Use Surveys/Audits - CII	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
6	Irrigation	Incentivize Irrigation Equipment Upgrades - L	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
7	Irrigation	Smart Irrigation Controller (Weather-Based Ir	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
8	Multi Family	Water Use Surveys/Audits - MFR	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0

9	Single Family	High Efficiency Faucet Aerator / Showerhead	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
10	Single Family	Incentivize Irrigation Equipment Upgrades - S	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
11	CII	Landscape Conversion or Turf Removal - MF	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
12	Single Family	Soil Moisture Sensor Rebate	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
13	CII	Water Savings Incentive Program for CII	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
14	CII	Restaurant Spray Nozzle Rebates	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	Total Electricity Savings		**$1,298**	**$2,519**	**$3,670**	**$4,756**	**$5,781**	**$5,452**	**$5,147**	**$4,863**	**$4,600**	**$4,356**	**$4,129**	**$3,918**	**$3,722**	**$3,540**	**$3,372**	**$2,630**	**$1,924**	**$1,253**	**$612**	**$0**	**$0**	**$0**	**$0**	**$0**

Customer Gas Savings (Therms)

Activity ID	Class	Activity Name	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
1	Single Family	High Efficiency Clothes Washer Rebate - Res	4,535	8,804	12,828	16,622	20,205	19,056	17,988	16,997	16,077	15,223	14,429	13,693	13,008	12,373	11,783	9,191	6,726	4,377	2,138	0	0	0	0	0	0
2	Single Family	Water Use Surveys/Audits - SFR	8,661	15,590	21,133	25,568	29,115	20,454	13,525	7,982	3,548	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	Single Family	Landscape Conversion or Turf Removal -SFR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Single Family	Smart Irrigation Controller (Weather-Based Ir	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	CII	Water Use Surveys/Audits - CII	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	Irrigation	Incentivize Irrigation Equipment Upgrades - L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	Irrigation	Smart Irrigation Controller (Weather-Based Ir	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	Multi Family	Water Use Surveys/Audits - MFR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	Single Family	High Efficiency Faucet Aerator / Showerhead	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	Single Family	Incentivize Irrigation Equipment Upgrades - S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	CII	Landscape Conversion or Turf Removal - MF	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	Single Family	Soil Moisture Sensor Rebate	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	CII	Water Savings Incentive Program for CII	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	CII	Restaurant Spray Nozzle Rebates	18,263	36,525	54,788	73,050	91,313	73,050	54,788	36,525	18,263	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total Gas Savings		**31,458**	**60,919**	**88,748**	**115,240**	**140,633**	**112,560**	**86,301**	**61,505**	**37,887**	**15,223**	**14,429**	**13,693**	**13,008**	**12,373**	**11,783**	**9,191**	**6,726**	**4,377**	**2,138**	**0**	**0**	**0**	**0**	**0**	**0**

Customer Gas Savings (2019 dollars)

Activity ID	Class	Activity Name	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
1	Single Family	High Efficiency Clothes Washer Rebate - Res	$9,079	$17,627	$25,682	$33,279	$40,452	$38,151	$36,014	$34,030	$32,188	$30,477	$28,889	$27,414	$26,044	$24,772	$23,591	$18,402	$13,465	$8,764	$4,281	$0	$0	$0	$0	$0	$0
2	Single Family	Water Use Surveys/Audits - SFR	$17,340	$31,212	$42,310	$51,188	$58,291	$40,951	$27,079	$15,981	$7,103	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3	Single Family	Landscape Conversion or Turf Removal -SFR	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
4	Single Family	Smart Irrigation Controller (Weather-Based Ir	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
5	CII	Water Use Surveys/Audits - CII	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
6	Irrigation	Incentivize Irrigation Equipment Upgrades - L	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
7	Irrigation	Smart Irrigation Controller (Weather-Based Ir	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
8	Multi Family	Water Use Surveys/Audits - MFR	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
9	Single Family	High Efficiency Faucet Aerator / Showerhead	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
10	Single Family	Incentivize Irrigation Equipment Upgrades - S	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
11	CII	Landscape Conversion or Turf Removal - MF	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
12	Single Family	Soil Moisture Sensor Rebate	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
13	CII	Water Savings Incentive Program for CII	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
14	CII	Restaurant Spray Nozzle Rebates	$14,683	$29,365	$44,048	$58,730	$73,413	$58,730	$44,048	$29,365	$14,683	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	Total Gas Savings		**$41,102**	**$78,204**	**$112,040**	**$143,198**	**$172,155**	**$137,832**	**$107,140**	**$79,376**	**$53,973**	**$30,477**	**$28,889**	**$27,414**	**$26,044**	**$24,772**	**$23,591**	**$18,402**	**$13,465**	**$8,764**	**$4,281**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

User Entered Utility Avoided Water System Cost (2019 dollars)

Activity ID	Class	Activity Name	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
1	Single Family	High Efficiency Clothes Washer Rebate - Res	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2	Single Family	Water Use Surveys/Audits - SFR	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3	Single Family	Landscape Conversion or Turf Removal -SFR	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
4	Single Family	Smart Irrigation Controller (Weather-Based Ir	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
5	CII	Water Use Surveys/Audits - CII	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
6	Irrigation	Incentivize Irrigation Equipment Upgrades - L	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
7	Irrigation	Smart Irrigation Controller (Weather-Based Ir	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
8	Multi Family	Water Use Surveys/Audits - MFR	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
9	Single Family	High Efficiency Faucet Aerator / Showerhead	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
10	Single Family	Incentivize Irrigation Equipment Upgrades - S	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
11	CII	Landscape Conversion or Turf Removal - MF	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
12	Single Family	Soil Moisture Sensor Rebate	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
13	CII	Water Savings Incentive Program for CII	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
14	CII	Restaurant Spray Nozzle Rebates	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	Total Avoided Cost		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

User Entered Utility Avoided Wastewater System Cost (2019 dollars)

Activity ID	Class	Activity Name	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
1	Single Family	High Efficiency Clothes Washer Rebate - Res	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2	Single Family	Water Use Surveys/Audits - SFR	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3	Single Family	Landscape Conversion or Turf Removal -SFR	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
4	Single Family	Smart Irrigation Controller (Weather-Based Ir	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
5	CII	Water Use Surveys/Audits - CII	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
6	Irrigation	Incentivize Irrigation Equipment Upgrades - L	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
7	Irrigation	Smart Irrigation Controller (Weather-Based Ir	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
8	Multi Family	Water Use Surveys/Audits - MFR	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
9	Single Family	High Efficiency Faucet Aerator / Showerhead	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
10	Single Family	Incentivize Irrigation Equipment Upgrades - S	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0

11	CII	Landscape Conversion or Turf Removal - MF	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
12	Single Family	Soil Moisture Sensor Rebate	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
13	CII	Water Savings Incentive Program for CII	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
14	CII	Restaurant Spray Nozzle Rebates	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	Total Avoided Cost		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

User Entered Other Utility Avoided Cost (2019 dollars)

Activity ID	Class	Activity Name	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
1	Single Family	High Efficiency Clothes Washer Rebate - Res	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2	Single Family	Water Use Surveys/Audits - SFR	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3	Single Family	Landscape Conversion or Turf Removal -SFR	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
4	Single Family	Smart Irrigation Controller (Weather-Based Ir	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
5	CII	Water Use Surveys/Audits - CII	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
6	Irrigation	Incentivize Irrigation Equipment Upgrades - L	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
7	Irrigation	Smart Irrigation Controller (Weather-Based Ir	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
8	Multi Family	Water Use Surveys/Audits - MFR	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
9	Single Family	High Efficiency Faucet Aerator / Showerhead	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
10	Single Family	Incentivize Irrigation Equipment Upgrades - S	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
11	CII	Landscape Conversion or Turf Removal - MF	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
12	Single Family	Soil Moisture Sensor Rebate	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
13	CII	Water Savings Incentive Program for CII	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
14	CII	Restaurant Spray Nozzle Rebates	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	Total Avoided Cost		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

Model Calculator Utility Water System Avoided Cost (2019 dollars)

Activity ID	Class	Activity Name	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
1	Single Family	High Efficiency Clothes Washer Rebate - Res	$6,330	$12,508	$18,541	$24,436	$30,202	$28,997	$27,858	$26,781	$25,764	$24,805	$23,936	$23,116	$22,343	$21,615	$20,931	$16,621	$12,378	$8,196	$4,072	$0	$0	$0	$0	$0	$0
2	Single Family	Water Use Surveys/Audits - SFR	$44,190	$80,950	$111,641	$137,377	$159,068	$113,763	$76,557	$45,967	$20,779	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3	Single Family	Landscape Conversion or Turf Removal -SFR	$1,633	$3,324	$5,073	$6,880	$8,744	$8,902	$9,059	$9,217	$9,374	$9,532	$7,763	$5,925	$4,019	$2,044	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
4	Single Family	Smart Irrigation Controller (Weather-Based Ir	$3,120	$6,350	$9,691	$13,142	$16,703	$17,004	$17,306	$17,607	$17,908	$18,209	$14,829	$11,319	$7,677	$3,904	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
5	CII	Water Use Surveys/Audits - CII	$19,648	$35,992	$49,638	$61,080	$70,724	$50,581	$34,038	$20,438	$9,239	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
6	Irrigation	Incentivize Irrigation Equipment Upgrades - L	$3,705	$7,541	$11,508	$15,606	$19,835	$20,193	$20,550	$20,908	$21,265	$21,622	$17,610	$13,441	$9,117	$4,636	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
7	Irrigation	Smart Irrigation Controller (Weather-Based Ir	$2,833	$5,767	$8,800	$11,934	$15,169	$15,442	$15,715	$15,989	$16,262	$16,535	$13,467	$10,279	$6,972	$3,545	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
8	Multi Family	Water Use Surveys/Audits - MFR	$19,648	$35,992	$49,638	$61,080	$70,724	$50,581	$34,038	$20,438	$9,239	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
9	Single Family	High Efficiency Faucet Aerator / Showerhead	$17,822	$36,275	$55,360	$75,075	$95,421	$77,712	$59,316	$40,232	$20,460	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
10	Single Family	Incentivize Irrigation Equipment Upgrades - S	$1,019	$2,075	$3,166	$4,294	$5,457	$5,556	$5,654	$5,752	$5,851	$5,949	$4,845	$3,698	$2,508	$1,276	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
11	CII	Landscape Conversion or Turf Removal - MF	$4,900	$9,973	$15,219	$20,639	$26,232	$26,705	$27,178	$27,650	$28,123	$28,596	$23,289	$17,776	$12,057	$6,131	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
12	Single Family	Soil Moisture Sensor Rebate	$2,524	$5,138	$7,841	$10,633	$13,515	$13,759	$14,002	$14,246	$14,489	$14,733	$14,998	$15,264	$15,529	$15,795	$16,060	$16,350	$16,639	$16,929	$17,218	$17,507	$14,258	$10,883	$7,382	$3,754	$0
13	CII	Water Savings Incentive Program for CII	$29,293	$59,624	$90,992	$123,396	$156,838	$159,665	$162,491	$165,318	$168,144	$170,970	$174,052	$177,133	$180,214	$183,295	$186,376	$151,788	$115,856	$78,581	$39,962	$0	$0	$0	$0	$0	$0
14	CII	Restaurant Spray Nozzle Rebates	$10,707	$21,793	$33,259	$45,103	$57,327	$46,688	$35,636	$24,170	$12,292	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	Total Avoided Cost		**$167,372**	**$323,301**	**$470,364**	**$610,674**	**$745,960**	**$635,546**	**$539,399**	**$454,711**	**$379,189**	**$310,952**	**$294,789**	**$277,951**	**$260,436**	**$242,242**	**$223,367**	**$184,758**	**$144,873**	**$103,706**	**$61,252**	**$17,507**	**$14,258**	**$10,883**	**$7,382**	**$3,754**	**$0**

Model Calculator Utility Wastewater System Avoided Cost (2019 dollars)

Activity ID	Class	Activity Name	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
1	Single Family	High Efficiency Clothes Washer Rebate - Res	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
2	Single Family	Water Use Surveys/Audits - SFR	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3	Single Family	Landscape Conversion or Turf Removal -SFR	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
4	Single Family	Smart Irrigation Controller (Weather-Based Ir	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
5	CII	Water Use Surveys/Audits - CII	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
6	Irrigation	Incentivize Irrigation Equipment Upgrades - L	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
7	Irrigation	Smart Irrigation Controller (Weather-Based Ir	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
8	Multi Family	Water Use Surveys/Audits - MFR	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
9	Single Family	High Efficiency Faucet Aerator / Showerhead	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
10	Single Family	Incentivize Irrigation Equipment Upgrades - S	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
11	CII	Landscape Conversion or Turf Removal - MF	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
12	Single Family	Soil Moisture Sensor Rebate	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
13	CII	Water Savings Incentive Program for CII	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
14	CII	Restaurant Spray Nozzle Rebates	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	Total Avoided Cost		**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**	**$0**

Total Avoided Water and Wastewater Production Cost (2019 dollars)

Activity ID	Class	Activity Name	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
1	Single Family	High Efficiency Clothes Washer Rebate - Res	$6,330	$12,508	$18,541	$24,436	$30,202	$28,997	$27,858	$26,781	$25,764	$24,805	$23,936	$23,116	$22,343	$21,615	$20,931	$16,621	$12,378	$8,196	$4,072	$0	$0	$0	$0	$0	$0
2	Single Family	Water Use Surveys/Audits - SFR	$44,190	$80,950	$111,641	$137,377	$159,068	$113,763	$76,557	$45,967	$20,779	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
3	Single Family	Landscape Conversion or Turf Removal -SFR	$1,633	$3,324	$5,073	$6,880	$8,744	$8,902	$9,059	$9,217	$9,374	$9,532	$7,763	$5,925	$4,019	$2,044	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
4	Single Family	Smart Irrigation Controller (Weather-Based Ir	$3,120	$6,350	$9,691	$13,142	$16,703	$17,004	$17,306	$17,607	$17,908	$18,209	$14,829	$11,319	$7,677	$3,904	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
5	CII	Water Use Surveys/Audits - CII	$19,648	$35,992	$49,638	$61,080	$70,724	$50,581	$34,038	$20,438	$9,239	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
6	Irrigation	Incentivize Irrigation Equipment Upgrades - L	$3,705	$7,541	$11,508	$15,606	$19,835	$20,193	$20,550	$20,908	$21,265	$21,622	$17,610	$13,441	$9,117	$4,636	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
7	Irrigation	Smart Irrigation Controller (Weather-Based Ir	$2,833	$5,767	$8,800	$11,934	$15,169	$15,442	$15,715	$15,989	$16,262	$16,535	$13,467	$10,279	$6,972	$3,545	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
8	Multi Family	Water Use Surveys/Audits - MFR	$19,648	$35,992	$49,638	$61,080	$70,724	$50,581	$34,038	$20,438	$9,239	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
9	Single Family	High Efficiency Faucet Aerator / Showerhead	$17,822	$36,275	$55,360	$75,075	$95,421	$77,712	$59,316	$40,232	$20,460	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
10	Single Family	Incentivize Irrigation Equipment Upgrades - S	$1,019	$2,075	$3,166	$4,294	$5,457	$5,556	$5,654	$5,752	$5,851	$5,949	$4,845	$3,698	$2,508	$1,276	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
11	CII	Landscape Conversion or Turf Removal - MF	$4,900	$9,973	$15,219	$20,639	$26,232	$26,705	$27,178	$27,650	$28,123	$28,596	$23,289	$17,776	$12,057	$6,131	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
12	Single Family	Soil Moisture Sensor Rebate	$2,524	$5,138	$7,841	$10,633	$13,515	$13,759	$14,002	$14,246	$14,489	$14,733	$14,998	$15,264	$15,529	$15,795	$16,060	$16,350	$16,639	$16,929	$17,218	$17,507	$14,258	$10,883	$7,382	$3,754	$0

13	CII	Water Savings Incentive Program for CII	$29,293	$59,624	$90,992	$123,396	$156,838	$159,665	$162,491	$165,318	$168,144	$170,970	$174,052	$177,133	$180,214	$183,295	$186,376	$151,788	$115,856	$78,581	$39,962	$0	$0	$0	$0	$0	$0
14	CII	Restaurant Spray Nozzle Rebates	$10,707	$21,793	$33,259	$45,103	$57,327	$46,688	$35,636	$24,170	$12,292	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
	Total Avoided Cost		**$167,372**	**$323,301**	**$470,364**	**$610,674**	**$745,960**	**$635,546**	**$539,399**	**$454,711**	**$379,189**	**$310,952**	**$294,789**	**$277,951**	**$260,436**	**$242,242**	**$223,367**	**$184,758**	**$144,873**	**$103,706**	**$61,252**	**$17,507**	**$14,258**	**$10,883**	**$7,382**	**$3,754**	**$0**

Appendix C

Methodology for Water Conservation Program Savings Analyses

Appendix C
Methodology for Water Conservation Program Savings Analyses

This Appendix describes the methodology used to estimate water conservation program savings based on customer billing data, for the analyses presented in report Section 5.3.2, *Estimated Water Savings for Selected Programs Based on Customer Billing Data*.

Water use savings associated with conservation programs are typically estimated based on literature values, which may or may not accurately capture the specific ways customers in a specific area (i.e., Marin Municipal Water District [District]) use water. Therefore, District customer billing data were analyzed in order to assess the amount of water typically saved through implementation of each of the four selected conservation programs. Water use by program participants was compared to water use by a representative cohort over the same time period, that was stratified based on key criteria. Water use savings were estimated for the four conservation programs identified below:[1]

1. Advanced Metering Infrastructure (AMI) Leak Notifications Program
2. Residential High Efficiency Clothes Washer (HECW) Rebate Program
3. SFR Water Use Surveys/Audits Program
4. SFR Weather-Based Irrigation Controller (WBIC) Rebate Program

Specifically, water use before and after implementation of a given action (e.g., device replacement or turf removal) by program participants is compared to the water use by a cohort of accounts who have not participated in the same or other programs in the given time frame. The incremental volume of water saved by program participants compared to that of the cohort group can then be attributed to program participation, as other factors have been normalized. This analytical technique is a version of the "Difference-in-Differences Estimation" method. The Difference-in-Differences Estimation method is a standard method used in economics and social science for quantitatively evaluating observational study data by studying the differential effect of a treatment, or in this case participation in a given program as compared to a "control group," when a true controlled experiment cannot be performed (Columbia Public Health, 2013).

By comparing water use over time by program participants to a cohort group and identifying the incremental change in water use due to program participation, this methodology controls for variations in water use due to climatic, economic, and other temporally related factors. By stratifying (or weighting) the cohort group based on key factors (i.e., Census Block Group or neighborhood), this method also effectively controls for geographic-linked water use influencing factors, such as house and yard size, housing age, general socio-economic factors, general landscape management factors, etc.

Participant Sample Groups: In order to estimate water savings attributable to a single conservation program, participant sample groups for this analysis were limited to accounts that participated in only one program, and who participated in that program in only one year (e.g., did not receive several rebates from the same program over several years), except as indicated in savings results tables, as appropriate. The

[1] This analysis was also performed for the Rain Barrel Rebate Program. However, due to the limited sample size and likely other human factors, the results were not considered robust and thus are not presented herein.

participant sample groups were further limited to just those accounts that had active water use over the study period. Active accounts were identified as those who received six water bills and had non-zero water use in a given year.

Comparison Cohort Sample Groups: Accounts included in the cohort groups are limited to those accounts that had not participated in any program based on available data and that meet the same active account thresholds as described above for the participant sample groups (i.e., received six bills per year and non-zero annual water use). It is possible that members of the cohort group participated in a program that was not included in this study; however, given the large number of accounts included in these cohort groups the effect of participation in other programs would be expected to be minimal. Although not participants in a specific program, a portion of the cohort group members would be expected to have changed out water using devices with more efficient ones through natural replacement. Given this, the program savings identified by this method may actually be somewhat higher than estimated herein, resulting in a more conservative program savings estimate.

Study Periods: Since account-level water use billing data are available from 2004 to 2019, the participation data from 2010 to 2018 are analyzed so that one to three years of water use data can be used to capture the average water use before and after the participation year. The AMI Leak Notifications Program started in 2018, and thus even though there is only one year of billing data (2019) available to represent the average water use after the participation year, participation year 2018 is included.

Stratification: The water savings calculations for SFR accounts were stratified (or weighted) based on the Census Block Group (except as indicated in savings results table notes, as appropriate), as a way to control for geographically linked variables such as house and yard size, housing age, and general socio-economic factors, among others.

Water Savings Calculation: For each active account, the average annual water use for a period of three years prior to program participation is compared to the average annual water use in the year following program participation, dependent on available data. The change in water use by program participants is then compared to that of the cohort group over the same time period. The difference between the change in water use of the participants and the change in water use of the cohorts is the water savings due to the given conservation program. A positive average water savings suggests the program resulted in water savings, while a negative average water savings suggests the program was not successful in saving water.

References

Columbia Public Health, 2013. Difference in Difference Estimation. Columbia Public Health, https://www.publichealth.columbia.edu/research/population-health-methods/difference-difference-estimation#Overview, accessed 28 September 2020.

Appendix D

Prioritization and Screening of Future Water Conservation Measures

Prioritization and Screening of Future Water Conservation Measures
Marin-Sonoma Saving Water Partnership

INSTRUCTIONS: Please review and complete the orange highlighted cells using the provided dropdown lists. Comments and clarifications may be added to the comments column on the right. You may use the filter features to help navigate this list. "Preference for Implementation" need only be completed when a program is given a priorty of 3 or greater. See READ ME tab for additional information.

Conservation Measure/Program	Type	Indoor / Outdoor	Primary End Use	Sector	Priority as a Regional Program	Priority as a Local Program	Preference for Implementation	Current Implementation Status	Notes / Comments	Source	Added By
Agency Actions and Water Rates											
Customer Water Loss Reduction (AMI Leak Detection)	Agency action	Both	Water Loss	All						2015 Screening	EKI
Increase Enforcement of Customer Pressure Reducing Valve (PRV) Requirement	Agency action	Both	Water loss; Irrigation	All						Added 2020	EKI
Increase Enforcement of Indoor Fixture Retrofit at Time of Sale	Agency action	Indoor	Toilet, Urinal, Faucet, Showerhead	All					Enforcement of SB 407 at time of sale.	2015 Screening	EKI
Increase Enforcement of State Water Waste Regulations	Agency action	Outdoor	Irrigation	All					Assumes water waste regulations per Executive Order B-40-17 rulemaking is completed largely as currently proposed.	Added 2020	EKI
Install AMI for Existing Accounts	Agency action	Both	Water Loss	All						2015 Screening	EKI
Install AMI for High Water Users and Large Landscape Accounts	Agency action	Outdoor	Water Loss	All						2015 Screening	EKI
Install AMI in New Development	Agency action	Both	Water Loss	All						2015 Screening	EKI
Rate Structure Evaluation	Agency action	Both	All	All						2015 Screening	EKI
Regional UHET and/or Urinal Bulk Purchase Program	Agency action	Indoor	Toilet / Urinal	All					Fixtures are purchased in bulk at a discounted rate and then sold to customers at the discounted rate	2015 Screening	EKI
Water Budgeting/Monitoring for Large Landscape Accounts	Agency action	Both	Irrigation	IRR						2015 Screening	EKI
Establish Separate Pricing Structure for Irrigation Accounts	Water Rates	Outdoor	Irrigation	IRR						2015 Screening	EKI
Modification to or Implementation of Tiered Rate Conservation Pricing	Water Rates	Both	All	All						2015 Screening	EKI
Tiered Water Rates (Conservation Pricing)	Water Rates	Both	All	All						2015 Screening	EKI
Water Budget Based Billing for All Customers	Water Rates	Both	All	All						2015 Screening	EKI
Water Budget Based Billing for Only Irrigation Customers	Water Rates	Outdoor	Irrigation	CII, IRR						2015 Screening	EKI
Public Outreach and Education											
Water Use Surveys/Audits - CII	Audit/ Survey	Both	All	CII						2015 Screening	EKI
Water Use Surveys/Audits - MFR	Audit/ Survey	Indoor	All Indoor	MFR						2015 Screening	EKI
Water Use Surveys/Audits - SFR	Audit/ Survey	Both	All	SFR						2015 Screening	EKI
Educational Workshops	Public Outreach/ Workshop	Outdoor	All Outdoor	SFR						Added 2020	MMWD
Garden tour	Public Outreach/ Workshop	Outdoor	Outdoor	SFR						Added 2020	MMWD
Promote Green Building and Certification	Public Outreach/ Workshop	Both	All	All						2015 Screening	EKI
Provide Support with Smart Irrigation Controller Setup	Public Outreach/ Workshop	Outdoor	Irrigation	All						Added 2020	EKI
Public Outreach through Print & Electronic Media - Focused on Indoor Conservation	Public Outreach/ Workshop	Outdoor	All Indoor	All						2015 Screening	EKI
Public Outreach through Print & Electronic Media - Focused on Outdoor Irrigation	Public Outreach/ Workshop	Indoor	Irrigation	All						2015 Screening	EKI
QWEL Training (Qualified Water Efficient Landscaper)	Public Outreach/ Workshop	Outdoor	Irrigation	All						Added 2020	EKI
School Education Programs	Public Outreach/ Workshop	Both	All	SFR, MFR						2015 Screening	EKI
Device-Based and Financial Incentive Programs											
Direct Install of Efficient Indoor Fixtures - Commercial and Industrial	Direct Install/ No-Cost Device	Indoor	Toilet, Urinal, Faucet, Showerhead	CII						2015 Screening	EKI
Direct Install of Efficient Indoor Fixtures - Government Buildings	Direct Install/ No-Cost Device	Indoor	Toilet, Urinal, Faucet, Showerhead	CII						2015 Screening	EKI
Direct Install of Efficient Indoor Fixtures - Low Income Residential	Direct Install/ No-Cost Device	Indoor	Toilet, Faucet, Showerhead	SFR, MFR						2015 Screening	EKI
Direct Install of Efficient Indoor Fixtures - Residential	Direct Install/ No-Cost Device	Indoor	Toilet, Faucet, Showerhead	SFR, MFR						2015 Screening	EKI
High Efficiency Clothes Washer Install - Low Income Residential Customers	Direct Install/ No-Cost Device	Indoor	Clothes Washer	SFR, MFR						Added 2020	EKI
High Efficiency Faucet Aerator / Showerhead Giveaway - CII Customers	Direct Install/ No-Cost Device	Indoor	Faucet, Showerhead	CII						2015 Screening	EKI
High Efficiency Faucet Aerator / Showerhead Giveaway - Residential Customers	Direct Install/ No-Cost Device	Indoor	Faucet, Showerhead	SFR, MFR						2015 Screening	EKI
Rain Barrel Giveaway	Direct Install/ No-Cost Device	Outdoor	Irrigation	SFR						Added 2020	EKI
Rain Sensor Giveaway	Direct Install/ No-Cost Device	Outdoor	Irrigation	All						2015 Screening	EKI
Rotating Sprinkler Nozzle Giveaway	Direct Install/ No-Cost Device	Outdoor	Irrigation	All						Added 2020	EKI
Smart Irrigation Controller (Weather-Based Irrigation Controller) Giveaway - Large Landscape	Direct Install/ No-Cost Device	Outdoor	Irrigation	MFR, CII						2015 Screening	EKI
Smart Irrigation Controller (Weather-Based Irrigation Controller) Giveaway - SFR	Direct Install/ No-Cost Device	Outdoor	Irrigation	SFR						Added 2020	EKI
Soil Moisture Sensor Giveaway	Direct Install/ No-Cost Device	Outdoor	Irrigation	All						Added 2020	EKI
Toilet Flapper Giveaway - SFR customers	Direct Install/ No-Cost Device	Indoor	Toilet	SFR, MFR					Could be used for CII customers, but hasn't been yet.	Added 2020	Santa Rosa
UHET Direct Installation - CII	Direct Install/ No-Cost Device	Indoor	Toilet	CII						2015 Screening	EKI
UHET Direct Installation - Residential	Direct Install/ No-Cost Device	Indoor	Toilet	SFR, MFR						2015 Screening	EKI
Urinal Direct Installation - CII	Direct Install/ No-Cost Device	Indoor	Urinal	CII						Added 2020	EKI
Autoclave (Steam-Sterilizer) Retrofit Rebates	Rebate/ Financial Incentive	Indoor	CII Equipment	CII					More info: https://www.energy.gov/eere/femp/water-efficient-technology-opportunity-steam-sterilizer-condensate-retrofit-kit	Added 2020	EKI
Connectionless Food Steamer Rebates	Rebate/ Financial Incentive	Indoor	CII Equipment	CII					More info: https://www.energy.gov/eere/femp/water-efficient-technology-opportunity-connectionless-food-steamer	Added 2020	EKI
Dipper Well Rebates	Rebate/ Financial Incentive	Indoor	CII Equipment	CII					Incentivize replacement of perpetual-flow holders for ice cream dippers & utensils; https://server-products.com/equipment/conservewell/utensil-holder/87740.htm	Added 2020	EKI
Drip Irrigation Incentive for MFR and CII	Rebate/ Financial Incentive	Outdoor	Irrigation	MFR, CII						2015 Screening	EKI
Drip Irrigation Incentive for SFR	Rebate/ Financial Incentive	Outdoor	Irrigation	SFR						2015 Screening	EKI
Dry Vacuum Pumps	Rebate/ Financial Incentive	Indoor	CII Equipment	CII						2015 Screening	EKI
Efficient (EnergyStar) Dishwasher Rebates	Rebate/ Financial Incentive	Indoor	Dishwashers	SFR						2015 Screening	EKI
High Efficiency Clothes Washer Rebate - Residential	Rebate/ Financial Incentive	Indoor	Clothes Washer	SFR, MFR						2015 Screening	EKI
High Efficiency Clothes Washer Rebate Program - CII	Rebate/ Financial Incentive	Indoor	Clothes Washer	CII						2015 Screening	EKI
High Efficiency Urinal (<0.25 gal/flush) Rebates - CII	Rebate/ Financial Incentive	Indoor	Urinal	CII						2015 Screening	EKI

Prioritization and Screening of Future Water Conservation Measures
Marin-Sonoma Saving Water Partnership

INSTRUCTIONS: Please review and complete the orange highlighted cells using the provided dropdown lists. Comments and clarifications may be added to the comments column on the right. You may use the filter features to help navigate this list. "Preference for Implementation" need only be completed when a program is given a priorty of 3 or greater. See READ ME tab for additional information.

Conservation Measure/Program	Type	Indoor / Outdoor	Primary End Use	Sector	Priority as a Regional Program	Priority as a Local Program	Preference for Implementation	Current Implementation Status	Notes / Comments	Source	Added By
Hot Water on Demand Pump System Rebate	Rebate/ Financial Incentive	Indoor	Hot Water	SFR, MFR						2015 Screening	EKI
Incentivize Artificial Turf for Sports Fields	Rebate/ Financial Incentive	Outdoor	Irrigation	CII						2015 Screening	EKI
Incentivize Cooling Tower Upgrades	Rebate/ Financial Incentive	Indoor	Cooling Towers	CII						Added 2020	EKI
Incentivize Gray Water Retrofit for Existing SFR Customers	Rebate/ Financial Incentive	Outdoor	Irrigation / Gray Water	SFR						2015 Screening	EKI
Incentivize Gray Water Systems for New CII Development	Rebate/ Financial Incentive	Both	Irrigation / Gray Water	CII						2015 Screening	EKI
Incentivize Irrigation Equipment Upgrades - Large Landscapes	Rebate/ Financial Incentive	Outdoor	Irrigation	MFR, CII, IRR						2015 Screening	EKI
Incentivize Irrigation Equipment Upgrades - SFR	Rebate/ Financial Incentive	Outdoor	Irrigation	SFR						2015 Screening	EKI
Incentivize Replacement of Inefficient Commercial and Industrial Equipment	Rebate/ Financial Incentive	Indoor	CII Equipment	CII					Example: SoCal Water Smart Water Savings Incentive Program: https://socalwatersmart.com/en/commercial/water-savings-incentive-program/	2015 Screening	EKI
Incentivize Replacement of Pressure Reducing Valves (PRVs) with 60-70 psi PRVs	Rebate/ Financial Incentive	Both	Water loss; Irrigation	All					PRVs must be installed by customers with pressure exceeding 80 psi, per the plumbing code	2015 Screening	EKI
Incentivize Submetering for Existing Customers - CII	Rebate/ Financial Incentive	Both	All Indoor	MFR, COM, IRR						2015 Screening	EKI
Incentivize Submetering for Existing Customers - MFR	Rebate/ Financial Incentive	Both	All Indoor	MFR						2015 Screening	EKI
Incentivize Submetering of Cooling Towers for Existing Customers	Rebate/ Financial Incentive	Indoor	Cooling Towers	CII						2015 Screening	EKI
Indoor Fixture Program For Hotels & Motels	Rebate/ Financial Incentive	Indoor	All Indoor	CII						2015 Screening	EKI
Indoor Fixture Program For Schools	Rebate/ Financial Incentive	Indoor	All Indoor	CII						2015 Screening	EKI
Landscape Conversion or Turf Removal - MFR and CII	Rebate/ Financial Incentive	Outdoor	Irrigation	MFR, CII						2015 Screening	EKI
Landscape Conversion or Turf Removal -SFR	Rebate/ Financial Incentive	Outdoor	Irrigation	SFR						2015 Screening	EKI
Mulch rebate	Rebate/ Financial Incentive	Outdoor	Irrigation	SFR						Added 2020	MMWD
Nonresidential Incentive for Self-closing or Metering Faucets	Rebate/ Financial Incentive	Indoor	Faucet	CII						Added 2020	Sonoma
Plumber Initiated UHET and / or Urinal Retrofit Program	Rebate/ Financial Incentive	Indoor	Toilet	All						2015 Screening	EKI
Rain Barrel Rebate	Rebate/ Financial Incentive	Outdoor	Irrigation	SFR						2015 Screening	EKI
Rain Sensor Rebate	Rebate/ Financial Incentive	Outdoor	Irrigation	All						2015 Screening	EKI
Rainwater Catchment System Rebate for Large Landscapes	Rebate/ Financial Incentive	Outdoor	Irrigation	MFR, CII						2015 Screening	EKI
Rebates for Conductivity Controllers on Cooling Towers	Rebate/ Financial Incentive	Indoor	Cooling Towers	CII						2015 Screening	EKI
Restaurant Spray Nozzle Rebates	Rebate/ Financial Incentive	Indoor	CII Equipment	CII						2015 Screening	EKI
Rotating Sprinkler Nozzle Rebate	Rebate/ Financial Incentive	Outdoor	Irrigation	All						2015 Screening	EKI
Smart Irrigation Controller (Weather-Based Irrigation Controller) Rebates - Large Landscape	Rebate/ Financial Incentive	Outdoor	Irrigation	MFR, CII						2015 Screening	EKI
Smart Irrigation Controller (Weather-Based Irrigation Controller) Rebates - SFR	Rebate/ Financial Incentive	Outdoor	Irrigation	SFR						2015 Screening	EKI
Soil Moisture Sensor Rebate	Rebate/ Financial Incentive	Outdoor	Irrigation	All						2015 Screening	EKI
Swimming Pool and Hot Tub Cover Rebates	Rebate/ Financial Incentive	Outdoor	Pool/Hot Tub	SFR, MFR						Added 2020	EKI
Thermostatic Shut-Off Valve Showerheads/Tub Spouts Rebates	Rebate/ Financial Incentive	Indoor	Shower	SFR, MFR, CII					Reduce hot water use before showering https://www.thinkevolve.com/	Added 2020	EKI
Tier 4 Exemption	Rebate/ Financial Incentive	Both	toilet, Faucet, Showerhead, clothes washer, irrigation	SFR					Exemption from high tier water rates w/installation of devices	Added 2020	MMWD
UHET <1.0 gal/flush Rebate - CII	Rebate/ Financial Incentive	Indoor	Toilet	CII						2015 Screening	EKI
UHET <1.0 gal/flush Rebate - Residential	Rebate/ Financial Incentive	Indoor	Toilet	SFR, MFR						2015 Screening	EKI
Water Savings Incentive Program for CII	Rebate/ Financial Incentive	Indoor	All Indoor	CII					Financial incentive to reward demonstrated water savings and offset capital improvement costs; Example: SoCal Water Smart Water Savings Incentive Program: https://socalwatersmart.com/en/commercial/water-savings-incentive-program/	2015 Screening	EKI
Policies and Regulations											
Demand Offset/Water Neutral Policy for Large New Developments	Policy/ Regulation	Both	All	All						Added 2020	EKI
Prohibit Once through Cooling Systems	Policy/ Regulation	Both	CII Equipment	CII						2015 Screening	EKI
Require <0.25 gal/flush Urinals in New Development	Policy/ Regulation	Indoor	Urinal	CII						2015 Screening	EKI
Require <1.0 gal/flush Toilets in New Development	Policy/ Regulation	Indoor	Toilet	All					State minimum efficiency is 1.28 gal/flush	Added 2020	EKI
Require Cooling Tower Retrofits	Policy/ Regulation	Indoor	Cooling Towers	CII						2015 Screening	EKI
Require Efficient (EnergyStar) Dishwashers in New Development	Policy/ Regulation	Indoor	Dishwashers	SFR, MFR						2015 Screening	EKI
Require High Efficiency Clothes Washers in New Development	Policy/ Regulation	Indoor	Clothes Washer	SFR, MFR						2015 Screening	EKI
Require Hot Water on Demand / Structured Plumbing in New Residential Development	Policy/ Regulation	Indoor	Shower/Sink	SFR, MFR						2015 Screening	EKI
Require Irrigation Designers / Installers be Certified (QWEL)	Policy/ Regulation	Outdoor	Irrigation	All						2015 Screening	EKI
Require On-Site Water Reuse Systems (Grey Water or Black Water) for Large CII Developments	Policy/ Regulation	Outdoor	Irrigation / Recycled Water	CII					Example: https://sfwater.org/index.aspx?page=686	Added 2020	EKI
Require Plumbing for Gray Water in New SFR Development	Policy/ Regulation	Outdoor	Irrigation / Gray Water	SFR						2015 Screening	EKI
Require Plumbing for Recycled Water in New CII Development	Policy/ Regulation	Outdoor	Irrigation / Recycled Water	CII						Added 2020	EKI
Require Plumbing for Recycled Water in New MFR Development	Policy/ Regulation	Outdoor	Irrigation / Recycled Water	MFR						Added 2020	EKI
Require Rain Barrels in New Development	Policy/ Regulation	Outdoor	Irrigation	SFR						2015 Screening	EKI
Require Submetering by Unit for Existing Commercial Customers	Policy/ Regulation	Indoor	All Indoor	CII						Added 2020	EKI
Require Submetering by Unit for New Commercial Developments	Policy/ Regulation	Indoor	All Indoor	CII						Added 2020	EKI
Require Submetering for New MFR Developments	Policy/ Regulation	Indoor	All Indoor	MFR						2015 Screening	EKI
Require Submetering for New Mobile Home Park Developments	Policy/ Regulation	Indoor	All Indoor	MFR						2015 Screening	EKI
Require Submetering of Cooling Towers for Existing Customers	Policy/ Regulation	Indoor	Cooling Towers	CII						Added 2020	EKI
Require Submetering of Cooling Towers for New Development	Policy/ Regulation	Indoor	Cooling Towers	CII						Added 2020	EKI
Require Submetering of Existing MFR (and Mobile Home Park) Customers	Policy/ Regulation	Indoor	All Indoor	MFR						Added 2020	EKI
Require Submetering of Landscaping for Existing MFR and Commercial Customers	Policy/ Regulation	Outdoor	Irrigation	MFR, CII						Added 2020	EKI
Require Submetering of Landscaping for New MFR and Commercial Developments	Policy/ Regulation	Outdoor	Irrigation	CII						Added 2020	EKI
Require Swimming Pool and Hot Tub Covers	Policy/ Regulation	Outdoor	Pool/Hot Tub	SFR, MFR						2015 Screening	EKI

Prioritization and Screening of Future Water Conservation Measures
Marin-Sonoma Saving Water Partnership

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Conservation Measure/Program	Type	Indoor / Outdoor	Primary End Use	Sector	Priority as a Regional Program	Priority as a Local Program	Preference for Implementation	Current Implementation Status	Notes / Comments	Source	Added By
Require Water Efficiency Plan Reviews for New CII Development	Policy/ Regulation	Both	All Indoor	CII						2015 Screening	EKI
Require Weather Adjusting Smart Irrigation Controllers, Rain Sensors, and/or Soil Moisture Sensors in New Development	Policy/ Regulation	Outdoor	Irrigation	All						2015 Screening	EKI
Restrict Landscape Irrigation to Designated Days/Times	Policy/ Regulation	Outdoor	Irrigation	All					Under all conditions, not just drought	2015 Screening	EKI
Water Conserving Landscape and Irrigation Codes, More Stringent than MWELO	Policy/ Regulation	Outdoor	Irrigation	All						2015 Screening	EKI
Water Waste Ordinance	Policy/ Regulation	Outdoor	All Outdoor	All						Added 2020	MMWD

Abbreviations:
AMI = advanced metering infrastructure
CII = commercial, industrial, institutional
COM = commercial
HET = high efficiency toilet
HEU = high efficiency urinal
Info = information
IRR = irrigation account
MFR = multi-family residential
MWELO = Model Water Efficient Landscape Ordinance
PRV = pressure reducing valve
SFR = single-family residential
SMSWP = Sonoma-Marin Saving Water Partnership
UHET = ultra high efficiency toilet

Appendix D

UWMP Agency Notification Letters

July 21, 2023

City of Novato
Adam McGill
City Manager
922 Machin Avenue
Novato, CA 94945

Re: **Notice of Preparation of an Updated 2020 Urban Water Management Plan**

Marin Municipal Water District is currently reviewing the adopted 2020 Urban Water Management Plan "UWMP" to incorporate the updated housing projections. We invite your agency's participation in this revision process.

A draft of the Updated 2020 UWMP will be made available for public review and a public hearing will be scheduled for late summer/ early fall 2023. If you would like more information regarding the District's adopted 2020 UWMP or if you would like to participate in the preparation of the Updated 2020 UWMP, please contact Carrie Pollard at:

Marin Municipal Water District
220 Nellen Avenue
Corte Madera, CA 94925
Phone: (415) 945-1522
capollard@marinwater.org

Sincerely,

Carrie Pollard
Water Efficiency Manager

July 21, 2023

City of Mill Valley
Todd Cusimano
City Manager
26 Corte Madera Avenue
Mill Valley, CA 94941

Re: **Notice of Preparation of an Updated 2020 Urban Water Management Plan**

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220 Nellen Avenue
Corte Madera, CA 94925
Phone: (415) 945-1522
capollard@marinwater.org

Sincerely,

Carrie Pollard
Water Efficiency Manager

July 21, 2023

Marin County Administrator
Matthew Hymel
Administrator
3501 Civic Center Drive, Suite 325
San Rafael, CA 94903

Re: **Notice of Preparation of an Updated 2020 Urban Water Management Plan**

Marin Municipal Water District is currently reviewing the adopted 2020 Urban Water Management Plan "UWMP" to incorporate the updated housing projections. We invite your agency's participation in this revision process.

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Corte Madera, CA 94925
Phone: (415) 945-1522
capollard@marinwater.org

Sincerely,

Carrie Pollard
Water Efficiency Manager

July 21, 2023

City of Larkspur
Dan Schwarz
City Manager
400 Magnolia Avenue
Larkspur, CA 94939

Re: **Notice of Preparation of an Updated 2020 Urban Water Management Plan**

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220 Nellen Avenue
Corte Madera, CA 94925
Phone: (415) 945-1522
capollard@marinwater.org

Sincerely,

Carrie Pollard
Water Efficiency Manager

July 21, 2023

Town of Fairfax
Heather Abrams
Town Manager
142 Bolinas Road
Fairfax, CA 94930

Re: **Notice of Preparation of an Updated 2020 Urban Water Management Plan**

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220 Nellen Avenue
Corte Madera, CA 94925
Phone: (415) 945-1522
capollard@marinwater.org

Sincerely,

Carrie Pollard
Water Efficiency Manager

July 21, 2023

Town of Corte Madera
Adam Wolff
Town Manager
300 Tamalpais Drive
Corte Madera, CA 94925-0159

Re: **Notice of Preparation of an Updated 2020 Urban Water Management Plan**

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Phone: (415) 945-1522
capollard@marinwater.org

Sincerely,

Carrie Pollard
Water Efficiency Manager

July 21, 2023

City of Belvedere
Robert Zadnik
City Manager
450 San Rafael Avenue
Belvedere, CA 94920

Re: **Notice of Preparation of an Updated 2020 Urban Water Management Plan**

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Corte Madera, CA 94925
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capollard@marinwater.org

Sincerely,

Carrie Pollard
Water Efficiency Manager

July 21, 2023

Town of Ross
Christa Johnson
Town Manager
P.O. Box 320
Ross, CA 94957

Re: **Notice of Preparation of an Updated 2020 Urban Water Management Plan**

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220 Nellen Avenue
Corte Madera, CA 94925
Phone: (415) 945-1522
capollard@marinwater.org

Sincerely,

Carrie Pollard
Water Efficiency Manager

July 21, 2023

Town of San Anselmo
David Donery
Town Administrator
525 San Anselmo Avenue
San Anselmo, CA 94960

Re: **Notice of Preparation of an Updated 2020 Urban Water Management Plan**

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220 Nellen Avenue
Corte Madera, CA 94925
Phone: (415) 945-1522
capollard@marinwater.org

Sincerely,

Carrie Pollard
Water Efficiency Manager

July 21, 2023

City of San Rafael
Christine Alilovich
City Manager
1400 Fifth Avenue
San Rafael, CA 94915-1560

Re: **Notice of Preparation of an Updated 2020 Urban Water Management Plan**

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220 Nellen Avenue
Corte Madera, CA 94925
Phone: (415) 945-1522
capollard@marinwater.org

Sincerely,

Carrie Pollard
Water Efficiency Manager

July 21, 2023

City of Sausalito
Chris Zapata
City Manager
420 Litho Street
Sausalito, CA 94965

Re: **Notice of Preparation of an Updated 2020 Urban Water Management Plan**

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220 Nellen Avenue
Corte Madera, CA 94925
Phone: (415) 945-1522
capollard@marinwater.org

Sincerely,

Carrie Pollard
Water Efficiency Manager

July 21, 2023

Town of Tiburon
Greg Chanis
Town Manager
1505 Tiburon Boulevard
Tiburon, CA 94920

Re: **Notice of Preparation of an Updated 2020 Urban Water Management Plan**

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220 Nellen Avenue
Corte Madera, CA 94925
Phone: (415) 945-1522
capollard@marinwater.org

Sincerely,

Carrie Pollard
Water Efficiency Manager

July 21, 2023

North Marin Water District
Tony Williams
General Manager
999 Rush Creek Place
Novato, CA 94945

Re: **Notice of Preparation of an Updated 2020 Urban Water Management Plan**

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220 Nellen Avenue
Corte Madera, CA 94925
Phone: (415) 945-1522
capollard@marinwater.org

Sincerely,

Carrie Pollard
Water Efficiency Manager

July 21, 2023

Sonoma County Water Agency
Grant Davis
General Manager
404 Aviation Blvd
Santa Rosa, CA 95403

Re: **Notice of Preparation of an Updated 2020 Urban Water Management Plan**

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220 Nellen Avenue
Corte Madera, CA 94925
Phone: (415) 945-1522
capollard@marinwater.org

Sincerely,

Carrie Pollard
Water Efficiency Manager

November 28, 2023

City of Belvedere
Mr. Robert Zadnik
City Manager
450 San Rafael Avenue
Belvedere, 94920

Re: **Notice of Public Hearing - Updated 2020 Urban Water Management Plan and Water Shortage Contingency Plan**

The 2020 Urban Water Management Plan (UWMP) was adopted June 15, 2022 and further updates to the District's Water Shortage Contingency Plan (WSCP) were adopted February 21, 2023. The District will consider an update to the 2020 UWMP and 2023 WSCP to reflect new population growth numbers based on the Regional Housing Needs Allocation as prepared for the cities, towns and Marin County by the Association of Bay Area Governments, which updates can be viewed or printed from the District's website (https://www.marinwater.org/UrbanWaterManagementPlan). A copy of the proposed document is also available for review at the District's office (220 Nellen Avenue, Corte Madera).

You are invited to submit comments regarding any aspect of this matter in writing or verbally at the public hearing. Prior to the public hearing, you may submit written comments via email to BoardComment@MarinWater.org. Members of the public may also attend and submit comments verbally at the public hearing online by accessing the follow web link https://us06web.zoom.us/j/88134852296 or by phone by calling 1-669-444-9171 and entering the webinar ID#: 881 3485 2296.

The agenda packet containing the staff report will be available on the District's website at www.marinwater.org after 4:30 p.m. on December 15, 2023.

For information on the Urban Water Management Plan, please contact Carrie Pollard at (415) 945-1522 or email her at capollard@marinwater.org.

Sincerely,

Carrie Pollard
Water Efficiency Manager

November 28, 2023

Town of Corte Madera
Mr. Adam Wolff
Town Manager
300 Tamalpais Drive
Corte Madera, 94925-0159

Re: **Notice of Public Hearing - Updated 2020 Urban Water Management Plan and Water Shortage Contingency Plan**

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Sincerely,

Carrie Pollard
Water Efficiency Manager

November 28, 2023

Town of Fairfax
Mrs. Heather Abrams
Town Manager
142 Bolinas Road
Fairfax, 94930

Re: **Notice of Public Hearing - Updated 2020 Urban Water Management Plan and Water Shortage Contingency Plan**

The 2020 Urban Water Management Plan (UWMP) was adopted June 15, 2022 and further updates to the District's Water Shortage Contingency Plan (WSCP) were adopted February 21, 2023. The District will consider an update to the 2020 UWMP and 2023 WSCP to reflect new population growth numbers based on the Regional Housing Needs Allocation as prepared for the cities, towns and Marin County by the Association of Bay Area Governments, which updates can be viewed or printed from the District's website (https://www.marinwater.org/UrbanWaterManagementPlan). A copy of the proposed document is also available for review at the District's office (220 Nellen Avenue, Corte Madera).

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The agenda packet containing the staff report will be available on the District's website at www.marinwater.org after 4:30 p.m. on December 15, 2023.

For information on the Urban Water Management Plan, please contact Carrie Pollard at (415) 945-1522 or email her at capollard@marinwater.org.

Sincerely,

Carrie Pollard
Water Efficiency Manager

November 28, 2023

City of Larkspur
Mr. Dan Schwarz
City Manager
400 Magnolia Avenue
Larkspur, 94939

Re: **Notice of Public Hearing - Updated 2020 Urban Water Management Plan and Water Shortage Contingency Plan**

The 2020 Urban Water Management Plan (UWMP) was adopted June 15, 2022 and further updates to the District's Water Shortage Contingency Plan (WSCP) were adopted February 21, 2023. The District will consider an update to the 2020 UWMP and 2023 WSCP to reflect new population growth numbers based on the Regional Housing Needs Allocation as prepared for the cities, towns and Marin County by the Association of Bay Area Governments, which updates can be viewed or printed from the District's website (https://www.marinwater.org/UrbanWaterManagementPlan). A copy of the proposed document is also available for review at the District's office (220 Nellen Avenue, Corte Madera).

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Sincerely,

Carrie Pollard
Water Efficiency Manager

November 28, 2023

Marin County Administrator
Mr. Matthew Hymel
Administrator
3501 Civic Center Drive, Suite 325
San Rafael, 94903

Re: **Notice of Public Hearing - Updated 2020 Urban Water Management Plan and Water Shortage Contingency Plan**

The 2020 Urban Water Management Plan (UWMP) was adopted June 15, 2022 and further updates to the District's Water Shortage Contingency Plan (WSCP) were adopted February 21, 2023. The District will consider an update to the 2020 UWMP and 2023 WSCP to reflect new population growth numbers based on the Regional Housing Needs Allocation as prepared for the cities, towns and Marin County by the Association of Bay Area Governments, which updates can be viewed or printed from the District's website (https://www.marinwater.org/UrbanWaterManagementPlan). A copy of the proposed document is also available for review at the District's office (220 Nellen Avenue, Corte Madera).

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Sincerely,

Carrie Pollard
Water Efficiency Manager

November 28, 2023

City of Mill Valley
Mr. Todd Cusimano
City Manager
26 Corte Madera Avenue
Mill Valley, 94941

Re: **Notice of Public Hearing - Updated 2020 Urban Water Management Plan and Water Shortage Contingency Plan**

The 2020 Urban Water Management Plan (UWMP) was adopted June 15, 2022 and further updates to the District's Water Shortage Contingency Plan (WSCP) were adopted February 21, 2023. The District will consider an update to the 2020 UWMP and 2023 WSCP to reflect new population growth numbers based on the Regional Housing Needs Allocation as prepared for the cities, towns and Marin County by the Association of Bay Area Governments, which updates can be viewed or printed from the District's website (https://www.marinwater.org/UrbanWaterManagementPlan). A copy of the proposed document is also available for review at the District's office (220 Nellen Avenue, Corte Madera).

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Sincerely,

Carrie Pollard
Water Efficiency Manager

November 28, 2023

City of Novato
Mr. Adam McGill
City Manager
922 Machin Avenue
Novato, 94945

Re: **Notice of Public Hearing - Updated 2020 Urban Water Management Plan and Water Shortage Contingency Plan**

The 2020 Urban Water Management Plan (UWMP) was adopted June 15, 2022 and further updates to the District's Water Shortage Contingency Plan (WSCP) were adopted February 21, 2023. The District will consider an update to the 2020 UWMP and 2023 WSCP to reflect new population growth numbers based on the Regional Housing Needs Allocation as prepared for the cities, towns and Marin County by the Association of Bay Area Governments, which updates can be viewed or printed from the District's website (https://www.marinwater.org/UrbanWaterManagementPlan). A copy of the proposed document is also available for review at the District's office (220 Nellen Avenue, Corte Madera).

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Sincerely,

Carrie Pollard
Water Efficiency Manager

November 28, 2023

Sonoma County Water Agency
Mr. Grant Davis
General Manager
404 Aviation Blvd
Santa Rosa, 95403

Re: **Notice of Public Hearing - Updated 2020 Urban Water Management Plan and Water Shortage Contingency Plan**

The 2020 Urban Water Management Plan (UWMP) was adopted June 15, 2022 and further updates to the District's Water Shortage Contingency Plan (WSCP) were adopted February 21, 2023. The District will consider an update to the 2020 UWMP and 2023 WSCP to reflect new population growth numbers based on the Regional Housing Needs Allocation as prepared for the cities, towns and Marin County by the Association of Bay Area Governments, which updates can be viewed or printed from the District's website (https://www.marinwater.org/UrbanWaterManagementPlan). A copy of the proposed document is also available for review at the District's office (220 Nellen Avenue, Corte Madera).

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For information on the Urban Water Management Plan, please contact Carrie Pollard at (415) 945-1522 or email her at capollard@marinwater.org.

Sincerely,

Carrie Pollard
Water Efficiency Manager

November 28, 2023

North Marin Water District
Mr. Tony Williams
General Manager
999 Rush Creek Place
Novato, 94945

Re: **Notice of Public Hearing - Updated 2020 Urban Water Management Plan and Water Shortage Contingency Plan**

The 2020 Urban Water Management Plan (UWMP) was adopted June 15, 2022 and further updates to the District's Water Shortage Contingency Plan (WSCP) were adopted February 21, 2023. The District will consider an update to the 2020 UWMP and 2023 WSCP to reflect new population growth numbers based on the Regional Housing Needs Allocation as prepared for the cities, towns and Marin County by the Association of Bay Area Governments, which updates can be viewed or printed from the District's website (https://www.marinwater.org/UrbanWaterManagementPlan). A copy of the proposed document is also available for review at the District's office (220 Nellen Avenue, Corte Madera).

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For information on the Urban Water Management Plan, please contact Carrie Pollard at (415) 945-1522 or email her at capollard@marinwater.org.

Sincerely,

Carrie Pollard
Water Efficiency Manager

November 28, 2023

Town of Tiburon
Mr. Greg Chanis
Town Manager
1505 Tiburon Boulevard
Tiburon, 94920

Re: **Notice of Public Hearing - Updated 2020 Urban Water Management Plan and Water Shortage Contingency Plan**

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Sincerely,

Carrie Pollard
Water Efficiency Manager

November 28, 2023

City of Sausalito
Mr. Chris Zapata
City Manager
420 Litho Street
Sausalito, 94965

Re: **Notice of Public Hearing - Updated 2020 Urban Water Management Plan and Water Shortage Contingency Plan**

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Sincerely,

Carrie Pollard
Water Efficiency Manager

November 28, 2023

City of San Rafael
Mrs. Christine Alilovich
City Manager
1400 Fifth Avenue
San Rafael, 94915-1560

Re: **Notice of Public Hearing - Updated 2020 Urban Water Management Plan and Water Shortage Contingency Plan**

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Sincerely,

Carrie Pollard
Water Efficiency Manager

November 28, 2023

Town of San Anselmo
Mr. David Donery
Town Administrator
525 San Anselmo Avenue
San Anselmo, 94960

Re: **Notice of Public Hearing - Updated 2020 Urban Water Management Plan and Water Shortage Contingency Plan**

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Sincerely,

Carrie Pollard
Water Efficiency Manager

November 28, 2023

Town of Ross
Mrs. Christa Johnson
Town Manager
P.O. Box 320
Ross, 94957

Re: **Notice of Public Hearing - Updated 2020 Urban Water Management Plan and Water Shortage Contingency Plan**

The 2020 Urban Water Management Plan (UWMP) was adopted June 15, 2022 and further updates to the District's Water Shortage Contingency Plan (WSCP) were adopted February 21, 2023. The District will consider an update to the 2020 UWMP and 2023 WSCP to reflect new population growth numbers based on the Regional Housing Needs Allocation as prepared for the cities, towns and Marin County by the Association of Bay Area Governments, which updates can be viewed or printed from the District's website (https://www.marinwater.org/UrbanWaterManagementPlan). A copy of the proposed document is also available for review at the District's office (220 Nellen Avenue, Corte Madera).

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Sincerely,

Carrie Pollard
Water Efficiency Manager

Appendix E

UWMP Public Hearing Notices

November 29, 2023

NOTICE OF PUBLIC HEARING BY THE BOARD OF DIRECTORS OF MARIN MUNICIPAL WATER DISTRICT TO CONSIDER THE ADOPTION OF AN UPDATE TO THE 2020 URBAN WATER MANAGEMENT PLAN AND 2020 WATER SHORTAGE CONTINGENCY PLAN

NOTICE IS HEREBY GIVEN the Board of Directors of Marin Municipal Water District (District) will hold a public hearing on December 19, 2023 at its regularly scheduled meeting commencing at or after 6:30 pm to consider the adoption of an update to the 2020 Urban Water Management Plan and 2020 Water Shortage Contingency Plan.

The Urban Water Management Planning Act, Water Code Section 10610 et seq., mandates that every urban supplier of water providing water for municipal purposes to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually, prepare an Urban Water Management Plan, the primary objective of which is the management of urban water demands and efficient use of water.

The 2020 Urban Water Management Plan (UWMP) was adopted June 15, 2022 and further updates to the District's Water Shortage Contingency Plan (WSCP) were adopted February 21, 2023. The District will consider an update to the 2020 UWMP and 2023 WSCP to reflect new population growth numbers based on the Regional Housing Needs Allocation as prepared for the cities, towns and Marin County by the Association of Bay Area Governments, which updates can be viewed or printed from the District's website (https://www.marinwater.org/UrbanWaterManagementPlan). A copy of the proposed document is also available for review at the District's office (220 Nellen Avenue, Corte Madera).

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The agenda packet containing the staff report will be available on the District's website at www.marinwater.org after 4:30 p.m. on December 15, 2023. For further details on this matter or to request a copy of the staff report, please contact Terrie Gillen, Board Secretary, at tgillen@marinwater.org or at (415) 945-1448.

For information on the Urban Water Management Plan, please contact Carrie Pollard at (415) 945-1522 or email her at capollard@marinwater.org.

Appendix F

SB X7-7 Compliance Tables

SB X7-7 2020 Compliance Form

The SB X7-7 2020 Compliance Form is for the calculation of 2020 compliance only. All retail suppliers must complete the SB X7-7 Compliance Form. Baseline and target calculations are done in the SB X 7-7 Verification Form.

The SB X7-7 Verification Form is for the calculation of baselines and targets and is a separate workbook from the SB X7-7 2020 Compliance Form. Most Suppliers will have completed the SB X7-7 Verification Form with their 2015 UWMP and do not need to complete this form again in 2020. See Chapter 5 Section 5.3 of the UWMP Guidebook for more information regarding which Suppliers must, or may, complete the SB X7-7 Verification Form for their 2020 UWMP. 2020 compliance calculations are done in the SB X7-7 2020 Compliance Form.

WUE Data Portal Entry Exceptions

The data from the tables below will not be entered into WUE Data Portal tables. These tables will be submitted as separate uploads, in Excel, to WUE Data Portal.

Process Water Deduction

SB X7-7 tables 4-C, 4-C.1, 4-C.2, 4-C.3, 4-C.4 and 4-D

A supplier that will use the process water deduction will complete the appropriate tables in Excel, submit them as a separate upload to the WUE Data Portal, and include them in its UWMP.

SB X7-7 Regional Alliance - 2020 GPCD (Actual)				
Participating Member Agency Name *Add rows as needed*	**2020 Actual GPCD[1]**	**2020 Population**	**(2020 GPCD) X (2020 Population)**	**Regional Alliance 2020 GPCD (Actual)**
City of Cotati	113	7,533	851,229	
Marin Municipal Water District	128	191,269	24,482,432	
North Marin Water District	119	61,658	7,337,302	
City of Petaluma	107	64,251	6,900,557	
City of Rohnert Park	96	43,069	4,126,872	
City of Santa Rosa	99	173,628	17,189,172	
City of Sonoma	166	11,725	1,946,350	
Valley of the Moon Water Distict	102	23,077	2,353,854	
Town of Windsor	119	28,397	3,379,243	
Regional Alliance Totals	1,049	604,607	68,567,011	**113**

[*] *All participating agencies must submit individual SB X7-7 Tables, as applicable, showing the individual agency's calculations. These tables are: SB X7-7 Tables 0 through 6 , Table 7, any required supporting tables (as stated in SB X7-7 Table 7), and SB X7-7 Table 9, as applicable.These individual agency tables will be submitted with the individual or Regional Urban Water Management Plan.*

NOTES

SB X7-7 Regional Alliance - 2020 Compliance

2020 Actual GPCD	Optional Adjustment for Economic Growth[1]	Adjusted **2020 Actual GPCD**	**2020 Target GPCD** [2]	**Did Alliance Achieve Targeted Reduction for 2020?**
113	-	113	129	YES

[1] Adjustments for economic growth can be applied to either the individual supplier's data or to the aggregate regional alliance data (but not both), depending upon availability of suitable data and methods. *[2] 2020 Target GPCD will be taken from the Regional Alliance's SB X7-7 Verification Form, Weighted Target Table.*

NOTES

SB X7-7 RA1 - Weighted Baseline				
Participating Member Agency Name	**10-15 year Baseline GPCD***	**Average Population During 10-15 Year Baseline Period**	**(Baseline GPCD) X (Population)**	**Regional Alliance Weighted Average 10-15 Year Baseline GPCD**
City of Cotati	159	6,559	1,043,146	
Marin Municipal Water District	149	178,670	26,690,318	
North Marin Water District	173	54,061	9,370,435	
City of Petaluma	180	52,622	9,491,997	
City of Rohnert Park	161	40,811	6,582,847	
City of Santa Rosa	145	143,109	20,806,963	
City of Sonoma	225	9,679	2,173,212	
Valley of the Moon Water Distict	146	20,969	3,058,648	
Town of Windsor	156	24,572	3,834,809	
Regional Alliance Total	1,495	531,051	83,052,375	**156**

**All participating agencies must submit individual SB X7-7 Tables, as applicable, showing the individual agency's calculations. These tables are: SB X7-7 Tables 0 through 6 , Table 7, any required supporting tables (as stated in SB X7-7 Table 7), and SB X7-7 Table 9, as applicable.These individual agency tables will be submitted with the individual or Regional Urban Water Management Plan.*

NOTES

SB X7-7 RA1 - Weighted 2020 Target				
Participating Member Agency Name	**2020 Target GPCD***	**2015 Population**	**(Target) X (Population)**	**Regional Alliance Weighted Average 2020 Target**
City of Cotati	130	7,288	947,440	
Marin Municipal Water District	124	189,000	23,436,000	
North Marin Water District	139	61,381	8,531,959	
City of Petaluma	141	61,798	8,713,518	
City of Rohnert Park	119	41,675	4,959,325	
City of Santa Rosa	126	173,071	21,806,946	
City of Sonoma	180	11,147	2,006,460	
Valley of the Moon Water Distict	124	23,478	2,911,272	
Town of Windsor	130	27,486	3,573,180	
Regional Alliance Total	1,213	596,324	76,886,100	**129**

**All participating agencies must submit individual SB X7-7 Tables, as applicable, showing the individual agency's calculations. These tables are: SB X7-7 Tables 0 through 6 , Table 7, any required supporting tables (as stated in SB X7-7 Table 7), and SB X7-7 Table 9, as applicable.These individual agency tables will be submitted with the individual or Regional Urban Water Management Plan.*

NOTES

Appendix G

Board Policy No. 2 Recycled Water

MARIN MUNICIPAL WATER DISTRICT

BOARD POLICY

No.: 2

Date: 4/26/78

Revised 10/31/90
Revised 2/23/94
Revised 5/21/97

Subject: RECYCLED WATER

The Marin Municipal Water District wishes to encourage the maximum water reclamation of sanitary effluent for all beneficial uses. The development and operation of water reclamation facilities is consistent with the goals of the Marin Countywide Plan, and is determined to be compatible with the development of other water sources and the operation of a potable water system.

The following are offered to show the extent to which the District supports the development of water reclamation:

1. The Marin Municipal Water District recognizes water reclamation as an additional water source and an integral part of its water supply.

2. The District will from time to time determine the points, quantities, and rates of flow at which it will deliver recycled water for use by its customers. These determinations shall be made solely by the District on the basis of availability of dependable supply of recycled water, the feasibility of the distribution thereof to the point of delivery, and the water requirements of the customer.

3. In the discretion of the District, certain areas in and around a water reclamation facility may be designated as "recycled water use areas" which may require, as a condition of water service, the use of recycled water for irrigation, indoor water use, and other types of non-potable use.

4. The Water District shall pay all costs associated with the financing of reclamation treatment plants, transmission and distribution systems, excepting service installation charges and connection fees, which shall be determined and levied as follows:

   Existing Consumers. Consumers within a "recycled water use area" who have installed an irrigation service prior to designation of said use area, or who have a possible recycled water use which can be separated from any potable use, may, at the discretion of the District, be required to connect to the recycled water system by assuring their onsite system is properly plumbed, but without charge or fee of any nature from the District.

New Consumers. New consumers requesting service within a "recycled water use area" may be required, at the discretion of the District, to connect an irrigation service, separate indoor water use service, or other type of non-potable use service to the recycled water system. In such case, the District may charge said consumer the actual costs of service installation, together with the connection fee established for new uses.

5. In order to encourage the use of recycled water for appropriate and beneficial purposes, the rates to be charged for recycled water are less than the potable rates and are set forth in District Code Section 6.01.070.

Appendix H

Water Shortage Contingency Plan

Appendix I

2007 WATER CONSERVATION MASTER PLAN

MARIN MUNICIPAL WATER DISTRICT

2007 Water Conservation Master Plan

Adopted June 20, 2007

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Acknowledgments

Marin Municipal Water District 2007 Board of Directors

Cynthia Koehler, President
Larry Russell, Vice President
David Behar, Director
Alex Forman, Director
Jack Gibson, Director

Paul Helliker
General Manager

Daniel Carney
Water Conservation Manager

MMWD has made every effort to be accurate and complete in the presentation of this report. Thanks to the many individuals who have contributed the ideas, questions, and comments that have made the preparation of this Master Plan possible, some of whom are recognized as follows:

Members of the Conservation Action Committee

Maddaus Water Management

Charlton Research

Descomstudios

MMWD Staff:

Environmental Review	***Public Information***	***Finance***
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INTRODUCTION

In 2007, the relationship between human activities and the resulting environmental impacts is a fact accepted by most people. We *know* we must act now in order to protect natural resources for future generations. Water is no exception. Worldwide, overuse and mismanagement of water supplies lead to over-drafted aquifers, depleted fisheries, habitat degradation, water-borne diseases, war, and economic hardship.

Marin is an oasis. Sweet, clean water runs off local mountains and flows abundantly in most years. If it were not for the problems of limited storage, recurring droughts, a growing population, and the financial and environmental costs of developing new water supplies, the need to increase efficiency would be less urgent. In light of these problems, it is appropriate for the District to redouble conservation efforts and sustain them in the future.

Conservation, however, is not intended to be a stand-alone strategy for managing the District's water portfolio. Efficiency measures have a point of diminishing returns, just as reservoirs have a limited storage capacity. Although there is a significant amount of water to be conserved in Marin, at a certain point it becomes too difficult, expensive, or inconvenient to use less water and still maintain a customary standard of living.

Ongoing capital improvements will always be necessary to increase system operating efficiencies and provide a hedge against catastrophic drought emergencies. To this end, the District is analyzing the benefits of detecting and repairing leaky pipes, augmenting delivery capacity, modernizing outdated equipment, entering into cooperative supply agreements with neighboring water agencies, and exploring new filtration technologies.

How much water can ultimately be conserved on a sustained, normal year basis? What will be the water demand in 2025? Will we get more or less rain due to global climate change? There are no certain answers to these questions. History shows us that conservation programs reliably and permanently reduce water demand. We do know that new water-saving products are in the stores today and more are being developed, and that the cost of these products will drop over time as more manufacturers enter the market in response to greater demand. We also know that public education is the golden key that can unlock and sustain the greatest water conservation potential.

Public opinion surveys indicate that the citizens of Marin value a healthy environment and that they value water conservation as one of the most important solutions to the ongoing specter of inadequate water supply. These surveys also indicate that most MMWD customers believe they are doing all they can to conserve water. Clearly, there are opportunities to educate our customers on new, cost-effective ways to use our water supplies as efficiently as possible.

In this Master Plan, the terms *water conservation* and *water efficiency* are used interchangeably to mean the practice of making the *best use of water resources*. The basic goal of the Plan is to draw a conservation trail map for the District. Several program options are presented, and all trails lead to the same destination—a future where water waste is reduced, the environment is protected, and water rates are based on the efficient use of available resources.

Reliability

In order to evaluate the reliability of water efficiency programs and the savings they can provide, two fundamental concepts come into play:

- ***Technical Savings Potential*****:** savings resulting from the installation of efficient plumbing fixtures such as high-efficiency toilets, clothes washers and irrigation systems; and from maintaining the water system infrastructure.
- ***Behavioral Savings Potential***: savings resulting from activities such as taking shorter showers, turning off faucets, and reducing landscape watering.

The results the District can achieve by targeting both of these savings potentials are more than twice as great as the technical savings alone. This *elasticity* is a key concept that must be understood when determining the investment value of technical and behavioral programs such as plumbing fixtures and customer education.

Technical Savings comprise more than 90% of the potential water savings, costs, and benefits associated with the various conservation program options in this Plan. This is the 'standard method' used in the conservation industry because it is the most objective method to forecast future savings. It is more difficult to create a formula that predicts how people will behave. Fortunately, a method has been devised to quantify behavioral savings. Bill Maddaus, a recognized expert in the field of water efficiency, has calculated the behavioral savings that can be gained when people take shorter showers, fix leaks, and turn off running faucets. These detailed calculations are included in Appendix A, starting on page 37 of the *Maddaus Conservation Technical Analysis*.

The calculation below estimates the percentage of savings from technical and behavioral actions based on the calculations in Table 10 of the Maddaus Analysis. (Note: The behavioral savings of 500 acre feet represents 10% of the total conservation savings shown for Program D in Appendix A, Table 10, page 41 of the Maddaus Analysis.)

Plumbing Code	=	1,600 acre feet per year
Conservation Savings (technical)	=	2,900 acre feet per year
Technical Savings Potential	=	*4,500 acre feet per year*
25% Drought Ordinance	=	7,000 acre feet per year
Conservation Savings (behavioral)	=	500 acre feet per year
Behavioral Savings Potential	=	*7,500 acre feet per year*

Total District Potential in 2025 = 12,000 acre feet per year
(Plumbing Code + Technical + Behavioral)

The savings potential of daily activities can be illustrated with a simple 'shower scenario':

> If a 2.5 gallon-per-minute shower head is replaced with a 2.0 gallon-per-minute shower head, the savings can easily be formulated: i.e., **0.5 gallon**-per-minute is the *technical savings* potential for that shower head replacement—a **20%** savings per minute. If the person takes a 10-minute shower, then the technical savings would be **5 gallons** (10 minutes x 0.5 gallon-per-minute).
>
> Plus, there is a *behavioral savings potential*. How much more water would be saved if this person reduced their shower time from 10 minutes to 6 minutes? A 4-minute shorter shower would result in *behavioral savings* of **8 gallons** (4-minutes x 2.0 gallons-per-minute).

To recap:

> Original 2.5 gpm shower head x 10 minutes = 25 gallons
> New 2.0 gpm shower head x 6 minutes = 12 gallons
> **Savings for each shower = 13 gallons**

Savings elasticity can work in both directions, however, as customers can reduce or increase their water use. Increases in average water use are common whenever water agencies reduce conservation activities in the years following drought emergencies. This phenomenon is seen at MMWD today, where average water use is gradually increasing 15-years after the last drought and following a period of significant decreases in conservation program activity.

On the other hand, increases in conservation activities typically result in reductions in average consumption. This has been observed since 1991 with the enactment of conservation legislation and the implementation of sustained conservation programs in California. Every major water purveyor in California reports that total water consumption has remained virtually unchanged due to conservation—despite significant increases in population:

> *"While the District's customer base has increased by more than 20% and the population increased by more than 10% between 1970 and 2004, use in 2004 was essentially the same as use in 1970 due to a variety of water conservation efforts now in place."*
>
> *Source: MMWD UWMP 2005*

If the District was able to achieve the deployment rates of water-efficient technologies projected in the Maddaus analysis, and if we succeed in securing ongoing behavioral changes among our customers, or when required during infrequent 25% demand reduction rationing events, it could be possible to achieve water use savings of approximately **12,000** acre feet per year by 2025.

It is important to remember, however, that behavioral savings require ongoing effort to sustain them, while technical savings are less dependent on behavior and therefore more reliable. Additionally, it is important to note that the calculations in this Plan describe changes in customer's water *Demand,* and are completely separate from, and different than, MMWD's *supply* or *operational yield* calculations.

The most efficient and cost-effective conservation programs target both behavioral and technical savings. Providing thousands of rebates for toilets and clothes washers is expensive. Instead, if we can inspire (or require) people to buy these fixtures without a rebate, it can cost the District less money and achieve the same water-saving results.

The strategy recommended in this Master Plan places a greater emphasis on 'human resources' than on plumbing fixtures, per se, although both are essential components of each program alternative. Incentive programs, new development ordinances, and building codes generate the technical savings, while school education, public outreach, and customer survey programs create the social awareness needed to harvest the even greater behavioral savings.

There are financial impacts to the District and its customers when normal year water use is decreased *and* when it is increased. This Plan calculates costs and potential water savings associated with decreasing normal year water use in the District. A growing body of research indicates that combined **"triple bottom-line"** benefits—i.e., benefits to the *District* + *Customer* + *Environment*—exceed the relatively simple cost/benefit calculations included in this Plan. Numerous environmental impacts (and costs) are reduced when communities become more water efficient. Staff recommends that the District conduct advanced research to quantify the regional costs and benefits associated with environmental changes resulting from conservation activities. Areas of interest may include climate change, greenhouse gases, energy consumption, waste water, urban runoff pollution, air quality, water quality, invasive plants, fire safety, and changes in native habitats.

Modern water efficiency programs have been operating in California for almost two decades. Since 1991, research and field experience have demonstrated that these programs are the most cost-effective and reliable first line of defense for worsening water problems. Less waste means lower energy use, less urban runoff pollution, extending available storage supplies, more water for fisheries, reduced waste water treatment and discharge, downsizing or eliminating costly new water projects, and being better prepared to weather the next drought.

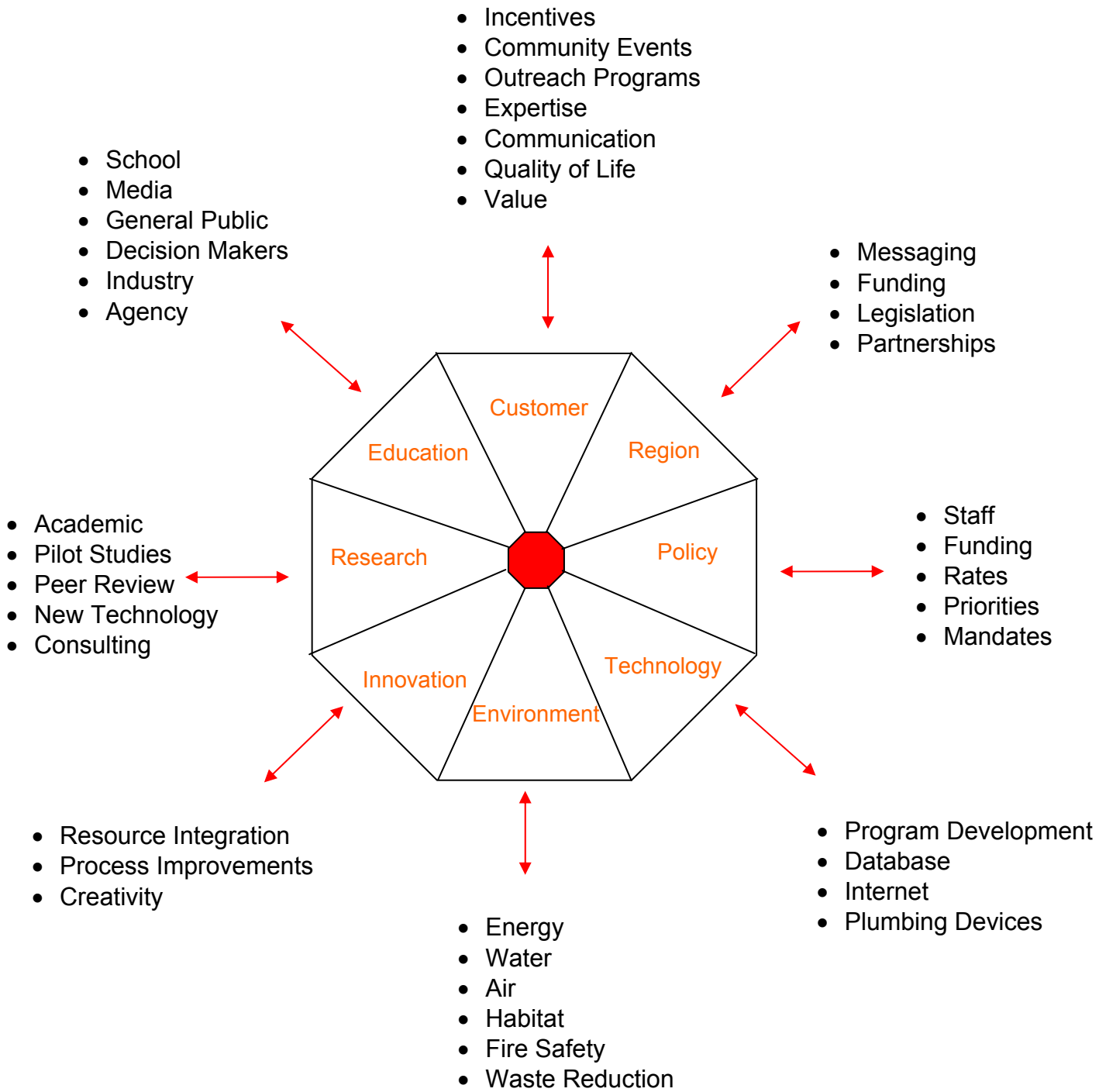
This Plan examines District conservation programs in the past, present, and future—from the 1970s through 2030. It incorporates the history of water shortages, current and future demands, marketing strategies, and the costs and benefits of conservation programs. Information is taken from a variety of sources including the general public, consultants, water agencies, Conservation Action Committee meetings, the Board of Directors, and District staff. The primary source materials referenced in the Plan include:

- *Water Conservation Baseline Study Final Report (DMC 1994)*
- *Water Efficient Conservation Master Plan (Barakat & Chamberlin 1994)*
- *Water Entitlement and Water Budget Program Report (MMWD Staff 1995)*
- *Water Conservation Action Plan for 1997 (MMWD Staff 1997)*
- *Review of Conservation Activities Final Report (Fiske, Stout, Nelson 2001)*
- *MMWD Urban Water Management Plan 2005 (MMWD Staff 2005)*
- *2006 Water Management Report (MMWD Staff 2006)*
- *Conservation Technical Analysis (Maddaus 2007)*
- *Memorandum of Understanding Regarding Water Conservation in California (CUWCC, Amended 2007)*

A well-structured conservation program is complex and is woven into the social fabric of the community. **Figure 1** shows relationships among elements in a model conservation program:

FIGURE 1

RELATIONAL MODEL OF AN URBAN WATER CONSERVATION PROGRAM



EXECUTIVE SUMMARY

Today, MMWD is increasing conservation activities in response to rising water demand caused by increasing population and 15 years of relatively drought-free conditions. In 2006 – 2007, the conservation department completed a major reorganization and embarked on a long-term strategy to strengthen relationships with MMWD customers and resource agencies in the region. Every program element is under review and is being revised as needed.

This strategy is based on several basic principles:

- Incentives are the backbone of effective conservation programs.
- Positive conservation messages build customer confidence and goodwill in the District.
- Customer participation increases when programs emphasize services rather than penalties and enforcement of ordinances.
- High-visibility public outreach and education programs are essential in order for conservation programs to achieve sustainable long-term reductions in demand.
- Water pricing is a powerful conservation tool that provides reliable improvements in efficiency.
- A conservation-focused analysis of the District's tiered rate structure, entitlements, connection fees, and water budgets is required.
- A revision of all conservation ordinances is required.

Program Analysis

The District has completed two studies of the District's water conservation potential in the past year:

- *2006 Water Management Report (MMWD)*
- *Conservation Technical Analysis (Maddaus)*

In April 2006, the Water Management Report was completed by District staff to accomplish three goals:

1. Calculate water savings resulting from conservation activities in the District from 1991 through 2006.
2. Reconcile the number of water-efficient plumbing fixtures that have been installed in the District and the number of inefficient fixtures remaining.
3. Calculate the maximum *technical* water savings remaining in the District.

Staff calculated current savings in the District to be approximately **3,000** acre feet per year, resulting from program activities and building code changes since 1991. The future *maximum technical savings* was determined to be approximately **7,000** acre feet per year in a normal rainfall year. Therefore, according to these calculations, the total normal year conservation potential in the District is approximately **10,000** acre feet per year (current + maximum technical savings). The Report concluded that the District would need to implement a model conservation program over at least the next ten years in order to obtain these savings (Appendix C, 2006 Water Management Report, pages 1-6).

In October 2006, the District engaged the Maddaus Water Management consulting group to analyze the District's conservation potential, using the Least Cost Planning Decision Support System (DSS) Model they developed. This analysis was completed in April 2007 and provides a detailed account of the savings potential of four program alternatives (Programs A – D) through the year 2030, as well as a drought and demand hardening assessment.

The Maddaus Analysis is used as the primary reference source because of the accuracy of the DSS model and expertise of Maddaus Water Management.

Table 1 summarizes the results of both analyses:

TABLE 1
COMPARISON OF MMWD AND MADDAUS CONSERVATION ANALYSES

STUDY	CURRENT DEMAND REDUCTION (ac. ft./year)	POTENTIAL DEMAND REDUCTION (ac. ft./year)	PROGRAM COST PER ACRE FOOT SAVED	AVERAGE % CUSTOMER SATURATION
Maddaus* *April 2007*	Not Calculated	**3,000 – 5,400** Programs A – D by 2030	$1,000	10 – 50%
MMWD* *April 2006*	2,800 – 3,400	**5,400 – 8,600** Maximum Savings by 2018	$1,400	90 – 100%

* Appendix A ** Appendix C

The Maddaus program alternatives include savings that will be obtained through the effects of state plumbing codes and new development ordinances. These savings will accrue as property owners replace older, less efficient appliances and in new building developments. Except for some minor costs associated with the administration of District ordinances related to plumbing retrofits and plan review, these savings are virtually 'free' from the utility cost perspective.

Table 2 describes the general elements and savings potential associated with each program option:

TABLE 2
Maddaus Program Descriptions and Future Water Savings*

Program	Description	2030 Water Savings, AF/Yr	2030 Water Savings with Plumbing Code, AF/Yr
Plumbing Code Only	No Conservation Program beyond Plumbing Code	2,000	2,000
A	Continue Current MMWD Program (Mostly BMPs) Market Penetration 6-12%	1,000	3,000
B	Add New Measures to Current Program Market penetration 10-20%	2,000	4,000
C	Add New Measures to Current Program Market penetration 20-30%	3,000	5,000
D	Add New Measures to Current Program Market penetration 30-50%	3,500	5,500

* Adapted from Maddaus Analysis, Appendix A, Table 8, page 35.

Table 3 lists the costs for the Maddaus program alternatives (B – D) in years 2008 – 2030. (Note: These three alternatives were selected for comparison based on staff's budget analysis and final program recommendations.)

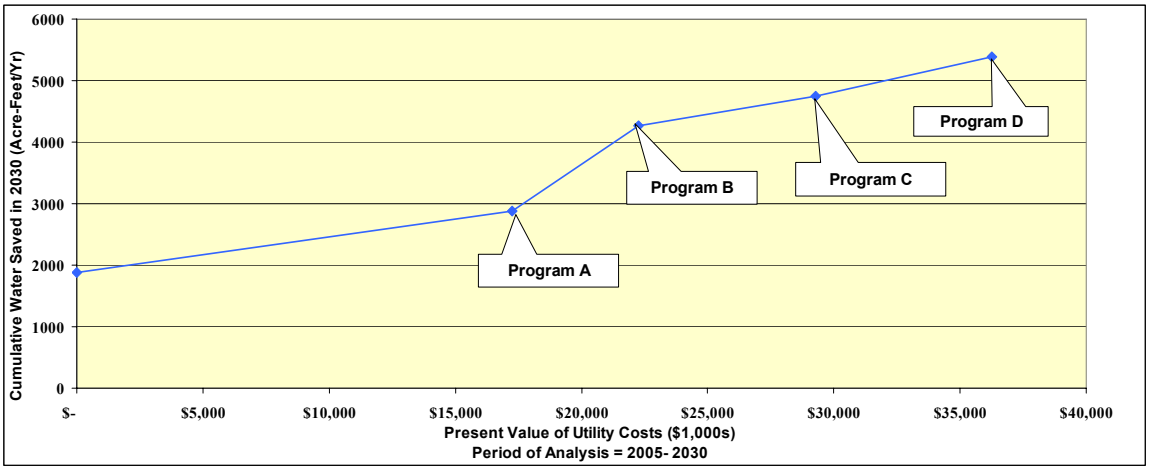
TABLE 3
MADDAUS PROGRAM COSTS (2008-2030)

Program	Average Annual District Cost* ($1,000s)	Average Annual Customer Cost* ($1,000s)	Average Annual Community Cost (District + Customer)* ($1,000s)	Average Annual Community Cost Per Service Connection**	Total District Cost*** ($1,000s)	Total Customer Cost*** ($1,000s)	Total Community Cost*** ($1,000s)
B	$1,117	$2,300	$3,679	$61.00	$22,244	$41,136	$63,380
C	$1,316	$2,709	$4,333	$71.00	$29,269	$48,454	$77,723
D	$1,826	$3,262	$5,088	$84.00	$36,255	$60,031	$96,286

* Adapted from Maddaus Analysis, Appendix A, Attachment 2, page 51; costs are undiscounted.
** Based on 60,670 accounts. Source: CUWCC 2004 BMP Report.
*** Adapted from Maddaus Analysis, Appendix A, Table 8, page 35.

Figure 2 graphs the utility costs versus annual water savings in 2030.

FIGURE 2
Maddaus Present Value of Utility Costs versus Cumulative Water Saved in 2030*



* From Maddaus Analysis, Appendix A, Figure 11, page 36.

Table 4 lists the cost per acre foot and potential water savings during this same time period:

TABLE 4
MADDAUS COST PER ACRE FOOT & WATER SAVINGS POTENTIAL

Program	District Cost per ac. ft.*	Customer Cost per ac. ft.*	Community Cost per ac. ft. (District + Customer)*	Annual Water Savings Potential in 2030 (ac. ft.)*	Total Water Savings as a % of Total Production in 2030**
B, C, D	$400	$700	$1,100	**4,300 – 5,400**	**13% – 17%**

* Adapted from Maddaus Analysis, Appendix A, Table 8, page 35. Savings includes plumbing code.
** Adapted from Maddaus Analysis, Appendix A, Table ES-2, page 3. Percentage includes plumbing code.

MMWD Program Recommendations

By using the Maddaus Analysis as a reference model, and adapting Maddaus Programs B, C, and D to the organizational framework of the District, staff has prepared customized program alternatives for MMWD. The MMWD alternatives are roughly equivalent to Maddaus programs in terms of overall costs and savings targets, and Tables 1 – 4 can be used for purposes of direct comparison.

The MMWD Programs include an Automated Meter Reading (AMR)/Advanced Meter Infrastructure (AMI) and Leak Detection Program that will be operated by the Facilities and Watershed Division, and Conservation Programs 1 – 3 to be operated by the Water Conservation Department. **Table 5** summarizes the costs and savings targets associated with each MMWD program alternative and provides a description of program activities that would be accomplished during the next two-year budget cycle:

TABLE 5
MMWD CONSERVATION PROGRAM ALTERNATIVES

Program	AMR/AMI & Leak Detection	**Conservation Program #1** (compare to Maddaus Program B)	**Conservation Program #2** (compare to Maddaus Program C)	**Conservation Program #3** (compare to Maddaus Program D)
Description	The District has not had an individual dedicated solely to leak detection in more than five years. Staff recommends that two positions be dedicated to leak detection. These positions would be classified as Utility Workers III, reporting to the Area Field Supervisor in the Facilities and Watershed Division. Based on past experience, it requires five years for one worker to survey all nine hundred miles of pipeline and sixty thousand meters in the District. With two Staff dedicated to leak detection, the task should be accomplished in three years. Automated Meter Reading (AMR) and Advanced Meter Infrastructure (AMI) technologies would replace existing meters and provide numerous technological opportunities for revenue recovery and conservation.	MMWD Program #1 is the "status quo" option – with program expenditures in FY '08/'09 similar to FY '07 levels. Program costs will change in response to inflation, staff salaries and benefits, and program implementation for all programs through 2030. New rebate programs initiated in FY '07 will be funded at partial levels, and customer saturation targets would remain at current levels. The Customer Assistance Program (CAP), water waste, and Time of Service programs will continue at minimum levels; and a new school education program will be initiated (Appendix B, Staff Reports). Some website and database tools will be developed.	Program #2 includes increases in spending for rebates, staffing, and customer services beyond FY '07 levels. New rebate programs initiated in 2007 will be funded at higher levels, and CAP services will increase significantly for all customer types. Three new Conservation Specialist I positions would be added to perform field surveys and provide program support. One existing Conservation Specialist III position would be upgraded to an existing Conservation Coordinator position, and the Mid-Manager position will be upgraded to a Senior Manager position. A new School Education Program will be initiated and funded at increased levels. Improvements to public outreach and marketing, conservation databases, website development, contractor education, and regional development projects will also be accelerated.	Five new Conservation Specialist I positions will be added to perform field surveys and provide program support. One new Conservation Specialist II will be added to support School Education Programs. One existing Conservation Specialist III position will be upgraded to an existing Conservation Coordinator position, and the Mid-Manager position will be upgraded to a Senior Manager. Rebate programs will be funded at higher levels, and very significant improvements in the CAP programs will occur for all customer types. The new School Education Program will be funded at above average levels. Significant improvements will be made in public outreach and marketing, conservation database and website development, contractor education, research, and regional development projects.
FY '08/'09 District Costs (per year)	AMR/AMI – $1,700,000 Leak Detection – $272,000	$1,800,000	$2,700,000	$3,300,000
Staff Requirements	AMR/AMI – to be determined Leak Detection – Add 2 positions	No new positions	Add 3 and upgrade 2 positions	Add 6 and upgrade 2 positions
2015 Demand Reduction (ac.ft./year)	AMR/AMI – to be determined Leak Detection – 400*	2,400**	2,800**	3,400**
2030 Demand Reduction (ac.ft./year)	AMR/AMI – to be determined Leak Detection – 800*	3,500**	3,900**	4,600**

* Adapted from Maddaus Analysis, Appendix A, Table 4, page 20. Savings are calculated as a "30-year Average".

** Adapted from Maddaus Analysis, Appendix A, Table 8, page 35. Savings includes plumbing code minus Leak Detection Program savings.

Program Implementation

Strategy

In order to cost-effectively operate MMWD's conservation programs, staff will work collaboratively with private and public partners to the greatest extent possible. This strategy is designed to produce the following results:

- Administrative costs can be reduced or deferred to other service providers.
- Program participation will increase via networking among partners.
- Communication and marketing messages will be more effective as they reach more customers more often.
- Rebate and incentive costs can be reduced more quickly if market transformation occurs at a faster pace—water-saving devices become more available and affordable.
- Public events will cost less to produce and will reach more customers.
- Water savings resulting from behavioral changes will increase with growing public awareness.
- Public support for rate increases may increase if more customers realize direct benefits from District programs.
- Funding opportunities for research and new technologies will increase with greater program visibility and wider regional benefits.

Communications and Marketing

MMWD's audience includes all of its 190,000 customers. Reminding them of the need to be mindful about water—use well, not waste—is an ongoing and overarching goal of the District's communications plan. MMWD has identified audiences where it expects to have the greatest impact on water use:

1. Residential customers
   - Homeowners with irrigation systems
   - Homeowners' Associations
   - Professional landscapers, plant nurseries, garden supply centers
   - Civic, health, environmental, and conservation organizations
   - Highest water users

2. Commercial customers
   - City and county public works departments
   - Schools (maintenance supervisors)
   - Hospitals
   - Private businesses
   - Golf courses
   - Owners of multi-family residential housing

3. Teachers, school-age children, and their families

District Policy

Funding

To provide long-term funding for conservation programs and revenue for District operations, the following funding mechanisms are proposed:

- Regular tier-break adjustments
- Service and/or connection fees dedicated to conservation programs
- On-bill conservation surcharges based on current consumption
- Bond financing secured with conservation surcharges
- On-bill financing (e.g., "Pay-As-You-Save")

Ordinances

Revising the existing conservation ordinances, and adding new development ordinances, should be a high priority for the District over the next year. Although overall savings resulting from ordinances will be relatively small, they are highly cost effective. Opportunities exist to increase the effectiveness of ordinances by building enforcement networks with local municipalities and other special districts.

Conclusions

The District is at a critical turning point in its history and must make significant investments that balance water supply and demand, and fund infrastructure maintenance and operations.

Investments in water conservation programs have reliably reduced water demand in the District for over 30 years and continue to yield consistent results. The conditions now exist for the District to launch an aggressive, sustained conservation campaign and set a new achievement standard for water efficiency in California: Water supplies are limited, new supplies are expensive to develop and impact the environment, the citizens of Marin are knowledgeable and motivated, the District has the in-house expertise to develop and operate programs successfully, and the technologies exist that can reliably reduce consumption in the future.

Although conservation is a cost-effective method that extends available water supplies and provides environmental benefits, under the current District pricing structure, lowered water sales also reduce District revenue. Solving this financial catch-22 is the most critical challenge limiting conservation today.

Finally, it is a political decision that will determine the level of conservation savings the District attains. Only by making a commitment to work together as an agency and a community, to overcome financial and social barriers, and to invest in public education and technology, can the conservation potential in Marin be achieved.

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MMWD CONSERVATION PROGRAMS

STATEWIDE CONTEXT

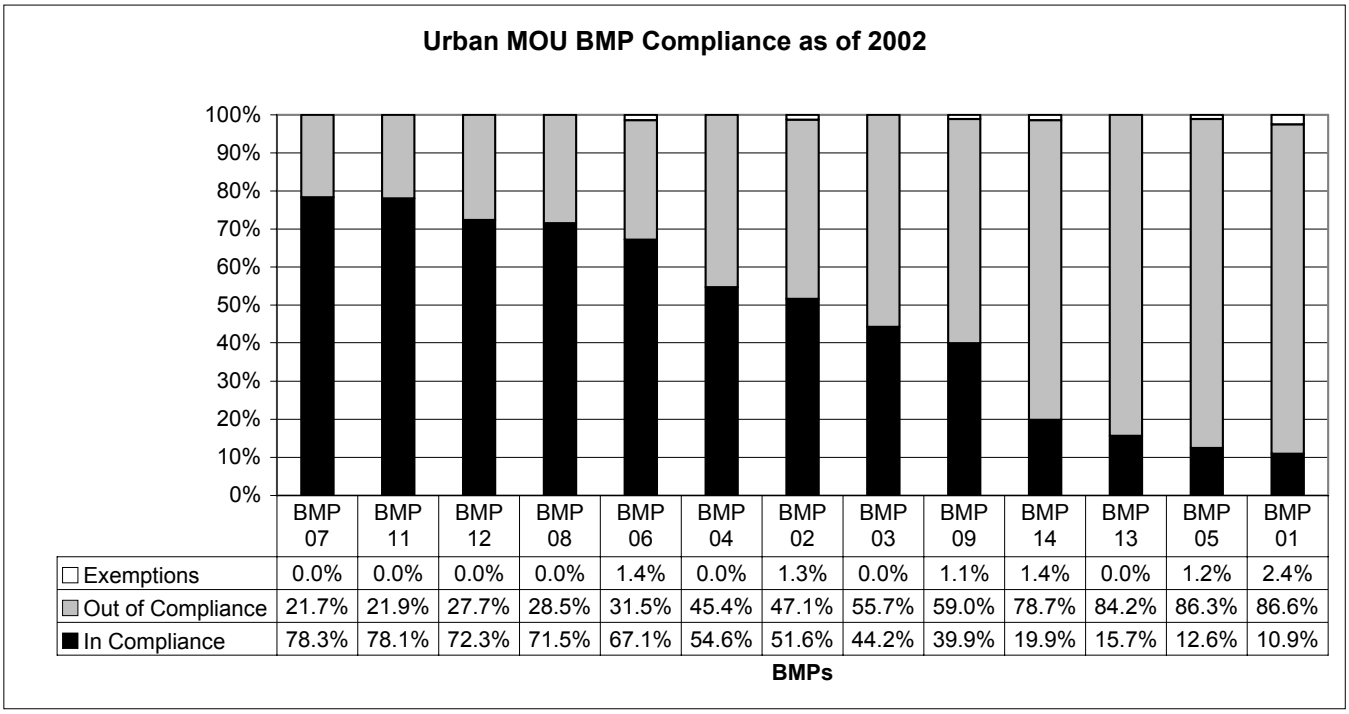
California communities are under increasing pressure to meet future water demands. Increasing population, environmental conditions, rising capital and operational costs, recreational needs, agricultural demands, and changing weather patterns are all contributing factors. Statewide, modern conservation programs began in 1991 when MMWD and most other water agencies signed the first *Memorandum of Understanding Regarding Water Conservation in California*. This historic event transformed conservation programs among individual agencies into a statewide coalition dedicated to sustained water use efficiency practices. The *Memorandum* describes 14 Best Management Practices (BMPs) that include everything from toilets to irrigation systems and rate structures. An agency is considered "on track" for a given BMP if it is meeting the implementation schedule. For example, MMWD has completed the implementation of BMP #14, the "Residential Ultra-low Flow Toilet BMP", because an estimated 48,000 ULFTs have been installed in the District since 1994.

For an agency to be 'on-track' with the BMPs is comparable to constructing a building to meet minimum building codes. BMPs were born out of statewide political compromise, and as such, represent a fairly low standard of achievement. Nevertheless, it is a good standard and serves as a starting point for future conservation efforts. If all the BMPs were fully implemented by all water agencies, plus savings from building codes, demand in California would be reduced by approximately 1 million acre feet each year by 2030. This represents approximately 33% of the maximum savings technically available through improved water efficiency practices.

Currently, however, no water agencies have fully implemented the BMPs. As a result, actual water savings equal only one-third of the BMP goal. Lack of resources dedicated to conservation programs is the primary reason for not achieving anticipated savings.

Figure 3 below is extracted from a presentation of the CUWCC *CALFED Year 4 Comprehensive Report*, and it shows the relative levels of water agency BMP compliance as of 2002.

FIGURE 3
Statewide BMP Compliance



	BMP 07	BMP 11	BMP 12	BMP 08	BMP 06	BMP 04	BMP 02	BMP 03	BMP 09	BMP 14	BMP 13	BMP 05	BMP 01
Exemptions	0.0%	0.0%	0.0%	0.0%	1.4%	0.0%	1.3%	0.0%	1.1%	1.4%	0.0%	1.2%	2.4%
Out of Compliance	21.7%	21.9%	27.7%	28.5%	31.5%	45.4%	47.1%	55.7%	59.0%	78.7%	84.2%	86.3%	86.6%
In Compliance	78.3%	78.1%	72.3%	71.5%	67.1%	54.6%	51.6%	44.2%	39.9%	19.9%	15.7%	12.6%	10.9%

Table 6 on the following page compares BMP program statistics of seven California water agencies, including MMWD.

TABLE 6
Comparison of BMP Program Implementation *

Water Agency (%) indicates customer saturation	Alameda County Water District	Redwood City	East Bay Municipal Utility District	Irvine Ranch Water District	Long Beach Water Department	San Francisco PUC	Marin Municipal Water District
BMP 1 Residential Surveys	8,014 (11.3%)	368 (1.8%)	67,056 (19.2%)	3,052 (4.0%)	32,697 (40.8%)	89,379 (60.6%)	4,653 (8.4%)
BMP 3 Leak Detection	System audit in 2004	No program reported	2 – Staff 1 – Vehicle	No audit reported	System audit in 2000	Program to begin in 2005	System audit in 2001
BMP 5 Landscape Surveys	842 (16.0%)	22 (1.1%)	2,025 (7.2%)	0 reported	364 (4.0%)	3,165 (14.0%)	97 (9.5%)
BMP 6 2006 Data Clothes Washers	13,324 (18.8%)	1,080 (5.4%)	30,368 (8.7%)	8,435 (9.9%)	6,703 (8.4%)	7,811 (5.3%)	6619 (11.9%)
BMP 9 CII Audits	370 (10.6%)	0 reported	3,393 (14.8%)	50 (1.0%)	2,336 (28.5%)	12,885 (60%)	253 (7.1%)
BMP 14 ULF Toilets	0 reported	0 reported	24,443	26,707	43,419	37,034	48,857
Total Accounts	77,907	22,931	377,318	85,728	89,381	170,670	60,670
Dollars Spent on BMP Programs*	$683,444	$660,486	$4,848,518 ('03/'04 avg.)	$633,752	$1,489,364	$1,016,952	$973,312 (source:MMWD)
Dollars Spent per Person	$2.11	$7.96	$7.96	$2.06	$3.04	$1.28	$5.23
Dollars Spent per Ac. Ft. Delivered	$12.11	$48.36	$18.54	$7.05	$17.93	$9.98	$29.97
Population*	323,250	83,000	1,325,000	308,400	490,000	792,700	186,000
Water Deliveries (Ac. Ft.)*	56,427	13,659	261,560	89,916	83,086	101,870	32,478
Ac. Ft. Saved per Year		563 ac.ft @ $1,173/ac. ft. in 2005[1]	18,412 ac.ft./year @ $263/ac. ft.[2]				3,000 ac. ft./year @ $324/ac. ft.[3]

* Source: http://bmp.cuwcc.org/bmp/read_only/list.lasso. **Important Note: All data is from CUWCC 2004 BMP reports, except where indicated.**

1. Source: 2005 UWMP, Table 6.2, City of Redwood City.
2. Source: EBMUD 2004 Water Conservation & Water Recycling Annual Report page E-2.
3. Source: MMWD 2006 Water Management Report, Appendix C, page 6.

FUTURE MMWD PROGRAM GOALS AND OBJECTIVES

Goals:

1. Produce reliable water savings at the lowest cost
2. Protect the natural environment
3. Foster positive customer experiences
4. Enhance the health of urban forests
5. Cultivate the conservation ethic in Marin

Objectives:

- Promote behavioral conservation actions to the greatest extent possible through sustained public outreach programs
- Develop programs with manufacturers and retailers that leverage bulk discounts on plumbing fixtures
- Enact new development ordinances in coordination with all municipal agencies and special districts
- Enlist local community organizations as program partners to increase the effectiveness and number of customer contacts
- Provide service-oriented programs that enhance customers' lifestyles and property values
- Offer financial incentives that promote market transformation
- Increase public education activities
- Develop technologies that lower program transaction costs and barriers to customer participation
- Participate in regional partnerships related to funding, marketing, and customer education
- Promote programs that protect environmental resources

FUTURE MMWD PROGRAM DESCRIPTIONS

Each of the program options listed below is based on a combination of information from the Maddaus Analysis, MMWD's budget projections, and staff's professional judgment. In general, the programs are designed to maximize staff resources by leveraging community resources and to minimize costs through volume purchases and technology.

- ***Automated Meter Reading (AMR) & Advanced Meter Infrastructure (AMI)***
- ***Leak Detection Program***
- ***Conservation Program #1***
- ***Conservation Program #2***
- ***Conservation Program #3***

Automated Meter Reading (AMR) & Advanced Meter Infrastructure (AMI)

- **Total FY '08/'09 Utility Costs: $1,700,000 per year**
- **Average Annual Cost (10 years): $1,700,000 per year***
- **Total 10-year cost: $14 – 18 million**
  (including replacement of 60,000 meters)
- **Staff Requirements: To be determined**
- **Demand Reduction potential 2015: To be determined**
- **Demand Reduction potential 2035: To be determined**

** Based on an estimated total project cost of $15 million at a nominal annual interest rate of 4.160%*

Background

District staff has conducted research on various new meter reading technologies over the past several years. Many unanswered questions remain regarding potential costs for additional staff resources, demand reduction potential, and changes in revenue that may result from more accurate meter readings. In order to answer these questions, MMWD has engaged an industry consultant that is currently conducting a detailed assessment that will be completed by August 2007. Once this assessment is completed staff will have the information needed to make a more informed recommendation on how the District should proceed and what the costs associated with such a program would be.

While new technologies continue to be developed at a rapid pace, AMR and AMI systems are becoming increasingly cost-effective tools offering a variety of benefits. Automated Meter Reading (AMR) refers to the ability to collect data from a meter remotely and automatically via various different methods, RF (radio frequency) wireless, power line, and telephone lines. Advanced Meter Infrastructure (AMI) is the next, newest step in meter technology. AMI represents an infrastructure that utilizes smart meters with advanced two-way communications that enable utilities to meet their business needs for meter data collection. Utilities with AMI systems have the ability to collect data on an hour-by-hour basis, if needed. And, it enables consumers to actively and frequently collect their own consumption data.

The District has approximately 60,000 meters in the system. Of these, approximately 55,000 are residential meters; 2,000 are irrigation meters; and the remainder serves businesses and/or office complexes. The District's current Meter Change Program (MCP) is based on a 20-year meter life. Meters are warranted by the manufacturer for 15 years or 1.5 million gallons of water/2,000 ccfs. Within the next six years, 32,000 of the District's meters are scheduled for replacement, representing more than 50% of the District's meters.

The cost of the basic meter currently being installed by the District is approximately $48.00, while the cost of an AMR/AMI meter is approximately $180.00, not including the cost of installation.

Potential Benefits

AMR/AMI meters can provide the District and its customers with a wide range of benefits that are unavailable with manually read meters. Some of these benefits are summarized below:

Meter Operations

- Reduces stuck meter maintenance calls
- Decreases vehicle traffic
- Decreases vehicle carbon gas emissions
- Decreases vehicle maintenance and fuel costs

Customer Service/Finance

- Improves service by providing in-home water usage monitoring by consumers
- Facilitates monthly billing
- Decreases re-reads/mis-read trips
- Decreases move-in/move-out trips
- Decreases vehicle traffic on the road
- Decreases vehicle carbon gas emissions
- Decreases vehicle maintenance and fuel costs

Engineering

- Decreases unaccounted for water loss

Water Conservation

- Provides leak detection, data logging, and usage monitoring
- Allows time-of-day use monitoring and reporting
- Facilitates accurate water savings calculations

Safety

- Reduces Workmen's Compensation liability claims

Leak Detection Program

- **Total FY '08/'09 Utility Costs*: $230,000 per year**
- **Average Annual Cost (30 years): $190,000**
- **Staff Requirements: Add 2 positions**
- **Leak Reduction Potential (30-year average, ac. ft./year)**: 1.5% = 400 acre feet**
  2.0% = 500 acre feet
  3.0% = 800 acre feet

* Note: The leak detection program is included in each of Maddaus Programs B, C, and D—see Appendix A on page 44 of the Maddaus Analysis for details on leak detection program costs. However, since the leak detection program will be operated separately from the MMWD Conservation Programs, staff has calculated the costs for this program separately.

** Adapted from Maddaus Analysis, Table 4, page 20.

Background

The District measures annual "unaccounted for water losses" due to leaks and other unknown sources. There has been a marked improvement in loss control since the 1970s, when the average system losses were around 14%. Today, due to pipeline replacements and leak repairs, the average system loss is 10%. This 4% reduction in losses equates to a savings of about 1,200 acre-feet of water each year.

The District has not had an individual dedicated solely to leak detection in more than five years. Leak detection/survey is now handled by the Valve Technicians on an incident by incident basis. The Valve Technicians are first responders to all mainline leaks, mainline shut downs for the crews and contractors, consumer calls, and meter turn-on/offs. Under this scenario, it is difficult to dedicate the required blocks of time to complete leak survey work in a systematic manner.

The process of leak detection involves pinpointing a specific leak location. This process assists staff in completing repairs with a minimal amount of excavation. Leak surveying is accomplished by canvassing the entire water distribution system. Using sonic leak detection equipment, technicians are able to locate leaks that may be hidden from view, because they are not yet surfacing. The leaks typically found during a survey include District leaks—mainline and service line—and consumer leaks.

Benefits

Detecting and repairing leaks in the District's delivery system and on a customer's property is a highly cost-effective way to conserve water that the District has already purchased, treated, and delivered.

For example: Every 1% decrease in system water loss equals a savings of about 300 acre-feet per year. At Tier I prices, the retail value of this water is over $300,000 every year. By factoring in the additional benefits derived from avoided costs for potential property damages, and treating and pumping this water, the value of leak detection increases. Leak detection programs can provide other substantial benefits, including:

- Safeguarding public health and property. Discovery of leaks before they turn into larger main breaks and reduce the likelihood of property damage and public safety.
- Improved public relations. Consumers appreciate maintenance of the water system and help with consumer problems. Field personnel doing leak detection provide visual assurance that the system is being maintained.
- Reduced legal liability. By early detection, we are able to repair leaks before they become large main breaks. This helps protect the District from expensive lawsuits.
- Reduced disruption to consumers. More leaks are repaired on a planned basis rather than developing into major breaks that disrupt service.

Recommendations

Staff recommends that two positions be dedicated to leak detection. These positions would be would be filled by in-house candidates, and classified as Utility Workers III; based on the job skills and experience the position requires. They would report to the Area Field Supervisor in the Facilities and Watershed Division.

Based on past experience, it requires five years for one worker to survey all nine hundred miles of pipeline and sixty thousand meters in the District. With two staff dedicated to leak detection, the task should be accomplished in three years. New technology is available for leak detection, including data loggers that are placed at various locations within the District's system, such as service laterals, system mainline valves and hydrants. These data loggers are programmed to turn on automatically at different intervals during the night and 'listen' for leaks. This information is downloaded to a computer and then used to pinpoint leaks. This is a great tool and will be used to conduct a thorough and comprehensive leak survey, especially at program start up.

Based on the fact that it has been over five years since the last leak survey, staff is recommending the following approach be taken to initiate this program:

- Survey the District's distribution system by walking the entire service area, listening on all service laterals and other points of contact. This will enable the surveyor to find the smaller meter leaks, service leaks, and also consumer leaks that would not be picked up by the data loggers.

- A large portion of the work would be done at night. Typically, the best hours for leak detection are between 10 pm and 5 am. These are the hours of the least amount of water consumption and there is not the noise from traffic that you would find during daylight hours.

First-Year Startup Costs

(2) Utility Worker III	$140,000 (@ step 5)
Benefits	50,000
(2) Trucks	60,000
Sonic Leak Detectors & Pipe Locators	10,000
Total First-Year Costs	$260,000

Staff will reevaluate the leak detection program after approximately three years, following the initial survey of the entire water distribution system. Recommendations about future staffing and funding levels will be provided to the District based on the volume of survey activity.

Costs for mainline, service, and meter leaks would be borne by the respective cost centers already in place. Although additional staff and equipment for leak repairs may be needed, depending on the volume of leaks discovered, staff does not anticipate this occurring at this time.

The Leak Detection Program could start as soon as the positions are advertised by Human Resources and filled.

Conservation Program #1

(compare to Maddaus Program B)

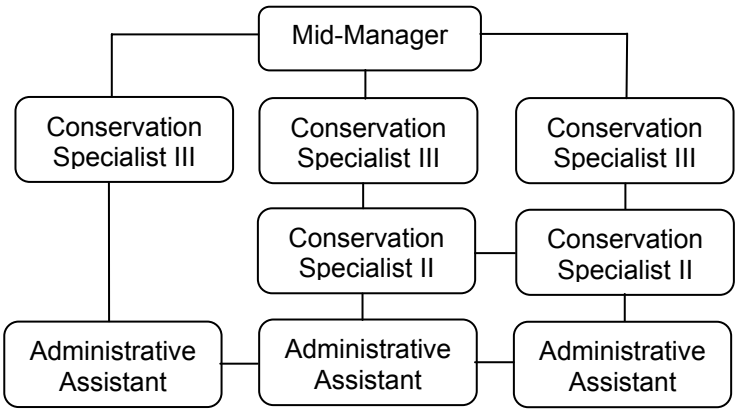
- **Total FY '08/'09 Utility Costs: $1.8 million per year***
- **Total Utility Costs FY 2008 – 2022: $25,000,000****
- **Staff Requirements: No change**
- **Market Penetration: 10 – 20%**
- **Demand Reduction with plumbing code 2015: 2,400 acre feet per year*****
- **Demand Reduction with plumbing code 2030: 3,900 acre feet per year*****

* MMWD calculated the "Total FY '08/'09 Utility Costs" based on staff's budget analysis using actual full-time equivalent costs and program expenditures.

** "Total Utility Costs FY 2008 – 2022" are based on the Maddaus Program B cost projections listed on page 51 of Appendix A and have been adjusted by MMWD to include a 3% inflation rate.

*** Demand Reductions are derived by subtracting leak detection program savings of 1.5% from the Conservation Program B + plumbing code savings listed in Table 8 on page 35 of the Maddaus Analysis.

FIGURE 4
Program #1 Organizational Chart



The MMWD conservation programs are currently operated using an interactive team approach. **Figure 4** illustrates this interactivity, using multiple lines that connect staff positions. These lines indicate that a staff member coordinates job tasks with multiple teams. MMWD Program #1 is the "status quo" option—with program expenditures in FY '08/'09 similar to FY '07 levels. Program costs will change in response to inflation, staff salaries and benefits, and program implementation for all programs through 2030. New rebate programs initiated in FY '07 will be funded at partial levels, and customer saturation targets would remain at current levels. The Customer Assistance Program (CAP), water waste, and Time of Service programs will continue at minimum levels; and a new school education program will be initiated (Appendix B, Staff Reports). Some website and database tools will be developed.

Table 7 compares **MMWD Conservation Program #1** budgeted activities in FY'08/'09 with the number of activities listed in the Maddaus Program B analysis:

TABLE 7
Program #1 Budgeted Activities FY '08/'09

Activity Description	MMWD Budgeted Activities per year in FY '08/'09	Maddaus Program B Activities per year	Maddaus Water Use Reduction Target	Maddaus Market Penetration Goal
Indoor Residential Survey BMP 1	440	588	5%	30%
Outdoor Residential Survey BMP 1	440	588	10%	30%
Landscape Budgets BMP 5	300	116	15%	90%
Landscape Survey BMP 5	20	7	10%	1.8%
Clothes Washers BMP 6	1,200	1,200	34%	26%
Public Education BMP 7	51,000	51,000	1%	100%
Commercial Audits BMP 9	12	49	12%	12%
ULFT Ordinance BMP 14	2,000	575	Equals service change rate	60%
Rain Sensor Retrofit	1,500	3,259	30%	9%
San Quentin Toilets	300	200	NA	54%
HET Rebates	1,000	1,085	20%	57%
Homeowner Classes	54	272	5%	5%
Coin-Op Washers	71	22	15%	34%
Irrigation Incentives	275	212	5% Residential 15% Commercial	15%
Hotel Retrofit	50	48	40%	20%
Commercial Rebate	150	24	10%	10%
HE Urinal Rebate	100	24	10%	71%
New Development Ordinance	Yes	Yes	NA	100%

Conservation Program #2

(compare to Maddaus Program C)

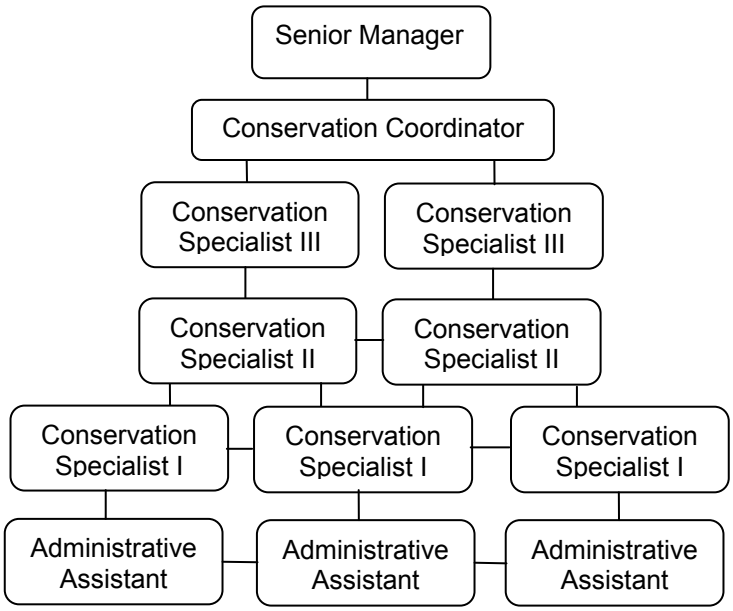
- **Total FY '08/'09 Utility Costs: $2.7 million per year***
- **Total Utility Costs FY 2008 – 2022: $36,000,000****
- **Staff Requirements: Add 3 positions/Upgrade 2**
- **Market Penetration: 20 – 30%**
- **Demand Reduction with plumbing code 2015: 2,700 acre feet per year*****
- **Demand Reduction with plumbing code 2030: 4,200 acre feet per year*****

* MMWD calculated the "Total FY '08/'09 Utility Costs" based on staff's budget analysis using actual full-time equivalent costs and program expenditures.

** "Total Utility Costs FY 2008 – 2022" for program C are based on 81% of the Maddaus Program D cost projections listed on page 51 of Appendix A and have been adjusted by MMWD to include a 3% inflation rate.

*** Demand Reductions are derived by subtracting leak detection program savings of 2.0% from the Conservation Program C + plumbing code savings listed in Table 8 on page 35 of the Maddaus Analysis.

FIGURE 5
Program #2 Organizational Chart



Program #2 includes increases in spending for rebates, staffing, and customer services beyond FY '07 levels. New rebate programs initiated in 2007 will be funded at higher levels, and CAP services will increase significantly for all customer types. Three new Conservation Specialist I positions would be added to perform field surveys and provide program support. One existing Conservation Specialist III position would be upgraded to an existing Conservation Coordinator position, and the Mid-Manager position will be upgraded to a Senior Manager position. A new School Education Program will be initiated and funded at increased levels. Improvements to public outreach and marketing, conservation databases, website development, contractor education, and regional development projects will also be accelerated.

Table 8 compares **MMWD Conservation Program #2** budgeted activities in FY '08/'09 with the number of activities listed in the Maddaus Program C analysis:

TABLE 8
Program #2 Budgeted Activities FY '08/'09

Activity Description	MMWD Budgeted Activities per year in FY '08/'09	Maddaus Program C Activities per year	Maddaus Water Use Reduction Target	Maddaus Market Penetration Goal
Indoor Residential Survey BMP 1	575	588	5%	30%
Outdoor Residential Survey BMP 1	575	588	10%	30%
Landscape Budgets BMP 5	360	116	15%	90%
Landscape Survey BMP 5	60	7	10%	1.8%
Clothes Washers BMP 6	1,440	1,200	34%	26%
Public Education BMP 7	100,000	51,000	1%	100%
Commercial Audits BMP 9	40	83	26%	12%
ULFT Ordinance BMP 14	2,000	575	Equals service change rate	60%
Rain Sensor Retrofit	4,483	6,085	30%	9%
San Quentin Toilets	300	200	NA	54%
HET Rebates	1,800	1,671	30%	57%
Homeowner Classes	297	542	5%	10%
Coin-Op Washers	150	37	25%	34%
Irrigation Incentives	750	518	10% Residential 25% Commercial	15%
Hotel Retrofit	137 Rooms	72 Rooms	60%	20%
Commercial Rebate	150	24	10%	10%
HE Urinal Rebate	250	50	20%	71%
New Development Ordinance	Yes	Yes	NA	100%

Conservation Program #3

(compare to Maddaus Program D)

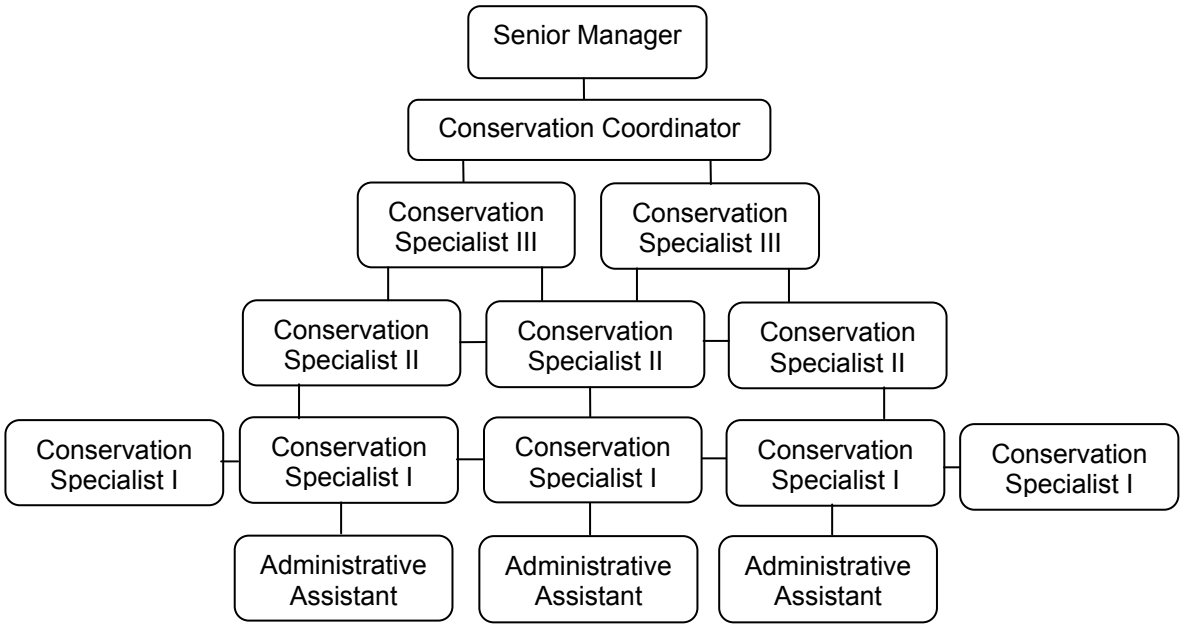
- **Total FY '08/'09 Utility Costs: $3.3 million per year***
- **Total Utility Costs FY 2008 – 2022: $44,000,000****
- **Staff Requirements: Add 6 positions/Upgrade 2**
- **Market Penetration: 30 – 50%**
- **Demand Reduction with plumbing code 2015: 3,000 acre feet per year*****
- **Demand Reduction with plumbing code 2030: 4,600 acre feet per year*****

* MMWD calculated the "Total FY '08/'09 Utility Costs" based on staff's budget analysis using actual full-time equivalent costs and program expenditures.

** "Total Utility Costs FY 2008 – 2022" are based on the Maddaus Program D cost projections listed on page 51 of Appendix A and have been adjusted by MMWD to include a 3% inflation rate.

*** Demand Reductions are derived by subtracting leak detection program savings of 3.0% from the Conservation Program D + plumbing code savings listed in Table 8 on page 35 of the Maddaus Analysis.

FIGURE 6
Program #3 Organizational Chart



Program #3 increases program expenditures for staffing and customer services beyond Program #2 levels. Five new Conservation Specialist I positions will be added to perform field surveys and provide program support. One new Conservation Specialist II will be added to support School Education Programs. One existing Conservation Specialist III position will be upgraded to an existing Conservation Coordinator position, and the Mid-Manager position will be upgraded to a Senior Manager. New rebate programs initiated in 2007 will be funded at higher levels, and very significant improvements in the CAP programs will occur for all customer types. A new School Education Program will be initiated and funded at above average levels. Significant improvements will be made in public outreach and marketing, conservation database and website development, contractor education, research, and regional development projects.

Table 9 compares **MMWD Conservation Program #3** budgeted activities in FY '08/'09 with the number of activities listed in the Maddaus Program D analysis:

TABLE 9
Program #3 Budgeted Activities FY '08/'09

Activity Description	MMWD Budgeted Activities per year in FY '08/'09	Maddaus Program D Activities per year	Maddaus Water Use Reduction Target	Maddaus Market Penetration Goal
Indoor Residential Survey BMP 1	1200	588	5%	30%
Outdoor Residential Survey BMP 1	1200	588	10%	30%
Landscape Budgets BMP 5	750	116	15%	90%
Landscape Survey BMP 5	120	7	10%	1.8%
Clothes Washers BMP 6	1,750	2,700	34%	26%
Public Education BMP 7	120,000	51,000	1%	100%
Commercial Audits BMP 9	165	123	26%	12%
ULFT Ordinance BMP 14	2,500	575	Equals service change rate	60%
Rain Sensor Retrofit	4,900	6,085	30%	9%
San Quentin Toilets	400	200	NA	54%
HET Rebates	1,980	1,671	30%	57%
Homeowner Classes	325	542	5%	10%
Coin-Op Washers	150	37	25%	34%
Irrigation Incentives	1,000	1,036	10% Residential 25% Commercial	15%
Hotel Retrofit	150 Rooms	72 Rooms	60%	20%
Commercial Rebate	165	24	10%	10%
HE Urinal Rebate	275	50	20%	71%
New Development Ordinance	Yes	Yes	NA	100%

CURRENT MMWD PROGRAM STATUS

Since 1991, MMWD has completed, or is on track to complete, 11 out of 14 BMPs. This is a very good track record compared to many other water agencies in California. The District has excelled in programs to install ULFTs, residential showerheads and high-efficiency clothes washers; promote public information; and implement conservation pricing. Areas needing improvement include customer site surveys, landscape equipment retrofits, and school education programs. A complete history of the District's conservation achievements is included in Appendix C, the *2006 Water Management Report*.

Four new conservation programs have been approved and implemented in 2006 – 2007: the Conservation Action Committee; High-Efficiency Toilet Rebate Program; Landscape Equipment Rebate; and Conservation Outreach and Marketing Programs. A new School Education Program proposal (Appendix B) has also been prepared for Board review.

In order to track and report on the progress of conservation programs at the District, new database tools are currently under development. These tools will be integrated with the existing SAP system, Access databases, and GIS programs. When completed, the District will have the ability to track conservation activities for each service address and report on changes in water consumption before and after activity. Additionally, landscape area measurements and the water budget process will be automated and allow significant increases in staff productivity.

Collaborations are under way with the following community partners:

School Education Programs

- Next Generation
- California Regional Environmental Education Community (CREEC) Network
- Environmental Education Council of Marin
- The Bay Institute
- School Environment Education Docents (SEED)
- PlayFair

Landscape Programs

- Marin Master Gardeners
- Bay-Friendly Landscaping and Gardening
- Irrigation manufacturers and retailers
- California Landscape Contractors Association
- U.C. Cooperative Extension

Commercial and Residential Programs

- Bay Area Public Agencies
- Intergy
- Electric & Gas Industries Association (EGIA)
- California Youth Energy Services

PROGRAM ACTIVITY LEVELS

Customers are responding positively to MMWD's customer-friendly conservation strategy. For example, the new high-efficiency toilet rebate program (started in January 2007) has issued more than 300 toilet rebates over the first 3-month period, and interest in this program continues to grow. To put this number of rebates into perspective, other larger water agencies in the Bay Area completed only 150 – 300 HET rebates in all of 2006, while Redwood City installed 4,800 residential toilets between 2005 and 2006 with their direct-installation program.

MMWD's high-efficiency clothes washer program also continues to rebate an average of 1,200 washers each year, after 12 years in operation and more than 9,000 rebates. Staff calculates that as many as 40,000 washers are eligible for rebates in the next 10 years (Appendix C, 2006 Water Management Report, page 14).

This positive response to District programs can be attributed to several demographic characteristics—which are indicators that conservation programs can maintain high activity levels in Marin:

- Residential accounts represent more than 90% of the customer base.
- Residential remodeling projects are very common in Marin and provide opportunities to upgrade plumbing fixtures.
- The average construction age of houses is 1968, prior to enactment of the National Energy Policy Act in 1992 that mandated water efficient plumbing fixtures, indicating a larger than average pool of older, less efficient fixtures.
- Marin is an affluent and highly educated community, with fewer economic barriers and a strong history of participation in conservation activities.
- Public opinion surveys and comments indicate that a majority of residents see conservation as the preferred water supply option.
- Conservation is a cost-effective method to extend limited water supplies and provide a host of environmental benefits to the community.

COMMUNITY INPUT

Marin residents are extraordinarily interested in environmental issues, including water conservation. District customers have contributed many outstanding ideas intended to improve the environment through natural resource conservation. In 2006 – 2007, Staff conducted two Conservation Action Committee meetings and a "HydroForce Workshop" at College of Marin, and also published a notice about the Master Plan in the March/April edition of *On the Water Front* to solicit input on the future of conservation programs in the District. Staff has recorded the following ideas voiced at Board meetings, public events, during informal conversations, and from e-mails and letters:

- Expedite installation of water-saving devices for large municipal water users by providing direct-installation programs that remove financial and institutional barriers.
- Encourage the use of rain water catchments, grey water, and wells to offset irrigation requirements.
- Increase public awareness through highly visible logos, messages, and product branding.
- Institute a District conservation fee on each water bill that would be removed during any billing cycle that the customer stayed within a set water budget.
- Improve the District's phone system and website so it is easier to contact Staff, participate in incentive programs, and get information.
- Create demonstration projects (gardens, art, retrofit public facilities) to increase awareness.
- Proactively contact customers who are over their water budget to offer program assistance.
- Encourage the use of sub-meters to help customers self-monitor their water use throughout the month.
- Work with manufacturers to provide local "time of purchase" rebates to simplify and enhance incentive programs.
- To highlight the relationship between water and power, a special brochure— "101 Ways to Save Water and Power"— was created.
- Coordinate with relevant programs and ordinances in the County, Cities, wastewater districts, and other water agencies.
- Expand recycling and storm water capture systems throughout the District.
- Increase education programs and internships for students.
- Work with retailers and manufacturers to add labels to plants and irrigation equipment to help consumers identify water-conserving products.
- Implement on-bill financing opportunities like the "Pay-As-You -Save" program.
- Conduct pilot studies on a community or neighborhood scale.
- Study the potential to reduce evaporation from surface reservoirs.
- Require auto dealerships and rental agencies to use recycling car washes.
- Study the potential for composting toilets.
- Sponsor friendly community competitions offering prizes and recognition to the most efficient participants.

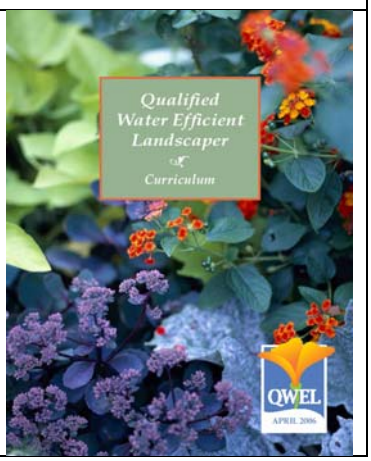
The following section titled the 'Conservation Scrapbook' is provided in order to illustrate many of the activities currently underway or completed in the past year by the conservation department:

CONSERVATION SCRAPBOOK – 2006/2007

<table>
<tr><td rowspan="2">Analysis</td><td>Commissioned the Conservation Technical Analysis by Maddaus Water Management (Appendix A).
A detailed technical analysis of the conservation savings potential through 2030.

MADDAUS WATER MANAGEMENT</td></tr>
<tr><td>District staff completed the MMWD 2006 Water Management Report (Appendix C) in April 2006. This history of conservation program accomplishments from the 1970s through April 2006 provides a detailed account of the water savings achieved in the past and calculates the maximum technical savings in the future.

  </td></tr>
<tr><td rowspan="2">Education</td><td> 
MMWD hosted 30 public events and workshops. Contractors were trained in new irrigation technologies. Staff partnered with a variety of groups including the Girl Scouts, Marin Environmental Forum, Marin Art & Garden Center, County of Marin, College of Marin, Sustainable Marin, and many others, who joined together to build a strong social awareness around water conservation.</td></tr>
<tr><td>Qualified Water Efficient Landscape Training Program – MMWD partnered with the Sonoma County Water Agencies, College of Marin, the California Landscape Contractors Association and numerous landscape professionals to develop a comprehensive certification program. Over a period of weeks, the program trains landscape workers in the principles of water conservation, integrated pest management, and irrigation systems.

  </td></tr>
</table>

<table>
<tr><td>Education</td><td>The Northern California Water Management & Technology Education Center
N o r C a l W A M T E C

College of Marin – Together with staff from the Environmental Landscape and Biology Departments at the College, MMWD staff are at the forefront of developing a new Northern California Irrigation Technology Center. This Center will be the first of its kind north of Fresno and is envisioned to offer students and the community a world-class conference center, classrooms, and research facilities focusing on sustainable urban landscape practices. The first ground-breaking class will be hosted by MMWD at the proposed site of the new Center at the Indian Valley Campus on Saturday, July 22. The California Conservation Corps, U.C. Davis Extension, and the Master Gardeners are also new partners in this effort.</td></tr>
<tr><td>Technology</td><td> 
MMWD completed a pilot landscape water use satellite study and developed GIS tools that enable measurements of landscape water needs automatically. Partnerships with regional agencies, the Department of Water Resources and the Bureau of Reclamation are being explored to obtain higher resolution images and develop a full-scale production tool to measure landscape areas. This tool will transform the process of creating water budgets, increasing staff productivity 10-fold when combined with an improved conservation database.</td></tr>
<tr><td>Partnerships</td><td>In cooperation with the College of Marin and SPAWN, MMWD helped to create “Balance on the Edge”, a streamside garden exhibit at the San Francisco Flower and Garden Show. This design demonstrates how beautiful landscapes can also benefit natural ecosystems.
  </td></tr>
</table>

Partnerships

To make it easier for MMWD customers to adopt Bay-Friendly gardening practices, the District is introducing a new rebate program for efficient irrigation equipment and supplies.

Bay-Friendly gardening mimics natural systems which recycle everything—water, debris, and nutrients—endlessly. It means paying attention to climate and local conditions, and using appropriate plants that are adapted to those conditions.

"Bay-Friendly Landscaping" is a Stopwaste.org program developed by the Alameda County Waste Management Authority and the Alameda County Source Reduction and Recycling Board.

MMWD is actively working with PG&E, the Marin Energy Team, and Sustainable Marin to explore relationships between the benefits of energy and water conservation. MMWD was one of the first water agencies to join the Cities for Climate Protection program that is dedicated to reducing greenhouse gases caused by electrical generation.

Events

At the Marin County Fair, the first-ever ***"Eco-Sperience"*** focusing on healthy living in a healthy environment will be hosted by the Marin Municipal Water District. With over 10,000 square feet of outdoor space filled with hands-on educational activities for people of all ages, the ***"Eco-Sperience"*** is sure to be action packed!

Innovation

Facilities & Watershed and Conservation staff worked together to build a 4-foot high waterwheel made of redwood recovered from Mt. Tam. In this picture, students learn about the relationship between water and energy by turning a hand-operated pump. The water is pumped to a trough and falls onto the wooden paddles which cause the wheel to turn.

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POLICY RECOMMENDATIONS

Water supply and water demand are two sides of same decision making equation. If either side is over- or under-estimated, serious financial and social consequences can occur. Policies that encourage water efficiency through rate structures, incentives, and public awareness messaging make the best use of public dollars and, at the same time, reduce impacts to the environment and the cost of new water supply projects.

The job of conservation programs is to stabilize long-term consumption patterns at the lowest level possible. This task must be accomplished cost-effectively, and the programs must be embraced by a majority of customers in order to succeed.

Staff recommends an overall policy strategy that encourages participation by the greatest number of customers. This strategy differs from recommendations in the District's 1994 Master Plan, which contained programs to target customers using the greatest amount of water. Facts that support this recommendation include:

- Data derived from site survey experience shows that customers in the "top 20%" include parks, golf courses, and estates with extensive landscaping. When these sites have quality irrigation systems and are professionally managed, potential water savings can be relatively small. Residential customers in the "top 20%" have proven to be particularly resistant to changing water use behaviors. Resources spent to influence this small group of customers are often ineffective.

- Approximately 70% – 95% of residential accounts are billed at the Tiers 1 and 2 levels. Although each of these accounts uses less water than customers in Tiers 3 and 4, the water use efficiency is often low. By casting a wider program "net", the cumulative savings potential is increased.

- Conservation programs that reach a larger customer base increase the probability for behavior-based savings. Experience during drought emergencies shows that short-term savings can be as high as 65%. Long-term savings would be substantial if even 10% of customers implemented behavioral changes (e.g., turning off faucets, taking shorter showers, or reducing minutes on sprinkler timers).

- Customer surveys done in 2003 and 2005 indicate that more than 80% of customers support increased conservation, while 57% of those asked were not aware of any programs at the District. Thirty-seven percent had done nothing to conserve water.

The most successful conservation programs provide financial support, services, and information to help customers reduce costs and enhance their lifestyle. We have learned that:

- Incentives are the backbone of effective conservation programs. Incentives reinforce the District's role as a good steward of public resources.
- Positive messages about conservation build customer confidence and goodwill in the District. For example, in the past year, MMWD has shifted the conservation message away from penalties and enforcement action to focus on services and rebates. This shift has resulted in greater customer participation in programs, and a significant reduction in antagonistic phone calls.
- High visibility public outreach and education programs are essential for conservation programs to achieve sustainable long-term demand reductions. When asked, most customers want to help take care of Marin's natural resources.
- Water pricing is a powerful conservation tool that can provide reliable improvements in efficiency.
- Staff recommends a comprehensive study of the District's tiered rate structure, entitlements, connection fees, and water budgets be performed. As many as one-half of the water budgets in the District are inaccurate and based on inefficient historical use patterns.
- Conservation ordinances and penalties can be effective if they are enforceable. New development ordinances and conservation requirements attached to re-development permits are enforceable and should be a primary goal for MMWD during the next year. Widespread adoption of conservation requirements by local permitting agencies would yield significant savings at a very low cost to the District.

Funding

To provide long-term funding for conservation programs and revenue for District operations, the following funding mechanisms are proposed:

- Regular tier-break reviews and adjustments, as warranted, to monitor consumption trends and maintain customer awareness about the importance of conservation.
- Service and/or connection fees that fund conservation programs and offset revenue losses resulting from lowered consumption.
- On-bill conservation surcharges based on current consumption. Surcharges would be waived in any billing period where consumption was within a pre-determined water budget. Surcharges would be added in any billing period where use exceeded budgeted amounts. Budgets would be determined based on number of residents and landscape area.
- Bond financing to provide capital for conservation plumbing fixtures, secured with conservation surcharges.
- On-bill financing, such as the "Pay-As-You-Save" system or other zero-interest loan option.

COST SAVING STRATEGIES

Staff will work collaboratively with agencies, organizations, retailers, and manufacturers that can provide co-sponsoring, or in-kind support for MMWD's programs. Cost savings will be realized in several key program areas:

- Administrative costs can be reduced or deferred to other service providers.
- Program participation will increase via networking among customers.
- Communication and marketing messages will be more effective as they reach more customers more often.
- Rebate and incentive costs can be reduced more quickly if market transformation occurs at a faster pace—water-saving devices become more available and affordable.
- Public events will cost less to produce and reach more customers.
- Water savings from devices and behavioral changes will increase more rapidly with growing public awareness.
- Political support for rate adjustments may increase if more customers realize direct benefits from District programs.
- Funding opportunities will be increased due to greater program visibility and regional impacts.

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CONSERVATION MARKETING PLAN

Background

Historically, Marin Municipal Water District has been at the forefront of promoting water conservation. But record rainfall in recent years has lulled the public's concern about water conservation. The District has not communicated about the need for conservation as aggressively as in the past. Marin's water use is currently at its highest levels for the quarter since 1987.

Marin's water supplies are limited and precariously tied to annual rainfall. Marin is never more than one year away from a drought.

While drought conditions do not currently exist, MMWD recognizes the need to reinvigorate awareness of the need to use water wisely among customers. This has recently become even more urgent, as Marin's access to Sonoma County water may be curtailed because of last winter's scant rainfall.

Marin residents have a strong connection to the natural environment, are highly informed about environmental issues, and have rallied to conserve water in past drought years. Research and history indicate they are willing to "do the right thing" if given the information and support to do so. With environmental concerns at an all-time high, the public is highly receptive to taking action that can advance environmental solutions.

Water-saving technologies have evolved since Marin was last hard hit by drought, and MMWD is stepping up efforts to replace toilets, urinals, washing machines, and sprinkler systems with models offering greater efficiency. But MMWD's conservation messages cannot be limited to the installation of water-saving devices, "tips," rebates, or telling people that saving water is a good idea. As a public utility capable of reaching a vast customer base, and as the county's largest user of electricity, MMWD has an opportunity—and a responsibility—to assume a leadership role in conservation.

We recommend that MMWD position itself as a responsive, well-run public agency committed to conservation. This can be addressed by reinforcing conservation messaging throughout our communications with our customers, and by modeling conservation, leadership, and customer care throughout our operations.

Messaging and Positioning

Connecting MMWD to what our customers believe in and care about is essential to garnering their trust and buy-in.

Currently, the District isn't communicating a coherent conservation message. There is an abundance of collateral material offering conservation tips, technical fixes, and rebates. This information is by and large technical, not clearly targeted to intended audiences, and does not connect to the conservation values that are deeply held among people living in Marin.

The goal isn't to inform customers about MMWD or what it does. The goal is to build a reservoir of confidence and trust, which will be critical should conditions require MMWD to ration water use. MMWD needs to focus less on what it does than on the benefits provided.

The core strategies of MMWD's conservation campaign are to:

1. Connect the District's values to community values;
2. Make MMWD user-friendly and a "partner" in its interactions with customers;
3. Provide customers with easy-to-adopt programs and behaviors for using less water;
4. Demonstrate that the District is itself taking steps to conserve and sustain Marin's environment.

Audience

MMWD's audience includes all of its 190,000 customers. Reminding them of the need to be mindful about water—use well, not waste—is an ongoing and overarching goal of the District's communications.

MMWD has identified audiences where it expects to have the greatest impact on water use as well as awareness of water conservation ethic and education (see accompanying grid for breakout of targets and potential actions):

1. Residential customers
    - Homeowners with irrigation systems
    - HOAs
    - Professional landscapers, plant nurseries, garden supply centers
    - Civic, health, environmental, and conservation organizations
    - Highest water users
2. Commercial customers
    - City and county public works departments
    - Open space and parks departments
    - Schools (maintenance supervisors)
    - Colleges (maintenance, programs)
    - Hospitals
    - Private businesses
    - Golf courses
    - Owners of multi-family residential housing
    - Visitors/Hotels/Restaurants
3. Teachers, school-age children, college students and their families

MARIN MUNICIPAL WATER DISTRICT

descomstudios

CONSERVATION MARKETING

target audiences, programs, strategies

ACTIONS

AUDIENCES

		REBATES			INCENTIVES			PUBLIC EDUCATION			PARTNERSHIPS			CHANGE AGENTS	
		Urinal/Toilet	Washer	Irrigation	Bill Savings %	Staff visit	Premiums (Bottles, bags, etc)	Signage, icon, emblem	Consultation, Persuasion, Ordinance	Education, Workshops, Training	Certification	CoBranding & CoPromotion	Sponsorship	Pilot Projects	Front Line Marketers
RESIDENTIAL	Homeowner/tenant	•	•	•	•	•	•	•	•	•					•
	Neighborhood Assn					•	•	•	•	•	•	•	•	•	•
	HOAs			•	•	•	•	•	•	•	•	•	•	•	•
	MultiFamily Bldg	•	•	•	•	•	•	•	•					•	•
	Building/Grounds Manager			•	•	•	•	•	•	•	•				•
COMMERCIAL	Business	•	•	•	•	•	•	•	•			•	•	•	•
	Garden/supply	•	•	•	•	•	•	•	•	•	•	•	•	•	•
	Laundry	•	•	•	•	•	•	•	•			•	•		•
	Retail	•		•	•	•	•	•	•				•		•
	Restaurant	•		•	•	•	•	•	•			•	•		•
	Landscapers			•	•	•	•	•	•	•	•	•	•	•	•
MUNICIPAL	County	•		•	•	•	•	•	PARTICIPATE IN DEVELOPING		•	•	•	•	•
	Cities	•		•	•	•	•	•			•	•	•	•	•
	Special Districts	•		•	•	•	•	•			•	•	•	•	•
	Hospitals	•	•	•	•	•	•	•			•	•	•	•	•
EDUCATION	K12	•		•	•	•	•	•		•	•	•	•	•	•
	College of Marin (2)	•		•	•	•	•	•		•	•	•	•	•	•
	Dominican University	•	•	•	•	•	•	•		•	•	•	•	•	•
	PTAs							•					•		•
ORGANIZATIONS & NONPROFITS	Health	•		•	•	•	•	•		•	•	•	•	•	•
	Sustainables						•	•		•	•	•	•		•
	Social Services (assist)	•					•	•				•	•		•
	Social Service (ie, Rotary)						•	•				•	•	•	•
	Trade Associations	•		•	•	•	•	•			•	•	•		•
	Chambers of Commerce	•		•	•		•	•				•	•		•
	Environmental & Energy						•	•		•	•	•	•	•	•
REAL ESTATE PROFESSIONALS	Developers	•	•	•	•	•	•	•	•	•	•	•	•	•	•
	Inspectors							•		•	•	•			•
	Architects	•		•	•	•	•	•		•	•	•	•	•	•
	Landscape Architects			•	•	•	•	•	•	•	•	•	•	•	•
	Agents & Brokers	•						•	•	•	•	•		•	•
	Contractors	•	•	•	•	•	•	•	•	•	•	•	•	•	•
	Tradespeople	•	•	•	•		•	•	•	•	•	•	•		•
	Board of Realtors	•						•		•		•			•

Trends

In addition to developing conservation programs and incentives—some of which are included below—MMWD can have a greater impact by connecting its messages with issues the media is currently covering, as well as those of concern to customers.

Some examples of current media trends that MMWD can tie to are:

- Alternative energy/energy savings
- Bottled water
- Carbon trading/offsets
- Clean Technologies
- Climate change
- Dams
- Ecological footprint
- Endangered species
- Environment and health
- Fitness
- Fuel efficiency
- Gas prices
- Global warming
- Green building
- Green business
- Greenhouse gases
- High efficiency light bulbs
- Land use
- Organics and local food
- Outdoor recreation
- Recycling
- Salmon
- Sustainability
- Transportation
- Voluntarism
- Waste reduction

Recommendations

- MMWD establish and publicize a measurable, achievable, short-term target to rally around and demonstrate the water savings that Marin can achieve with small changes in water-use habits.
- MMWD adopt ongoing and consistent messaging that responsible water use is a way of life, whether or not drought conditions are present.
- MMWD audit, set targets, and create a plan to reduce its own ecological footprint and set an example to other Marin agencies, businesses, and customers.
- MMWD associate itself with the mountain, not the faucet (emphasizing values, not plumbing).

Communication and Customer Support

** suggests high priority*

*1. Institute semi-annual personal letters from Board members to their constituents, explaining MMWD's current water situation, commitment to conservation, conservation efforts, drought protocols, and what customers can do to be more conscious consumers.

*2. Institute a monthly email from MMWD Board to Marin's elected officials/staffs on status of water supply, to build awareness and support for MMWD's conservation efforts.

*3. Cultivate a network of elected and agency leaders, educators, conservation leaders, and green businesses. Enlist public agencies and Marin businesses as co-sponsors/ endorsers of MMWD water-saving campaign.

*4. Redesign and produce a series of billing inserts and billing envelopes tied to the conservation campaign and designed to regain customers' attention and inspire them to take water-saving actions.

*5. Give customers an opportunity to opt-in to a "conservation education fund" or add small assessment to bills that would be dedicated to conservation education and restoration activities, including school gardens, community gardens, field trips, volunteer programs, and outreach.

*6. Upgrade Web site to be interactive and customer-friendly, including features such as:

- Calculators for water use and reduction
- Plant selection database
- "How-tos" (video/multimedia format?) such as correcting irrigation problems, resetting sprinklers, installing a pressure valve, finding a leak, testing your toilet, etc.
- Downloadable rebate forms with online submission, online scheduling for a water audit, etc.
- Enable email from Web site to permit MMWD to answer customers' conservation questions
- Enable one-click email contact from Web site to report a leak or misuse
- Include ETo information, standardized run times, when to start watering, etc., on home page

*7. Collect email addresses. Develop an email news format with visually interesting and timely information and customer incentives.

*8. Upgrade phone system and install a "Conservation Hot Line," with recorded messages to answer common questions, as well as the ability to talk to an "expert" or leave a message with assurance of a reply via phone or email within a specific time period.

*9. Develop a graphically unified family of brochures to replace the many now in use, to create a visual identity for MMWD's conservation programs.

10. Develop a "conservation pledge" that customers can take. Display pledge at public events, in stores, and on Web site. Offer incentives (such as coupons for water-saving devices, plants) or premiums (such as non-plastic water bottle, watershed recreation map, etc.) for those who sign the pledge.

11. Host a workshop of water agencies to share best practices.

12. Create a branded "certification" program, modeled on Marin's Green Business Certification program, for organizations that take actions to reduce water use and promote resource efficiency to their colleagues, customers, and employees.

13. Display outdoor banners and install attractive display in MMWD lobby. Identify opportunities for public displays.

14. Participate in and create tie-ins to community events—town parades, picnics, Farmers' Markets, art festivals, and fairs (such as MMWD's Eco-Sperience environment at the Marin County Fair that focuses on water and healthy living in a healthy environment).

Media Outreach

*15. Develop a regular graphic feature (for Marin IJ) that illustrates progress toward a water-saving goal. (Current graphic is on existing supply).

*16. Proactively place stories on topics tied to current trends:

- What's on the horizon in ways to save water (new water meter technologies, smart irrigation controllers, GPS to pinpoint progress of invasive plants in the watershed)?
- Who's leading the way in water conservation?
- How does Marin compare to other districts, states, and nations in innovations and achievements in water conservation?
- What are the economic benefits/impacts of water conservation?

*17. Develop and run advertising on water conservation themes.

18. Develop a graphic or illustration tracing where Marin's water comes from. Highlight non-human dependence on water.

19. Develop outreach materials for publication in newsletters of nonprofits, agencies, and large employers, and posters for display in schools, stores, and businesses.

Programs

*20. Simplify rebate programs. Make rebates seamless for customers— i.e., rebate submission at point of purchase.

*21. Offer cash rebates and incentives to customers who voluntarily cut their water use 10% (note: PG&E's Flex Your Power campaign). Incentives might include coupon for drought-resistant plants, non-plastic water bottle, calendar, watershed recreational map, etc.)

*22. Institute amnesty and incentive campaign for multi-unit dwellings. (Despite free install and rebates, many residential multi-dwelling units are out of compliance with plumbing efficiency standards.)

*23. Prepare water conservation outreach targeted to renters, both residential and commercial.

*24. Mount "do-it-yourself" leak-detection awareness campaign.

*25. Work with schools and existing school programs (i.e., Next Generation, River of Words, school and community gardens) to make nature/conservation ethic message congruent with MMWD messaging.

*26. Provide Spanish-language programs and collateral materials for district communications. Market to Spanish-speaking landscape workers.

27. Capitalize on current high level of interest in the environment by offering direct install of residential toilets, with charge to customers' water bill (on-bill financing).

28. Develop field trip programs for schools, families, scouts, church, and other groups.

29. Explore creating a "junior watershed ranger" program.

Partnerships and Sponsorships

*30. Leverage broad awareness and interest in climate change and "being green" with partnerships and sponsorships with nonprofits, organizations, businesses, and agencies who share MMWD's environmental and public service goals.

Sample Campaign: NURSERY/GARDEN SUPPLY CENTER

District customers are purchasing new plants and irrigation equipment for summer; below is a menu of ideas. Implementing such a campaign typically requires months of development and coordination with all parties and partners.

1. Signage promoting low water use and native plants, zone designations, and proper irrigation equipment, timing, rain shut-off, and irrigation best practices at nurseries and garden centers.

2. Advertising with the same message in the IJ and Pacific Sun. If possible, tie in a special discount or sale at the store for co-branding and cooperation to bring in lots of customers at one time.

3. Collection of email address at time of purchase to send irrigation/conservation tips via email: when to start watering, when to add or decrease time on automatic systems, when new information or interactive features are posted at www.marinwater.org.

4. Co-branded incentive with retailer, offering a discount coupon on future purchase of water saving plants and products.

5. Garden signs for home use displaying an icon with strategic message: “doing our part to save water for next year” (language to be developed) along the lines of the ladybug “pesticide free zone” signs or the “Certified Green Business” logo.

6. Eye-catching and thematically unified tips card showing the top 5 – 10 things a water conscious gardener does.

7. Display of appropriate plants and irrigation equipment.

8. Discount tickets to Eco-Sperience/County Fair with minimum purchase; perhaps tie in visits to the various exhibits or workshops.

9. Offer a simplified rebate application process (perhaps an MMWD staff person at a table to help customers complete) as well as a coupon for a discount at that store for suitable devices or plants at the next visit if rebate form is filled out in store.

10. Contact and coordinate with environmental and sustainability groups for assistance in “getting the word out” through their email lists, communications, and meetings. Craft a simple message and identifying graphic to supply for their use. Investigate opportunities for MMWD spokespersons to make short presentations.

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CONCLUSIONS

1. The District is at a critical turning point in its history and must make significant investments that balance water supply and demand, and fund infrastructure maintenance and operations.

2. Investments in water conservation programs have reliably reduced water demand in the District for over 30 years and continue to yield consistent results.

3. The conditions now exist for the District to launch an aggressive, sustained conservation campaign and set a new achievement standard for water efficiency in California:

   - Water supplies are limited; new supplies are expensive to develop and impact the environment.

   - The pubic is knowledgeable and motivated.

   - The District has the in-house expertise to develop and operate successful conservation programs.

   - New technologies are available to reliably reduce consumption into the future.

   - Although conservation is a cost-effective method to extend available water supplies and provides environmental benefits, under the current District pricing structure, lowered water sales also reduce District revenue. Solving this financial catch-22 is the most critical challenge limiting conservation today.

4. Only by making a long-term commitment to overcome financial and social barriers, and to invest in public education and technology, can the District secure reliable conservation savings.

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Appendix J

Marin Municipal Water District Title 13 Water Service Conditions and Water Conservation Measures

Appendix K

AWWA Water Loss Reports

AWWA Free Water Audit Software v5.0

This spreadsheet-based water audit tool is designed to help quantify and track water losses associated with water distribution systems and identify areas for improved efficiency and cost recovery. It provides a "top-down" summary water audit format, and is not meant to take the place of a full-scale, comprehensive water audit format.

Auditors are strongly encouraged to refer to the most current edition of AWWA M36 Manual for Water Audits for detailed guidance on the water auditing process and targetting loss reduction levels

The spreadsheet contains several separate worksheets. Sheets can be accessed using the tabs towards the bottom of the screen, or by clicking the buttons below.

Please begin by providing the following information

Name of Contact Person:	Carrie Pollard
Email Address:	cpollard@marinwater.org
Telephone | Ext.:	4159451522
Name of City / Utility:	Marin Municipal Water District
City/Town/Municipality:	Corte Madera
State / Province:	California (CA)
Country:	USA
Year:	2019 Calendar Year
Audit Preparation Date:	7/1/2020
Volume Reporting Units:	Acre-feet
PWSID / Other ID:	2110002

The following guidance will help you complete the Audit

All audit data are entered on the ***Reporting Worksheet***

- Value can be entered by user
- Value calculated based on input data
- These cells contain recommended default values

Use of Option (Radio) Buttons: Pcnt: 0.25% Value:

Select the default percentage by choosing the option button on the left

To enter a value, choose this button and enter a value in the cell to the right

The following worksheets are available by clicking the buttons below or selecting the tabs along the bottom of the page

Instructions
The current sheet. Enter contact information and basic audit details (year, units etc)

Reporting Worksheet
Enter the required data on this worksheet to calculate the water balance and data grading

Comments
Enter comments to explain how values were calculated or to document data sources

Performance Indicators
Review the performance indicators to evaluate the results of the audit

Water Balance
The values entered in the Reporting Worksheet are used to populate the Water Balance

Dashboard
A graphical summary of the water balance and Non-Revenue Water components

Grading Matrix
Presents the possible grading options for each input component of the audit

Service Connection Diagram
Diagrams depicting possible customer service connection line configurations

Definitions
Use this sheet to understand the terms used in the audit process

Loss Control Planning
Use this sheet to interpret the results of the audit validity score and performance indicators

Example Audits
Reporting Worksheet and Performance Indicators examples are shown for two validated audits

Acknowledgements
Acknowledgements for the AWWA Free Water Audit Software v5.0

If you have questions or comments regarding the software please contact us via email at: wlc@awwa.org

AWWA Free Water Audit Software:
Reporting Worksheet

WAS v5.0

? Click to access definition
\+ Click to add a comment

Water Audit Report for: Marin Municipal Water District (2110002)
Reporting Year: 2019 | 1/2019 - 12/2019

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (n/a or 1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades

All volumes to be entered as: ACRE-FEET PER YEAR

To select the correct data grading for each input, determine the highest grade where the utility meets or exceeds all criteria for that grade and all grades below it.

<---------- Enter grading in column 'E' and 'J' ---------->

Master Meter and Supply Error Adjustments

WATER SUPPLIED

					Pcnt:	Value:	
Volume from own sources:	4	19,984.567	acre-ft/yr	8		-1.550	acre-ft/yr
Water imported:	9	5,502.991	acre-ft/yr	10	-0.52%		acre-ft/yr
Water exported:	n/a	0.000	acre-ft/yr				acre-ft/yr

Enter negative % or value for under-registration
Enter positive % or value for over-registration

WATER SUPPLIED: 25,517.873 acre-ft/yr

AUTHORIZED CONSUMPTION

Click here: ? for help using option buttons below

				Pcnt:	Value:	
Billed metered:	7	22,716.800	acre-ft/yr			
Billed unmetered:	n/a	0.000	acre-ft/yr			
Unbilled metered:	8	5.087	acre-ft/yr			
Unbilled unmetered:	8	8.306	acre-ft/yr		8.306	acre-ft/yr

Use buttons to select percentage of water supplied **OR** value

AUTHORIZED CONSUMPTION: ? 22,730.193 acre-ft/yr

WATER LOSSES (Water Supplied - Authorized Consumption) 2,787.679 acre-ft/yr

Apparent Losses

				Pcnt:	Value:	
Unauthorized consumption:		63.795	acre-ft/yr	0.25%		acre-ft/yr

Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed

Customer metering inaccuracies:	4	702.739	acre-ft/yr	3.00%		acre-ft/yr
Systematic data handling errors:		56.792	acre-ft/yr	0.25%		acre-ft/yr

Default option selected for Systematic data handling errors - a grading of 5 is applied but not displayed

Apparent Losses: ? 823.325 acre-ft/yr

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses: ? 1,964.354 acre-ft/yr

WATER LOSSES: 2,787.679 acre-ft/yr

NON-REVENUE WATER

NON-REVENUE WATER: ? 2,801.073 acre-ft/yr

= Water Losses + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

Length of mains:	8	853.1	miles
Number of active AND inactive service connections:	7	63,704	
Service connection density:		75	conn./mile main

Are customer meters typically located at the curbstop or property line? Yes

Average length of customer service line:

(length of service line, beyond the property boundary, that is the responsibility of the utility)

Average length of customer service line has been set to zero and a data grading score of 10 has been applied

Average operating pressure: 7 109.3 psi

COST DATA

Total annual cost of operating water system:	10	$80,237,859	$/Year	
Customer retail unit cost (applied to Apparent Losses):	8	$4.84	$/100 cubic feet (ccf)	
Variable production cost (applied to Real Losses):	5	$414.03	$/acre-ft	☐ Use Customer Retail Unit Cost to value real losses

WATER AUDIT DATA VALIDITY SCORE:

***** YOUR SCORE IS: 62 out of 100 *****

A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION:

Based on the information provided, audit accuracy can be improved by addressing the following components:

1: Volume from own sources
2: Customer metering inaccuracies
3: Variable production cost (applied to Real Losses)

AWWA Free Water Audit Software:
System Attributes and Performance Indicators

Water Audit Report for: Marin Municipal Water District (2110002)
Reporting Year: 2019 | 1/2019 - 12/2019

*** YOUR WATER AUDIT DATA VALIDITY SCORE IS: 62 out of 100 ***

System Attributes:

	Apparent Losses:	823.325	acre-ft/yr
+	Real Losses:	1,964.354	acre-ft/yr
=	**Water Losses:**	**2,787.679**	acre-ft/yr
?	Unavoidable Annual Real Losses (UARL):	1,735.60	acre-ft/yr
	Annual cost of Apparent Losses:	$1,735,820	
	Annual cost of Real Losses:	$813,301	Valued at **Variable Production Cost**

Return to Reporting Worksheet to change this assumpiton

Performance Indicators:

Financial:	Non-revenue water as percent by volume of Water Supplied:	11.0%	
	Non-revenue water as percent by cost of operating system:	3.2%	Real Losses valued at Variable Production Cost
Operational Efficiency:	Apparent Losses per service connection per day:	11.54	gallons/connection/day
	Real Losses per service connection per day:	27.53	gallons/connection/day
	Real Losses per length of main per day*:	N/A	
	Real Losses per service connection per day per psi pressure:	0.25	gallons/connection/day/psi
	From Above, Real Losses = Current Annual Real Losses (CARL):	1,964.35	acre-feet/year
?	Infrastructure Leakage Index (ILI) [CARL/UARL]:	1.13	

* This performance indicator applies for systems with a low service connection density of less than 32 service connections/mile of pipeline

AWWA Free Water Audit Software:
User Comments

Use this worksheet to add comments or notes to explain how an input value was calculated, or to document the sources of the information used.

General Comment:	See attached documentation

Audit Item	Comment
Volume from own sources:	
Vol. from own sources: Master meter error adjustment:	
Water imported:	
Water imported: master meter error adjustment:	
Water exported:	
Water exported: master meter error adjustment:	
Billed metered:	
Billed unmetered:	
Unbilled metered:	

Audit Item	Comment
Unbilled unmetered:	
Unauthorized consumption:	
Customer metering inaccuracies:	
Systematic data handling errors:	
Length of mains:	
Number of active AND inactive service connections:	
Average length of customer service line:	
Average operating pressure:	
Total annual cost of operating water system:	
Customer retail unit cost (applied to Apparent Losses):	
Variable production cost (applied to Real Losses):	

Audit Item	Comment

Audit Item	Comment

Audit Item	Comment

Audit Item	Comment

Audit Item	Comment

Audit Item	Comment

Audit Item	Comment

Audit Item	Comment

Audit Item	Comment

Audit Item	Comment

Audit Item	Comment

Audit Item	Comment

Audit Item	Comment

Audit Item	Comment

Audit Item	Comment

AWWA Free Water Audit Software: Water Balance

WAS v5.0

American Water Works Association.

Water Audit Report for:	Marin Municipal Water District (2110002)	
Reporting Year:	2019	1/2019 - 12/2019
Data Validity Score:	62	

		Water Exported 0.000			Billed Water Exported	Revenue Water 0.000
Own Sources (Adjusted for known errors) 19,986.117	System Input 25,517.873	Water Supplied 25,517.873	Authorized Consumption 22,730.193	Billed Authorized Consumption 22,716.800	Billed Metered Consumption (water exported is removed) 22,716.800	Revenue Water 22,716.800
					Billed Unmetered Consumption 0.000	
				Unbilled Authorized Consumption 13.393	Unbilled Metered Consumption 5.087	Non-Revenue Water (NRW) 2,801.073
					Unbilled Unmetered Consumption 8.306	
			Water Losses 2,787.679	Apparent Losses 823.325	Unauthorized Consumption 63.795	
					Customer Metering Inaccuracies 702.739	
					Systematic Data Handling Errors 56.792	
Water Imported 5,531.756				Real Losses 1,964.354	Leakage on Transmission and/or Distribution Mains Not broken down	
					Leakage and Overflows at Utility's Storage Tanks Not broken down	
					Leakage on Service Connections Not broken down	

AWWA Free Water Audit Software:
Dashboard

WAS v5.0

The graphic below is a visual representation of the Water Balance with bar heights propotional to the volume of the audit components

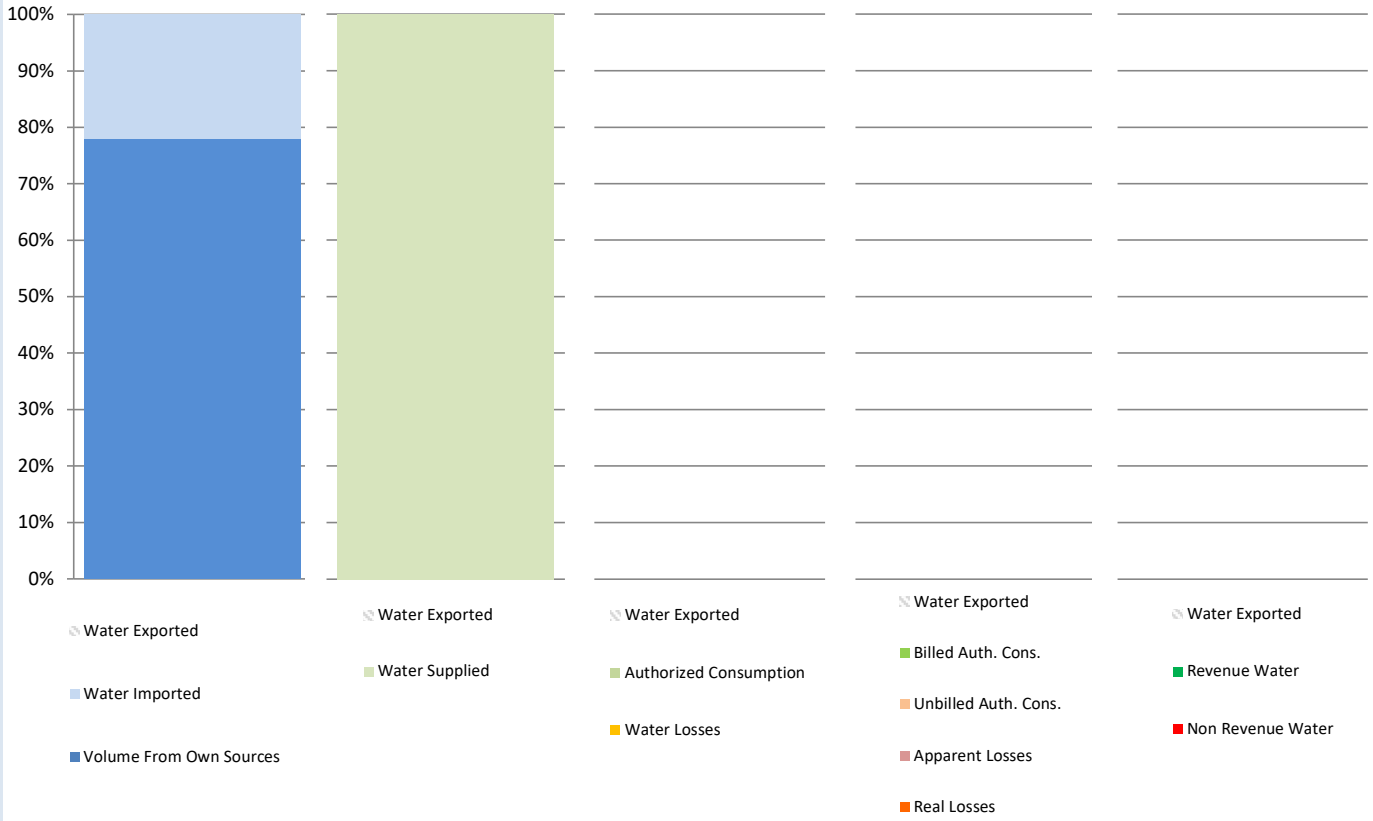
Water Audit Report for: Marin Municipal Water District (2110002)

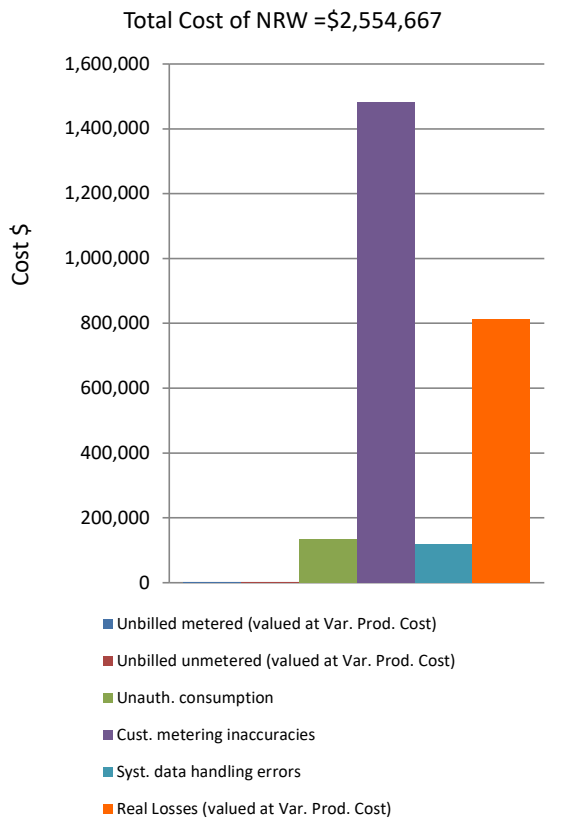
Reporting Year: 2019 | 1/2019 - 12/2019

Data Validity Score: 62

○ Show me the VOLUME of Non-Revenue Water

◉ Show me the COST of Non-Revenue Water





AWWA Free Water Audit Software: Grading Matrix

WAS 5.0

The grading assigned to each audit component and the corresponding recommended improvements and actions are highlighted in yellow. Audit accuracy is likely to be improved by prioritizing those items shown in red

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
WATER SUPPLIED											
Volume from own sources:	Select this grading only if the water utility purchases/imports all of its water resources (i.e. has no sources of its own)	Less than 25% of water production sources are metered, remaining sources are estimated. No regular meter accuracy testing or electronic calibration conducted.	25% - 50% of treated water production sources are metered; other sources estimated. No regular meter accuracy testing or electronic calibration conducted.	Conditions between 2 and 4	50% - 75% of treated water production sources are metered, other sources estimated. Occasional meter accuracy testing or electronic calibration conducted.	Conditions between 4 and 6	At least 75% of treated water production sources are metered, or at least 90% of the source flow is derived from metered sources. Meter accuracy testing and/or electronic calibration of related instrumentation is conducted annually. Less than 25% of tested meters are found outside of +/- 6% accuracy.	Conditions between 6 and 8	100% of treated water production sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted annually, less than 10% of meters are found outside of +/- 6% accuracy	Conditions between 8 and 10	100% of treated water production sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted semi-annually, with less than 10% found outside of +/- 3% accuracy. Procedures are reviewed by a third party knowledgeable in the M36 methodology.
Improvements to attain higher data grading for "Volume from own Sources" component:		to qualify for 2: Organize and launch efforts to collect data for determining volume from own sources	to qualify for 4: Locate all water production sources on maps and in the field, launch meter accuracy testing for existing meters, begin to install meters on unmetered water production sources and replace any obsolete/defective meters.		to qualify for 6: Formalize annual meter accuracy testing for all source meters; specify the frequency of testing. Complete installation of meters on unmetered water production sources and complete replacement of all obsolete/defective meters.		to qualify for 8: Conduct annual meter accuracy testing and calibration of related instrumentation on all meter installations on a regular basis. Complete project to install new, or replace defective existing, meters so that entire production meter population is metered. Repair or replace meters outside of +/- 6% accuracy.		to qualify for 10: Maintain annual meter accuracy testing and calibration of related instrumentation for all meter installations. Repair or replace meters outside of +/- 3% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to further improve meter accuracy.		to maintain 10: Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology.
Volume from own sources master meter and supply error adjustment:	Select n/a only if the water utility fails to have meters on its sources of supply	Inventory information on meters and paper records of measured volumes exist but are incomplete and/or in a very crude condition; data error cannot be determined	No automatic datalogging of production volumes; daily readings are scribed on paper records without any accountability controls. Flows are not balanced across the water distribution system: tank/storage elevation changes are not employed in calculating the "Volume from own sources" component and archived flow data is adjusted only when grossly evident data error occurs.	Conditions between 2 and 4	Production meter data is logged automatically in electronic format and reviewed at least on a monthly basis with necessary corrections implemented. "Volume from own sources" tabulations include estimate of daily changes in tanks/storage facilities. Meter data is adjusted when gross data errors occur, or occasional meter testing deems this necessary.	Conditions between 4 and 6	Hourly production meter data logged automatically & reviewed on at least a weekly basis. Data is adjusted to correct gross error when meter/instrumentation equipment malfunction is detected; and/or error is confirmed by meter accuracy testing. Tank/storage facility elevation changes are automatically used in calculating a balanced "Volume from own sources" component, and data gaps in the archived data are corrected on at least a weekly basis.	Conditions between 6 and 8	Continuous production meter data is logged automatically & reviewed each business day. Data is adjusted to correct gross error from detected meter/instrumentation equipment malfunction and/or results of meter accuracy testing. Tank/storage facility elevation changes are automatically used in "Volume from own sources" tabulations and data gaps in the archived data are corrected on a daily basis.	Conditions between 8 and 10	Computerized system (SCADA or similar) automatically balances flows from all sources and storages; results are reviewed each business day. Tight accountability controls ensure that all data gaps that occur in the archived flow data are quickly detected and corrected. Regular calibrations between SCADA and sources meters ensures minimal data transfer error.
Improvements to attain higher data grading for "Master meter and supply error adjustment" component:		to qualify for 2: Develop a plan to restructure recordkeeping system to capture all flow data; set a procedure to review flow data on a daily basis to detect input errors. Obtain more reliable information about existing meters by conducting field inspections of meters and related instrumentation, and obtaining manufacturer literature.	to qualify for 4: Install automatic datalogging equipment on production meters. Complete installation of level instrumentation at all tanks/storage facilities and include tank level data in automatic calculation routine in a computerized system. Construct a computerized listing or spreadsheet to archive input volumes, tank/storage volume changes and import/export flows in order to determine the composite "Water Supplied" volume for the distribution system. Set a procedure to review this data on a monthly basis to detect gross anomalies and data gaps.		to qualify for 6: Refine computerized data collection and archive to include hourly production meter data that is reviewed at least on a weekly basis to detect specific data anomalies and gaps. Use daily net storage change to balance flows in calculating "Water Supplied" volume. Necessary corrections to data errors are implemented on a weekly basis.		to qualify for 8: Ensure that all flow data is collected and archived on at least an hourly basis. All data is reviewed and detected errors corrected each business day. Tank/storage levels variations are employed in calculating balanced "Water Supplied" component. Adjust production meter data for gross error and inaccuracy confirmed by testing.		to qualify for 10: Link all production and tank/storage facility elevation change data to a Supervisory Control & Data Acquisition (SCADA) System, or similar computerized monitoring/control system, and establish automatic flow balancing algorithm and regularly calibrate between SCADA and source meters. Data is reviewed and corrected each business day.		to maintain 10: Monitor meter innovations for development of more accurate and less expensive flowmeters. Continue to replace or repair meters as they perform outside of desired accuracy limits. Stay abreast of new and more accurate water level instruments to better record tank/storage levels and archive the variations in storage volume. Keep current with SCADA and data management systems to ensure that archived data is well-managed and error free.
Water Imported:	Select n/a if the water utility's supply is exclusively from its own water resources (no bulk purchased/ imported water)	Less than 25% of imported water sources are metered, remaining sources are estimated. No regular meter accuracy testing.	25% - 50% of imported water sources are metered; other sources estimated. No regular meter accuracy testing.	Conditions between 2 and 4	50% - 75% of imported water sources are metered, other sources estimated. Occasional meter accuracy testing conducted.	Conditions between 4 and 6	At least 75% of imported water sources are metered, meter accuracy testing and/or electronic calibration of related instrumentation is conducted annually for all meter installations. Less than 25% of tested meters are found outside of +/- 6% accuracy.	Conditions between 6 and 8	100% of imported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted annually, less than 10% of meters are found outside of +/- 6% accuracy	Conditions between 8 and 10	100% of imported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted semi-annually for all meter installations, with less than 10% of accuracy tests found outside of +/- 3% accuracy.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Improvements to attain higher data grading for "Water Imported Volume" component: (*Note: usually the water supplier selling the water - "the Exporter" - to the utility being audited is responsible to maintain the metering installation measuring the imported volume. The utility should coordinate carefully with the Exporter to ensure that adequate meter upkeep takes place and an accurate measure of the Water Imported volume is quantified.*)		to qualify for 2: Review bulk water purchase agreements with partner suppliers; confirm requirements for use and maintenance of accurate metering. Identify needs for new or replacement meters with goal to meter all imported water sources.	To qualify for 4: Locate all imported water sources on maps and in the field, launch meter accuracy testing for existing meters, begin to install meters on unmetered imported water interconnections and replace obsolete/defective meters.		to qualify for 6: Formalize annual meter accuracy testing for all imported water meters, planning for both regular meter accuracy testing and calibration of the related instrumentation. Continue installation of meters on unmetered imported water interconnections and replacement of obsolete/defective meters.		to qualify for 8: Complete project to install new, or replace defective, meters on all imported water interconnections. Maintain annual meter accuracy testing for all imported water meters and conduct calibration of related instrumentation at least annually. Repair or replace meters outside of +/- 6% accuracy.		to qualify for 10: Conduct meter accuracy testing for all meters on a semi-annual basis, along with calibration of all related instrumentation. Repair or replace meters outside of +/- 3% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to improve meter accuracy.		to maintain 10: Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Continue to conduct calibration of related instrumentation on a semi-annual basis. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology.
Water imported master meter and supply error adjustment:	Select n/a if the Imported water supply is unmetered, with Imported water quantities estimated on the billing invoices sent by the Exporter to the purchasing Utility.	Inventory information on imported meters and paper records of measured volumes exist but are incomplete and/or in a very crude condition; data error cannot be determined Written agreement(s) with water Exporter(s) are missing or written in vague language concerning meter management and testing.	No automatic datalogging of imported supply volumes; daily readings are scribed on paper records without any accountability controls to confirm data accuracy and the absence of errors and data gaps in recorded volumes. Written agreement requires meter accuracy testing but is vague on the details of how and who conducts the testing.	Conditions between 2 and 4	Imported supply metered flow data is logged automatically in electronic format and reviewed at least on a monthly basis by the Exporter with necessary corrections implemented. Meter data is adjusted by the Exporter when gross data errors are detected. A coherent data trail exists for this process to protect both the selling and the purchasing Utility. Written agreement exists and clearly states requirements and roles for meter accuracy testing and data management.	Conditions between 4 and 6	Hourly Imported supply metered data is logged automatically & reviewed on at least a weekly basis by the Exporter. Data is adjusted to correct gross error when meter/instrumentation equipment malfunction is detected; and to correct for error confirmed by meter accuracy testing. Any data gaps in the archived data are detected and corrected during the weekly review. A coherent data trail exists for this process to protect both the selling and the purchasing Utility.	Conditions between 6 and 8	Continuous Imported supply metered flow data is logged automatically & reviewed each business day by the Exporter. Data is adjusted to correct gross error from detected meter/instrumentation equipment malfunction and/or results of meter accuracy testing. Any data errors/gaps are detected and corrected on a daily basis. A data trail exists for the process to protect both the selling and the purchasing Utility.	Conditions between 8 and 10	Computerized system (SCADA or similar) automatically records data which is reviewed each business day by the Exporter. Tight accountability controls ensure that all error/data gaps that occur in the archived flow data are quickly detected and corrected. A reliable data trail exists and contract provisions for meter testing and data management are reviewed by the selling and purchasing Utility at least once every five years.
Improvements to attain higher data grading for "Water imported master meter and supply error adjustment" component:		to qualify for 2: Develop a plan to restructure recordkeeping system to capture all flow data; set a procedure to review flow data on a daily basis to detect input errors. Obtain more reliable information about existing meters by conducting field inspections of meters and related instrumentation, and obtaining manufacturer literature. Review the written agreement between the selling and purchasing Utility.	to qualify for 4: Install automatic datalogging equipment on Imported supply meters. Set a procedure to review this data on a monthly basis to detect gross anomalies and data gaps. Launch discussions with the Exporters to jointly review terms of the written agreements regarding meter accuracy testing and data management; revise the terms as necessary.		to qualify for 6: Refine computerized data collection and archive to include hourly Imported supply metered flow data that is reviewed at least on a weekly basis to detect specific data anomalies and gaps. Make necessary corrections to errors/data errors on a weekly basis.		to qualify for 8: Ensure that all Imported supply metered flow data is collected and archived on at least an hourly basis. All data is reviewed and errors/data gaps are corrected each business day.		to qualify for 10: Conduct accountability checks to confirm that all Imported supply metered data is reviewed and corrected each business day by the Exporter. Results of all meter accuracy tests and data corrections should be available for sharing between the Exporter and the purchasing Utility. Establish a schedule for a regular review and updating of the contractual language in the written agreement between the selling and the purchasing Utility; at least every five years.		to maintain 10: Monitor meter innovations for development of more accurate and less expensive flowmeters; work with the Exporter to help identify meter replacement needs. Keep communication lines with Exporters open and maintain productive relations. Keep the written agreement current with clear and explicit language that meets the ongoing needs of all parties.
Water Exported:	Select n/a if the water utility sells no bulk water to neighboring water utilities (no exported water sales)	Less than 25% of exported water sources are metered, remaining sources are estimated. No regular meter accuracy testing.	25% - 50% of exported water sources are metered; other sources estimated. No regular meter accuracy testing.	Conditions between 2 and 4	50% - 75% of exported water sources are metered, other sources estimated. Occasional meter accuracy testing conducted.	Conditions between 4 and 6	At least 75% of exported water sources are metered, meter accuracy testing and/or electronic calibration conducted annually. Less than 25% of tested meters are found outside of +/- 6% accuracy.	Conditions between 6 and 8	100% of exported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted annually, less than 10% of meters are found outside of +/- 6% accuracy	Conditions between 8 and 10	100% of exported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted semi-annually for all meter installations, with less than 10% of accuracy tests found outside of +/- 3% accuracy.
Improvements to attain higher data grading for "Water Exported Volume" component: (*Note: usually, if the water utility being audited sells (Exports) water to a neighboring purchasing Utility, it is the responsibility of the utility exporting the water to maintain the metering installation measuring the Exported volume. The utility exporting the water should ensure that adequate meter upkeep takes place and an accurate measure of the Water Exported volume is quantified.*)		to qualify for 2: Review bulk water sales agreements with purchasing utilities; confirm requirements for use & upkeep of accurate metering. Identify needs to install new, or replace defective meters as needed.	To qualify for 4: Locate all exported water sources on maps and in field, launch meter accuracy testing for existing meters, begin to install meters on unmetered exported water interconnections and replace obsolete/defective meters		to qualify for 6: Formalize annual meter accuracy testing for all exported water meters. Continue installation of meters on unmetered exported water interconnections and replacement of obsolete/defective meters.		to qualify for 8: Complete project to install new, or replace defective, meters on all exported water interconnections. Maintain annual meter accuracy testing for all exported water meters. Repair or replace meters outside of +/- 6% accuracy.		to qualify for 10: Maintain annual meter accuracy testing for all meters. Repair or replace meters outside of +/- 3% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to improve meter accuracy.		to maintain 10: Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Water exported master meter and supply error adjustment:	Select n/a only if the water utility fails to have meters on its exported supply interconnections.	Inventory information on exported meters and paper records of measured volumes exist but are incomplete and/or in a very crude condition; data error cannot be determined Written agreement(s) with the utility purchasing the water are missing or written in vague language concerning meter management and testing.	No automatic datalogging of exported supply volumes; daily readings are scribed on paper records without any accountability controls to confirm data accuracy and the absence of errors and data gaps in recorded volumes. Written agreement requires meter accuracy testing but is vague on the details of how and who conducts the testing.	Conditions between 2 and 4	Exported metered flow data is logged automatically in electronic format and reviewed at least on a monthly basis, with necessary corrections implemented. Meter data is adjusted by the utility selling (exporting) the water when gross data errors are detected. A coherent data trail exists for this process to protect both the utility exporting the water and the purchasing Utility. Written agreement exists and clearly states requirements and roles for meter accuracy testing and data management.	Conditions between 4 and 6	Hourly exported supply metered data is logged automatically & reviewed on at least a weekly basis by the utility selling the water. Data is adjusted to correct gross error when meter/instrumentation equipment malfunction is detected; and to correct for error found by meter accuracy testing. Any data gaps in the archived data are detected and corrected during the weekly review. A coherent data trail exists for this process to protect both the selling (exporting) utility and the purchasing Utility.	Conditions between 6 and 8	Continuous exported supply metered flow data is logged automatically & reviewed each business day by the utility selling (exporting) the water. Data is adjusted to correct gross error from detected meter/instrumentation equipment malfunction and any error confirmed by meter accuracy testing. Any data errors/gaps are detected and corrected on a daily basis. A data trail exists for the process to protect both the selling (exporting) Utility and the purchasing Utility.	Conditions between 8 and 10	Computerized system (SCADA or similar) automatically records data which is reviewed each business day by the utility selling (exporting) the water. Tight accountability controls ensure that all error/data gaps that occur in the archived flow data are quickly detected and corrected. A reliable data trail exists and contract provisions for meter testing and data management are reviewed by the selling Utility and purchasing Utility at least once every five years.
Improvements to attain higher data grading for "Water exported master meter and supply error adjustment" component:		to qualify for 2: Develop a plan to restructure recordkeeping system to capture all flow data; set a procedure to review flow data on a daily basis to detect input errors. Obtain more reliable information about existing meters by conducting field inspections of meters and related instrumentation, and obtaining manufacturer literature. Review the written agreement between the utility selling (exporting) the water and the purchasing Utility.	to qualify for 4: Install automatic datalogging equipment on exported supply meters. Set a procedure to review this data on a monthly basis to detect gross anomalies and data gaps. Launch discussions with the purchasing utilities to jointly review terms of the written agreements regarding meter accuracy testing and data management; revise the terms as necessary.		to qualify for 6: Refine computerized data collection and archive to include hourly exported supply metered flow data that is reviewed at least on a weekly basis to detect specific data anomalies and gaps. Make necessary corrections to errors/data errors on a weekly basis.		to qualify for 8: Ensure that all exported metered flow data is collected and archived on at least an hourly basis. All data is reviewed and errors/data gaps are corrected each business day.		to qualify for 10: Conduct accountability checks to confirm that all exported metered flow data is reviewed and corrected each business day by the utility selling the water. Results of all meter accuracy tests and data corrections should be available for sharing between the utility and the purchasing Utility. Establish a schedule for a regular review and updating of the contractual language in the written agreements with the purchasing utilities; at least every five years.		to maintain 10: Monitor meter innovations for development of more accurate and less expensive flowmeters; work with the purchasing utilities to help identify meter replacement needs. Keep communication lines with the purchasing utilities open and maintain productive relations. Keep the written agreement current with clear and explicit language that meets the ongoing needs of all parties.
AUTHORIZED CONSUMPTION											
Billed metered:	n/a (not applicable). Select n/a only if the entire customer population is not metered and is billed for water service on a flat or fixed rate basis. In such a case the volume entered must be zero.	Less than 50% of customers with volume-based billings from meter readings; flat or fixed rate billing exists for the majority of the customer population	At least 50% of customers with volume-based billing from meter reads; flat rate billing for others. Manual meter reading is conducted, with less than 50% meter read success rate, remainding accounts' consumption is estimated. Limited meter records, no regular meter testing or replacement. Billing data maintained on paper records, with no auditing.	Conditions between 2 and 4	At least 75% of customers with volume-based, billing from meter reads; flat or fixed rate billing for remaining accounts. Manual meter reading is conducted with at least 50% meter read success rate; consumption for accounts with failed reads is estimated. Purchase records verify age of customer meters; only very limited meter accuracy testing is conducted. Customer meters are replaced only upon complete failure. Computerized billing records exist, but only sporadic internal auditing conducted.	Conditions between 4 and 6	At least 90% of customers with volume-based billing from meter reads; consumption for remaining accounts is estimated. Manual customer meter reading gives at least 80% customer meter reading success rate; consumption for accounts with failed reads is estimated. Good customer meter records eixst, but only limited meter accuracy testing is conducted. Regular replacement is conducted for the oldest meters. Computerized billing records exist with annual auditing of summary statistics conducting by utility personnel.	Conditions between 6 and 8	At least 97% of customers exist with volume-based billing from meter reads. At least 90% customer meter reading success rate; or at least 80% read success rate with planning and budgeting for trials of Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) in one or more pilot areas. Good customer meter records. Regular meter accuracy testing guides replacement of statistically significant number of meters each year. Routine auditing of computerized billing records for global and detailed statistics occurs annually by utility personnel, and is verified by third party at least once every five years.	Conditions between 8 and 10	At least 99% of customers exist with volume-based billing from meter reads. At least 95% customer meter reading success rate; or minimum 80% meter reading success rate, with Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) trials underway. Statistically significant customer meter testing and replacement program in place on a continuous basis. Computerized billing with routine, detailed auditing, including field investigation of representative sample of accounts undertaken annually by utility personnel. Audit is conducted by third party auditors at least once every three years.
Improvements to attain higher data grading for "Billed Metered Consumption" component:	If n/a is selected because the customer meter population is unmetered, consider establishing a new policy to meter the customer population and employ water rates based upon metered volumes.	to qualify for 2: Conduct investigations or trials of customer meters to select appropriate meter models. Budget funding for meter installations. Investigate volume based water rate structures.	to qualify for 4: Purchase and install meters on unmetered accounts. Implement policies to improve meter reading success. Catalog meter information during meter read visits to identify age/model of existing meters. Test a minimal number of meters for accuracy. Install computerized billing system.		to qualify for 6: Purchase and install meters on unmetered accounts. Eliminate flat fee billing and establish appropriate water rate structure based upon measured consumption. Continue to achieve verifiable success in removing manual meter reading barriers. Expand meter accuracy testing. Launch regular meter replacement program. Launch a program of annual auditing of global billing statistics by utility personnel.		to qualify for 8: Purchase and install meters on unmetered accounts. If customer meter reading success rate is less than 97%, assess cost-effectiveness of Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) system for portion or entire system; or otherwise achieve ongoing improvements in manual meter reading success rate to 97% or higher. Refine meter accuracy testing program. Set meter replacement goals based upon accuracy test results. Implement annual auditing of detailed billing records by utility personnel and implement third party auditing at least once every five years.		to qualify for 10: Purchase and install meters on unmetered accounts. Launch Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) system trials if manual meter reading success rate of at least 99% is not achieved within a five-year program. Continue meter accuracy testing program. Conduct planning and budgeting for large scale meter replacement based upon meter life cycle analysis using cumulative flow target. Continue annual detailed billing data auditing by utility personnel and conduct third party auditing at least once every three years.		to maintain 10: Continue annual internal billing data auditing, and third party auditing at least every three years. Continue customer meter accuracy testing to ensure that accurate customer meter readings are obtained and entered as the basis for volume based billing. Stay abreast of improvements in Automatic Meter Reading (AMR) and Advanced Metering Infrastructure (AMI) and information management. Plan and budget for justified upgrades in metering, meter reading and billing data management to maintain very high accuracy in customer metering and billing.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Billed unmetered:	Select n/a if it is the policy of the water utility to meter all customer connections and it has been confirmed by detailed auditing that all customers do indeed have a water meter; i.e. no intentionally unmetered accounts exist	Water utility policy does not require customer metering; flat or fixed fee billing is employed. No data is collected on customer consumption. The only estimates of customer population consumption available are derived from data estimation methods using average fixture count multiplied by number of connections, or similar approach.	Water utility policy does not require customer metering; flat or fixed fee billing is employed. Some metered accounts exist in parts of the system (pilot areas or District Metered Areas) with consumption read periodically or recorded on portable dataloggers over one, three, or seven day periods. Data from these sample meters are used to infer consumption for the total customer population. Site specific estimation methods are used for unusual buildings/water uses.	Conditions between 2 and 4	Water utility policy does require metering and volume based billing in general. However, a liberal amount of exemptions and a lack of clearly written and communicated procedures result in up to 20% of billed accounts believed to be unmetered by exemption; or the water utility is in transition to becoming fully metered, and a large number of customers remain unmetered. A rough estimate of the annual consumption for all unmetered accounts is included in the annual water audit, with no inspection of individual unmetered accounts.	Conditions between 4 and 6	Water utility policy does require metering and volume based billing but established exemptions exist for a portion of accounts such as municipal buildings. As many as 15% of billed accounts are unmetered due to this exemption or meter installation difficulties. Only a group estimate of annual consumption for all unmetered accounts is included in the annual water audit, with no inspection of individual unmetered accounts.	Conditions between 6 and 8	Water utility policy does require metering and volume based billing for all customer accounts. However, less than 5% of billed accounts remain unmetered because meter installation is hindered by unusual circumstances. The goal is to minimize the number of unmetered accounts. Reliable estimates of consumption are obtained for these unmetered accounts via site specific estimation methods.	Conditions between 8 and 10	Water utility policy does require metering and volume based billing for all customer accounts. Less than 2% of billed accounts are unmetered and exist because meter installation is hindered by unusual circumstances. The goal exists to minimize the number of unmetered accounts to the extent that is economical. Reliable estimates of consumption are obtained at these accounts via site specific estimation methods.
Improvements to attain higher data grading for "Billed Unmetered Consumption" component:		to qualify for 2: Conduct research and evaluate cost/benefit of a new water utility policy to require metering of the customer population; thereby greatly reducing or eliminating unmetered accounts. Conduct pilot metering project by installing water meters in small sample of customer accounts and periodically reading the meters or datalogging the water consumption over one, three, or seven day periods.	to qualify for 4: Implement a new water utility policy requiring customer metering. Launch or expand pilot metering study to include several different meter types, which will provide data for economic assessment of full scale metering options. Assess sites with access difficulties to devise means to obtain water consumption volumes. Begin customer meter installation.		to qualify for 6: Refine policy and procedures to improve customer metering participation for all but solidly exempt accounts. Assign staff resources to review billing records to identify errant unmetered properties. Specify metering needs and funding requirements to install sufficient meters to significant reduce the number of unmetered accounts		to qualify for 8: Push to install customer meters on a full scale basis. Refine metering policy and procedures to ensure that all accounts, including municipal properties, are designated for meters. Plan special efforts to address "hard-to-access" accounts. Implement procedures to obtain a reliable consumption estimate for the remaining few unmetered accounts awaiting meter installation.		to qualify for 10: Continue customer meter installation throughout the service area, with a goal to minimize unmetered accounts. Sustain the effort to investigate accounts with access difficulties, and devise means to install water meters or otherwise measure water consumption.		to maintain 10: Continue to refine estimation methods for unmetered consumption and explore means to establish metering, for as many billed remaining unmetered accounts as is economically feasible.
Unbilled metered:	select n/a if all billing-exempt consumption is unmetered.	Billing practices exempt certain accounts, such as municipal buildings, but written policies do not exist; and a reliable count of unbilled metered accounts is unavailable. Meter upkeep and meter reading on these accounts is rare and not considered a priority. Due to poor recordkeeping and lack of auditing, water consumption for all such accounts is purely guesstimated.	Billing practices exempt certain accounts, such as municipal buildings, but only scattered, dated written directives exist to justify this practice. A reliable count of unbilled metered accounts is unavailable. Sporadic meter replacement and meter reading occurs on an as-needed basis. The total annual water consumption for all unbilled, metered accounts is estimated based upon approximating the number of accounts and assigning consumption from actively billed accounts of same meter size.	Conditions between 2 and 4	Dated written procedures permit billing exemption for specific accounts, such as municipal properties, but are unclear regarding certain other types of accounts. Meter reading is given low priority and is sporadic. Consumption is quantified from meter readings where available. The total number of unbilled, unmetered accounts must be estimated along with consumption volumes.	Conditions between 4 and 6	Written policies regarding billing exemptions exist but adherence in practice is questionable. Metering and meter reading for municipal buildings is reliable but sporadic for other unbilled metered accounts. Periodic auditing of such accounts is conducted. Water consumption is quantified directly from meter readings where available, but the majority of the consumption is estimated.	Conditions between 6 and 8	Written policy identifies the types of accounts granted a billing exemption. Customer meter management and meter reading are considered secondary priorities, but meter reading is conducted at least annually to obtain consumption volumes for the annual water audit. High level auditing of billing records ensures that a reliable census of such accounts exists.	Conditions between 8 and 10	Clearly written policy identifies the types of accounts given a billing exemption, with emphasis on keeping such accounts to a minimum. Customer meter management and meter reading for these accounts is given proper priority and is reliably conducted. Regular auditing confirms this. Total water consumption for these accounts is taken from reliable readings from accurate meters.
Improvements to attain higher data grading for "Unbilled Metered Consumption" component:		to qualify for 2: Reassess the water utility's policy allowing certain accounts to be granted a billing exemption. Draft an outline of a new written policy for billing exemptions, with clear justification as to why any accounts should be exempt from billing, and with the intention to keep the number of such accounts to a minimum.	to qualify for 4: Review historic written directives and policy documents allowing certain accounts to be billing-exempt. Draft an outline of a written policy for billing exemptions, identify criteria that grants an exemption, with a goal of keeping this number of accounts to a minimum. Consider increasing the priority of reading meters on unbilled accounts at least annually.		to qualify for 6: Draft a new written policy regarding billing exemptions based upon consensus criteria allowing this occurrence. Assign resources to audit meter records and billing records to obtain census of unbilled metered accounts. Gradually include a greater number of these metered accounts to the routes for regular meter reading.		to qualify for 8: Communicate billing exemption policy throughout the organization and implement procedures that ensure proper account management. Conduct inspections of accounts confirmed in unbilled metered status and verify that accurate meters exist and are scheduled for routine meter readings. Gradually increase the number of unbilled metered accounts that are included in regular meter reading routes.		to qualify for 10: Ensure that meter management (meter accuracy testing, meter replacement) and meter reading activities for unbilled accounts are accorded the same priority as billed accounts. Establish ongoing annual auditing process to ensure that water consumption is reliably collected and provided to the annual water audit process.		to maintain 10: Reassess the utility's philosophy in allowing any water uses to go "unbilled". It is possible to meter and bill all accounts, even if the fee charged for water consumption is discounted or waived. Metering and billing all accounts ensures that water consumption is tracked and water waste from plumbing leaks is detected and minimized.
Unbilled unmetered:		Extent of unbilled, unmetered consumption is unknown due to unclear policies and poor recordkeeping. Total consumption is quantified based upon a purely subjective estimate.	Clear extent of unbilled, unmetered consumption is unknown, but a number of events are randomly documented each year, confirming existence of such consumption, but without sufficient documentation to quantify an accurate estimate of the annual volume consumed.	Conditions between 2 and 4	Extent of unbilled, unmetered consumption is partially known, and procedures exist to document certain events such as miscellaneous fire hydrant uses. Formulae is used to quantify the consumption from such events (time running multiplied by typical flowrate, multiplied by number of events).	Default value of 1.25% of system input volume is employed	Coherent policies exist for some forms of unbilled, unmetered consumption but others await closer evaluation. Reasonable recordkeeping for the managed uses exists and allows for annual volumes to be quantified by inference, but unsupervised uses are guesstimated.	Conditions between 6 and 8	Clear policies and good recordkeeping exist for some uses (ex: water used in periodic testing of unmetered fire connections), but other uses (ex: miscellaneous uses of fire hydrants) have limited oversight. Total consumption is a mix of well quantified use such as from formulae (time running multiplied by typical flow, multiplied by number of events) or temporary meters, and relatively subjective estimates of less regulated use.	Conditions between 8 and 10	Clear policies exist to identify permitted use of water in unbilled, unmetered fashion, with the intention of minimizing this type of consumption. Good records document each occurrence and consumption is quantified via formulae (time running multiplied by typical flow, multiplied by number of events) or use of temporary meters.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Improvements to attain higher data grading for "Unbilled Unmetered Consumption" component:		to qualify for 5: Utilize the accepted default value of 1.25% of the volume of water supplied as an expedient means to gain a reasonable quantification of this use. to qualify for 2: Establish a policy regarding what water uses should be allowed to remain as unbilled and unmetered. Consider tracking a small sample of one such use (ex: fire hydrant flushings).	to qualify for 5: Utilize accepted default value of 1.25% of the volume of water supplied as an expedient means to gain a reasonable quantification of this use. to qualify for 4: Evaluate the documentation of events that have been observed. Meet with user groups (ex: for fire hydrants - fire departments, contractors to ascertain their need and/or volume requirements for water from fire hydrants).		to qualify for 5: Utilize accepted default value of 1.25% of the volume of water supplied as an expedient means to gain a reasonable quantification of all such use. This is particularly appropriate for water utilities who are in the early stages of the water auditing process, and should focus on other components since the volume of unbilled, umetered consumption is usually a relatively small quatity component, and other larger-quantity components should take priority.	to qualify for 6 or greater: Finalize policy and begin to conduct field checks to better establish and quantify such usage. Proceed if top-down audit exists and/or a great volume of such use is suspected.	to qualify for 8: Assess water utility policy and procedures for various unmetered usages. For example, ensure that a policy exists and permits are issued for use of fire hydrants by persons outside of the utility. Create written procedures for use and documentation of fire hydrants by water utility personnel. Use same approach for other types of unbilled, unmetered water usage.		to qualify for 10: Refine written procedures to ensure that all uses of unbilled, unmetered water are overseen by a structured permitting process managed by water utility personnel. Reassess policy to determine if some of these uses have value in being converted to billed and/or metered status.		to maintain 10: Continue to refine policy and procedures with intention of reducing the number of allowable uses of water in unbilled and unmetered fashion. Any uses that can feasibly become billed and metered should be converted eventually.
APPARENT LOSSES											
Unauthorized consumption:		Extent of unauthorized consumption is unknown due to unclear policies and poor recordkeeping. Total unauthorized consumption is guesstimated.	Unauthorized consumption is a known occurrence, but its extent is a mystery. There are no requirements to document observed events, but periodic field reports capture some of these occurrences. Total unauthorized consumption is approximated from this limited data.	conditions between 2 and 4	Procedures exist to document some unauthorized consumption such as observed unauthorized fire hydrant openings. Use formulae to quantify this consumption (time running multiplied typical flowrate, multiplied by number of events).	Default value of 0.25% of volume of water supplied is employed	Coherent policies exist for some forms of unauthorized consumption (more than simply fire hydrant misuse) but others await closer evaluation. Reasonable surveillance and recordkeeping exist for occurrences that fall under the policy. Volumes quantified by inference from these records.	Conditions between 6 and 8	Clear policies and good auditable recordkeeping exist for certain events (ex: tampering with water meters, illegal bypasses of customer meters); but other occurrences have limited oversight. Total consumption is a combination of volumes from formulae (time x typical flow) and subjective estimates of unconfirmed consumption.	Conditions between 8 and 10	Clear policies exist to identify all known unauthorized uses of water. Staff and procedures exist to provide enforcement of policies and detect violations. Each occurrence is recorded and quantified via formulae (estimated time running multiplied by typical flow) or similar methods. All records and calculations should exist in a form that can be audited by a third party.
Improvements to attain higher data grading for "Unauthorized Consumption" component:		to qualify for 5: Use accepted default of 0.25% of volume of water supplied. to qualify for 2: Review utility policy regarding what water uses are considered unauthorized, and consider tracking a small sample of one such occurrence (ex: unauthorized fire hydrant openings)	to qualify for 5: Use accepted default of 0.25% of system input volume to qualify for 4: Review utility policy regarding what water uses are considered unauthorized, and consider tracking a small sample of one such occurrence (ex: unauthorized fire hydrant openings)		to qualify for 5: Utilize accepted default value of 0.25% of volume of water supplied as an expedient means to gain a reasonable quantification of all such use. This is particularly appropriate for water utilities who are in the early stages of the water auditing process.	to qualify for 6 or greater: Finalize policy updates to clearly identify the types of water consumption that are authorized from those usages that fall outside of this policy and are, therefore, unauthorized. Begin to conduct regular field checks. Proceed if the top-down audit already exists and/or a great volume of such use is suspected.	to quality for 8: Assess water utility policies to ensure that all known occurrences of unauthorized consumption are outlawed, and that appropriate penalties are prescribed. Create written procedures for detection and documentation of various occurrences of unauthorized consumption as they are uncovered.		to qualify for 10: Refine written procedures and assign staff to seek out likely occurrences of unauthorized consumption. Explore new locking devices, monitors and other technologies designed to detect and thwart unauthorized consumption.		to maintain 10: Continue to refine policy and procedures to eliminate any loopholes that allow or tacitly encourage unauthorized consumption. Continue to be vigilant in detection, documentation and enforcement efforts.
Customer metering inaccuracies:	select n/a only if the entire customer population is unmetered. In such a case the volume entered must be zero.	Customer meters exist, but with unorganized paper records on meters; no meter accuracy testing or meter replacement program for any size of retail meter. Metering workflow is driven chaotically with no proactive management. Loss volume due to aggregate meter inaccuracy is guesstimated.	Poor recordkeeping and meter oversight is recognized by water utility management who has allotted staff and funding resources to organize improved recordkeeping and start meter accuracy testing. Existing paper records gathered and organized to provide cursory disposition of meter population. Customer meters are tested for accuracy only upon customer request.	Conditions between 2 and 4	Reliable recordkeeping exists; meter information is improving as meters are replaced. Meter accuracy testing is conducted annually for a small number of meters (more than just customer requests, but less than 1% of inventory). A limited number of the oldest meters are replaced each year. Inaccuracy volume is largely an estimate, but refined based upon limited testing data.	Conditions between 4 and 6	A reliable electronic recordkeeping system for meters exists. The meter population includes a mix of new high performing meters and dated meters with suspect accuracy. Routine, but limited, meter accuracy testing and meter replacement occur. Inaccuracy volume is quantified using a mix of reliable and less certain data.	Conditions between 6 and 8	Ongoing meter replacement and accuracy testing result in highly accurate customer meter population. Testing is conducted on samples of meters of varying age and accumulated volume of throughput to determine optimum replacement time for various types of meters.	Ongoing meter replacement and accuracy testing result in highly accurate customer meter population. Statistically significant number of meters are tested in audit year. This testing is conducted on samples of meters of varying age and accumulated volume of throughput to determine optimum replacement time for these meters.	Good records of all active customer meters exist and include as a minimum: meter number, account number/location, type, size and manufacturer. Ongoing meter replacement occurs according to a targeted and justified basis. Regular meter accuracy testing gives a reliable measure of composite inaccuracy volume for the customer meter population. New metering technology is embraced to keep overall accuracy improving. Procedures are reviewed by a third party knowledgeable in the M36 methodology.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Improvements to attain higher data grading for "Customer meter inaccuracy volume" component:	If n/a is selected because the customer meter population is unmetered, consider establishing a new policy to meter the customer population and employ water rates based upon metered volumes.	to qualify for 2: Gather available meter purchase records. Conduct testing on a small number of meters believed to be the most inaccurate. Review staffing needs of the metering group and budget for necessary resources to better organize meter management.	to qualify for 4: Implement a reliable record keeping system for customer meter histories, preferably using electronic methods typically linked to, or part of, the Customer Billing System or Customer Information System. Expand meter accuracy testing to a larger group of meters.		to qualify for 6: Standardize the procedures for meter recordkeeping within an electronic information system. Accelerate meter accuracy testing and meter replacements guided by testing results.		to qualify for 8: Expand annual meter accuracy testing to evaluate a statistically significant number of meter makes/models. Expand meter replacement program to replace statistically significant number of poor performing meters each year.		to qualify for 9: Continue efforts to manage meter population with reliable recordkeeping. Test a statistically significant number of meters each year and analyze test results in an ongoing manner to serve as a basis for a target meter replacement strategy based upon accumulated volume throughput.	to qualify for 10: Continue efforts to manage meter population with reliable recordkeeping, meter testing and replacement. Evaluate new meter types and install one or more types in 5-10 customer accounts each year in order to pilot improving metering technology.	to maintain 10: Increase the number of meters tested and replaced as justified by meter accuracy test data. Continually monitor development of new metering technology and Advanced Metering Infrastructure (AMI) to grasp opportunities for greater accuracy in metering of water flow and management of customer consumption data.
Systematic Data Handling Errors:	Note: all water utilities incur some amount of this error. Even in water utilities with unmetered customer populations and fixed rate billing, errors occur in annual billing tabulations. Enter a positive value for the volume and select a grading.	Policies and procedures for activation of new customer water billing accounts are vague and lack accountability. Billing data is maintained on paper records which are not well organized. No auditing is conducted to confirm billing data handling efficiency. An unknown number of customers escape routine billing due to lack of billing process oversight.	Policy and procedures for activation of new customer accounts and oversight of billing records exist but need refinement. Billing data is maintained on paper records or insufficiently capable electronic database. Only periodic unstructured auditing work is conducted to confirm billing data handling efficiency. The volume of unbilled water due to billing lapses is a guess.	Conditions between 2 and 4	Policy and procedures for new account activation and oversight of billing operations exist but needs refinement. Computerized billing system exists, but is dated or lacks needed functionality. Periodic, limited internal audits conducted and confirm with approximate accuracy the consumption volumes lost to billing lapses.	Conditions between 4 and 6	Policy and procedures for new account activation and oversight of billing operations is adequate and reviewed periodically. Computerized billing system is in use with basic reporting available. Any effect of billing adjustments on measured consumption volumes is well understood. Internal checks of billing data error conducted annually. Reasonably accurate quantification of consumption volume lost to billing lapses is obtained.	Conditions between 6 and 8	New account activation and billing operations policy and procedures are reviewed at least biannually. Computerized billing system includes an array of reports to confirm billing data and system functionality. Checks are conducted routinely to flag and explain zero consumption accounts. Annual internal checks conducted with third party audit conducted at least once every five years. Accountability checks flag billing lapses. Consumption lost to billing lapses is well quantified and reducing year-by-year.	Conditions between 8 and 10	Sound written policy and procedures exist for new account activation and oversight of customer billing operations. Robust computerized billing system gives high functionality and reporting capabilities which are utilized, analyzed and the results reported each billing cycle. Assessment of policy and data handling errors are conducted internally and audited by third party at least once every three years, ensuring consumption lost to billing lapses is minimized and detected as it occurs.
Improvements to attain higher data grading for "Systematic Data Handling Error volume" component:		to qualify for 2: Draft written policy and procedures for activating new water billing accounts and oversight of billing operations. Investigate and budget for computerized customer billing system. Conduct initial audit of billing records by flow-charting the basic business processes of the customer account/billing function.	to qualify for 4: Finalize written policy and procedures for activation of new billing acocunts and overall billing operations management. Implement a computerized customer billing system. Conduct initial audit of billing records as part of this process.		to qualify for 6: Refine new account activation and billing operations procedures and ensure consistency with the utility policy regarding billing, and minimize opportunity for missed billings. Upgrade or replace customer billing system for needed functionality - ensure that billing adjustments don't corrupt the value of consumption volumes. Procedurize internal annual audit process.		to qualify for 8: Formalize regular review of new account activation process and general billing practices. Enhance reporting capability of computerized billing system. Formalize regular auditing process to reveal scope of data handling error. Plan for periodic third party audit to occur at least once every five years.		to qualify for 10: Close policy/procedure loopholes that allow some customer accounts to go unbilled, or data handling errors to exist. Ensure that billing system reports are utilized, analyzed and reported every billing cycle. Ensure that internal and third party audits are conducted at least once every three years.		to maintain 10: Stay abreast of customer information management developments and innovations. Monitor developments of Advanced Metering Infrastructure (AMI) and integrate technology to ensure that customer endpoint information is well-monitored and errors/lapses are at an economic minimum.
SYSTEM DATA											
Length of mains:		Poorly assembled and maintained paper as-built records of existing water main installations makes accurate determination of system pipe length impossible. Length of mains is guesstimated.	Paper records in poor or uncertain condition (no annual tracking of installations & abandonments). Poor procedures to ensure that new water mains installed by developers are accurately documented.	Conditions between 2 and 4	Sound written policy and procedures exist for documenting new water main installations, but gaps in management result in a uncertain degree of error in tabulation of mains length.	Conditions between 4 and 6	Sound written policy and procedures exist for permitting and commissioning new water mains. Highly accurate paper records with regular field validation; or electronic records and asset management system in good condition. Includes system backup.	Conditions between 6 and 8	Sound written policy and procedures exist for permitting and commissioning new water mains. Electronic recordkeeping such as a Geographical Information System (GIS) and asset management system are used to store and manage data.	Conditions between 8 and 10	Sound written policy exists for managing water mains extensions and replacements. Geographic Information System (GIS) data and asset management database agree and random field validation proves truth of databases. Records of annual field validation should be available for review.
Improvements to attain higher data grading for "Length of Water Mains" component:		to qualify for 2: Assign personnel to inventory current as-built records and compare with customer billing system records and highway plans in order to verify poorly documented pipelines. Assemble policy documents regarding permitting and documentation of water main installations by the utility and building developers; identify gaps in procedures that result in poor documentation of new water main installations.	to qualify for 4: Complete inventory of paper records of water main installations for several years prior to audit year. Review policy and procedures for commissioning and documenting new water main installation.		to qualify for 6: Finalize updates/improvements to written policy and procedures for permitting/commissioning new main installations. Confirm inventory of records for five years prior to audit year; correct any errors or omissions.		to qualify for 8: Launch random field checks of limited number of locations. Convert to electronic database such as a Geographic Information System (GIS) with backup as justified. Develop written policy and procedures.		to qualify for 10: Link Geographic Information System (GIS) and asset management databases, conduct field verification of data. Record field verification information at least annually.		to maintain 10: Continue with standardization and random field validation to improve the completeness and accuracy of the system.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Number of active AND inactive service connections:		Vague permitting (of new service connections) policy and poor paper recordkeeping of customer connections/billings result in suspect determination of the number of service connections, which may be 10-15% in error from actual count.	General permitting policy exists but paper records, procedural gaps, and weak oversight result in questionable total for number of connections, which may vary 5-10% of actual count.	Conditions between 2 and 4	Written account activation policy and procedures exist, but with some gaps in performance and oversight. Computerized information management system is being brought online to replace dated paper recordkeeping system. Reasonably accurate tracking of service connection installations & abandonments; but count can be up to 5% in error from actual total.	Conditions between 4 and 6	Written new account activation and overall billing policies and procedures are adequate and reviewed periodically. Computerized information management system is in use with annual installations & abandonments totaled. Very limited field verifications and audits. Error in count of number of service connections is believed to be no more than 3%.	Conditions between 6 and 8	Policies and procedures for new account activation and overall billing operations are written, well-structured and reviewed at least biannually. Well-managed computerized information management system exists and routine, periodic field checks and internal system audits are conducted. Counts of connections are no more than 2% in error.	Conditions between 8 and 10	Sound written policy and well managed and audited procedures ensure reliable management of service connection population. Computerized information management system, Customer Billing System, and Geographic Information System (GIS) information agree; field validation proves truth of databases. Count of connections recorded as being in error is less than 1% of the entire population.
Improvements to attain higher data grading for "Number of Active and Inactive Service Connections" component:	**Note: The number of Service Connections does <u>not</u> include fire hydrant leads/lines connecting the hydrant to the water main**	<u>to qualify for 2</u>: Draft new policy and procedures for new account activation and overall billing operations. Research and collect paper records of installations & abandonments for several years prior to audit year.	<u>to qualify for 4</u>: Refine policy and procedures for new account activation and overall billing operations. Research computerized recordkeeping system (Customer Information System or Customer Billing System) to improve documentation format for service connections.		<u>to qualify for 6</u>: Refine procedures to ensure consistency with new account activation and overall billing policy to establish new service connections or decommission existing connections. Improve process to include all totals for at least five years prior to audit year.		<u>to qualify for 8</u>: Formalize regular review of new account activation and overall billing operations policies and procedures. Launch random field checks of limited number of locations. Develop reports and auditing mechanisms for computerized information management system.		<u>to qualify for 10</u>: Close any procedural loopholes that allow installations to go undocumented. Link computerized information management system with Geographic Information System (GIS) and formalize field inspection and information system auditing processes. Documentation of new or decommissioned service connections encounters several levels of checks and balances.		<u>to maintain 10</u>: Continue with standardization and random field validation to improve knowledge of system.
Average length of customer service line:	Note: if customer water meters are located outside of the customer building next to the curb stop or boundary separating utility/customer responsibility, then the auditor should answer "Yes" to the question on the Reporting Worksheet asking about this. If the answer is Yes, the grading description listed under the Grading of 10(a) will be followed, with a value of zero automatically entered at a Grading of 10. See the Service Connection Diagram worksheet for a visual presentation of this distance.	Gradings 1-9 apply if customer properties are unmetered, if customer meters exist and are located inside the customer building premises, or if the water utility owns and is responsible for the entire service connection piping from the water main to the customer building. In any of these cases the average distance between the curb stop or boundary separating utility/customer responsibility for service connection piping, and the typical first point of use (ex: faucet) or the customer meter must be quantified. Gradings of 1-9 are used to grade the validity of the means to quantify this value. (See the "Service Connection Diagram" worksheet)									<u>Either of two conditions can be met for a grading of 10</u>: a) Customer water meters exist outside of customer buildings next to the curb stop or boundary separating utility/customer responsibility for service connection piping. If so, answer "Yes" to the question on the Reporting Working asking about this condition. A value of zero and a Grading of 10 are automatically entered in the Reporting Worksheet . b). Meters exist inside customer buildings, or properties are unmetered. In either case, answer "No" to the Reporting Worksheet question on meter location, and enter a distance determined by the auditor. For a Grading of 10 this value must be a very reliable number from a Geographic Information System (GIS) and confirmed by a statistically valid number of field checks.
		Vague policy exists to define the delineation of water utility ownership and customer ownership of the service connection piping. Curb stops are perceived as the breakpoint but these have not been well-maintained or documented. Most are buried or obscured. Their location varies widely from site-to-site, and estimating this distance is arbitrary due to the unknown location of many curb stops.	Policy requires that the curb stop serves as the delineation point between water utility ownership and customer ownership of the service connection piping. The piping from the water main to the curb stop is the property of the water utility; and the piping from the curb stop to the customer building is owned by the customer. Curb stop locations are not well documented and the average distance is based upon a limited number of locations measured in the field.	Conditions between 2 and 4	Good policy requires that the curb stop serves as the delineation point between water utility ownership and customer ownership of the service connection piping. Curb stops are generally installed as needed and are reasonably documented. Their location varies widely from site-to-site, and an estimate of this distance is hindered by the availability of paper records of limited accuracy.	Conditions between 4 and 6	Clear written policy exists to define utility/customer responsibility for service connection piping. Accurate, well-maintained paper or basic electronic recordkeeping system exists. Periodic field checks confirm piping lengths for a sample of customer properties.	Conditions between 6 and 8	Clearly worded policy standardizes the location of curb stops and meters, which are inspected upon installation. Accurate and well maintained electronic records exist with periodic field checks to confirm locations of service lines, curb stops and customer meter pits. An accurate number of customer properties from the customer billing system allows for reliable averaging of this length.	Conditions between 8 and 10	
Improvements to attain higher data grading for "Average Length of Customer Service Line" component:		<u>to qualify for 2</u>: Research and collect paper records of service line installations. Inspect several sites in the field using pipe locators to locate curb stops. Obtain the length of this small sample of connections in this manner.	<u>to qualify for 4</u>: Formalize and communicate policy delineating utility/customer responsibilities for service connection piping. Assess accuracy of paper records by field inspection of a small sample of service connections using pipe locators as needed. Research the potential migration to a computerized information management system to store service connection data.		<u>to qualify for 6</u>: Establish coherent procedures to ensure that policy for curb stop, meter installation and documentation is followed. Gain consensus within the water utility for the establishment of a computerized information management system.		<u>to qualify for 8</u>: Implement an electronic means of recordkeeping, typically via a customer information system, customer billing system, or Geographic Information System (GIS). Standardize the process to conduct field checks of a limited number of locations.		<u>to qualify for 10</u>: Link customer information management system and Geographic Information System (GIS), standardize process for field verification of data.		<u>to maintain 10</u>: Continue with standardization and random field validation to improve knowledge of service connection configurations and customer meter locations.
Average operating pressure:		Available records are poorly assembled and maintained paper records of supply pump characteristics and water distribution system operating conditions. Average pressure is guesstimated based upon this information and ground elevations from crude topographical maps. Widely varying distribution system pressures due to undulating terrain, high system head loss and weak/erratic pressure controls further compromise the validity of the average pressure calculation.	Limited telemetry monitoring of scattered pumping station and water storage tank sites provides some static pressure data, which is recorded in handwritten logbooks. Pressure data is gathered at individual sites only when low pressure complaints arise. Average pressure is determined by averaging relatively crude data, and is affected by significant variation in ground elevations, system head loss and gaps in pressure controls in the distribution system.	Conditions between 2 and 4	Effective pressure controls separate different pressure zones; moderate pressure variation across the system, occasional open boundary valves are discovered that breech pressure zones. Basic telemetry monitoring of the distribution system logs pressure data electronically. Pressure data gathered by gauges or dataloggers at fire hydrants or buildings when low pressure complaints arise, and during fire flow tests and system flushing. Reliable topographical data exists. Average pressure is calculated using this mix of data.	Conditions between 4 and 6	Reliable pressure controls separate distinct pressure zones; only very occasional open boundary valves are encountered that breech pressure zones. Well-covered telemetry monitoring of the distribution system (not just pumping at source treatment plants or wells) logs extensive pressure data electronically. Pressure gathered by gauges/dataloggers at fire hydrants and buildings when low pressure complaints arise, and during fire flow tests and system flushing. Average pressure is determined by using this mix of reliable data.	Conditions between 6 and 8	Well-managed, discrete pressure zones exist with generally predictable pressure fluctuations. A current full-scale SCADA System or similar realtime monitoring system exists to monitor the water distribution system and collect data, including real time pressure readings at representative sites across the system. The average system pressure is determined from reliable monitoring system data.	Conditions between 8 and 10	Well-managed pressure districts/zones, SCADA System and hydraulic model exist to give very precise pressure data across the water distribution system. Average system pressure is reliably calculated from extensive, reliable, and cross-checked data. Calculations are reported on an annual basis as a minimum.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Improvements to attain higher data grading for "Average Operating Pressure" component:		to qualify for 2: Employ pressure gauging and/or datalogging equipment to obtain pressure measurements from fire hydrants. Locate accurate topographical maps of service area in order to confirm ground elevations. Research pump data sheets to find pump pressure/flow characteristics	to qualify for 4: Formalize a procedure to use pressure gauging/datalogging equipment to gather pressure data during various system events such as low pressure complaints, or operational testing. Gather pump pressure and flow data at different flow regimes. Identify faulty pressure controls (pressure reducing valves, altitude valves, partially open boundary valves) and plan to properly configure pressure zones. Make all pressure data from these efforts available to generate system-wide average pressure.		to qualify for 6: Expand the use of pressure gauging/datalogging equipment to gather scattered pressure data at a representative set of sites, based upon pressure zones or areas. Utilize pump pressure and flow data to determine supply head entering each pressure zone or district. Correct any faulty pressure controls (pressure reducing valves, altitude valves, partially open boundary valves) to ensure properly configured pressure zones. Use expanded pressure dataset from these activities to generate system-wide average pressure.		to qualify for 8: Install a Supervisory Control and Data Acquisition (SCADA) System, or similar realtime monitoring system, to monitor system parameters and control operations. Set regular calibration schedule for instrumentation to insure data accuracy. Obtain accurate topographical data and utilize pressure data gathered from field surveys to provide extensive, reliable data for pressure averaging.		to qualify for 10: Annually, obtain a system-wide average pressure value from the hydraulic model of the distribution system that has been calibrated via field measurements in the water distribution system and confirmed in comparisons with SCADA System data.		to maintain 10: Continue to refine the hydraulic model of the distribution system and consider linking it with SCADA System for real-time pressure data calibration, and averaging.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
COST DATA											
Total annual cost of operating water system:		Incomplete paper records and lack of financial accounting documentation on many operating functions makes calculation of water system operating costs a pure guesstimate	Reasonably maintained, but incomplete, paper or electronic accounting provides data to estimate the major portion of water system operating costs.	Conditions between 2 and 4	Electronic, industry-standard cost accounting system in place. However, gaps in data are known to exist, periodic internal reviews are conducted but not a structured financial audit.	Conditions between 4 and 6	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited periodically by utility personnel, but not a Certified Public Accountant (CPA).	Conditions between 6 and 8	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited at least annually by utility personnel, and at least once every three years by third-party CPA.	Conditions between 8 and 10	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited annually by utility personnel and annually also by third-party CPA.
Improvements to attain higher data grading for "Total Annual Cost of Operating the Water System" component:		to qualify for 2: Gather available records, institute new financial accounting procedures to regularly collect and audit basic cost data of most important operations functions.	to qualify for 4: Implement an electronic cost accounting system, structured according to accounting standards for water utilities		to qualify for 6: Establish process for periodic internal audit of water system operating costs; identify cost data gaps and institute procedures for tracking these outstanding costs.		to qualify for 8: Standardize the process to conduct routine financial audit on an annual basis. Arrange for CPA audit of financial records at least once every three years.		to qualify for 10: Standardize the process to conduct a third-party financial audit by a CPA on an annual basis.		to maintain 10: Maintain program, stay abreast of expenses subject to erratic cost changes and long-term cost trend, and budget/track costs proactively
Customer retail unit cost (applied to Apparent Losses):	Customer population unmetered, and/or only a fixed fee is charged for consumption.	Antiquated, cumbersome water rate structure is used, with periodic historic amendments that were poorly documented and implemented; resulting in classes of customers being billed inconsistent charges. The actual composite billing rate likely differs significantly from the published water rate structure, but a lack of auditing leaves the degree of error indeterminate.	Dated, cumbersome water rate structure, not always employed consistently in actual billing operations. The actual composite billing rate is known to differ from the published water rate structure, and a reasonably accurate estimate of the degree of error is determined, allowing a composite billing rate to be quantified.	Conditions between 2 and 4	Straight-forward water rate structure in use, but not updated in several years. Billing operations reliably employ the rate structure. The composite billing rate is derived from a single customer class such as residential customer accounts, neglecting the effect of different rates from varying customer classes.	Conditions between 4 and 6	Clearly written, up-to-date water rate structure is in force and is applied reliably in billing operations. Composite customer rate is determined using a weighted average residential rate using volumes of water in each rate block.	Conditions between 6 and 8	Effective water rate structure is in force and is applied reliably in billing operations. Composite customer rate is determined using a weighted average composite consumption rate, which includes residential, commercial, industrial, institutional (CII), and any other distinct customer classes within the water rate structure.	Conditions between 8 and 10	Current, effective water rate structure is in force and applied reliably in billing operations. The rate structure and calculations of composite rate - which includes residential, commercial, industrial, institutional (CII), and other distinct customer classes - are reviewed by a third party knowledgeable in the M36 methodology at least once every five years.
Improvements to attain higher data grading for "Customer Retail Unit Cost" component:		to qualify for 2: Formalize the process to implement water rates, including a secure documentation procedure. Create a current, formal water rate document and gain approval from all stakeholders.	to qualify for 4: Review the water rate structure and update/formalize as needed. Assess billing operations to ensure that actual billing operations incorporate the established water rate structure.		to qualify for 6: Evaluate volume of water used in each usage block by residential users. Multiply volumes by full rate structure.	Launch effort to fully meter the customer population and charge rates based upon water volumes	to qualify for 8: Evaluate volume of water used in each usage block by all classifications of users. Multiply volumes by full rate structure.		to qualify for 10: Conduct a periodic third-party audit of water used in each usage block by all classifications of users. Multiply volumes by full rate structure.		to maintain 10: Keep water rate structure current in addressing the water utility's revenue needs. Update the calculation of the customer unit rate as new rate components, customer classes, or other components are modified.
Variable production cost (applied to Real Losses):	Note: if the water utility purchases/imports its entire water supply, then enter the unit purchase cost of the bulk water supply in the Reporting Worksheet with a grading of 10	Incomplete paper records and lack of documentation on primary operating functions (electric power and treatment costs most importantly) makes calculation of variable production costs a pure guesstimate	Reasonably maintained, but incomplete, paper or electronic accounting provides data to roughly estimate the basic operations costs (pumping power costs and treatment costs) and calculate a unit variable production cost.	Conditions between 2 and 4	Electronic, industry-standard cost accounting system in place. Electric power and treatment costs are reliably tracked and allow accurate weighted calculation of unit variable production costs based on these two inputs and water imported purchase costs (if applicable). All costs are audited internally on a periodic basis.	Conditions between 4 and 6	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Pertinent additional costs beyond power, treatment and water imported purchase costs (if applicable) such as liability, residuals management, wear and tear on equipment, impending expansion of supply, are included in the unit variable production cost, as applicable. The data is audited at least annually by utility personnel.	Conditions between 6 and 8	Reliable electronic, industry-standard cost accounting system in place, with all pertinent primary and secondary variable production and water imported purchase (if applicable) costs tracked. The data is audited at least annually by utility personnel, and at least once every three years by a third-party knowledgeable in the M36 methodology.	Conditions between 8 and 10	Either of two conditions can be met to obtain a grading of 10: 1) Third party CPA audit of all pertinent primary and secondary variable production and water imported purchase (if applicable) costs on an annual basis. or: 2) Water supply is entirely purchased as bulk water imported, and the unit purchase cost - including all applicable marginal supply costs - serves as the variable production cost. If all applicable marginal supply costs are not included in this figure, a grade of 10 should not be selected.
Improvements to attain higher data grading for "Variable Production Cost" component:		to qualify for 2: Gather available records, institute new procedures to regularly collect and audit basic cost data and most important operations functions.	to qualify for 4: Implement an electronic cost accounting system, structured according to accounting standards for water utilities		to qualify for 6: Formalize process for regular internal audits of production costs. Assess whether additional costs (liability, residuals management, equipment wear, impending infrastructure expansion) should be included to calculate a more representative variable production cost.		to qualify for 8: Formalize the accounting process to include direct cost components (power, treatment) as well as indirect cost components (liability, residuals management, etc.) Arrange to conduct audits by a knowledgable third-party at least once every three years.		to qualify for 10: Standardize the process to conduct a third-party financial audit by a CPA on an annual basis.		to maintain 10: Maintain program, stay abreast of expenses subject to erratic cost changes and budget/track costs proactively

Average Length of Customer Service Line

The three figures shown on this worksheet display the assignment of the Average Length of Customer Service Line, Lp, for the three most common piping configurations.

Figure 1 shows the configuration of the water meter outside of the customer building next to the curb stop valve. In this configuration Lp = 0 since the distance between the curb stop and the customer metering point is essentially zero.

Figure 2 shows the configuration of the customer water meter located inside the customer building, where Lp is the distance from the curb stop to the water meter.

Figure 3 shows the configuration of an unmetered customer building , where Lp is the distance from the curb stop to the first point of customer water consumption, or, more simply, the building line.

In any water system the Lp will vary notably in a community of different structures, therefore the average Lp value is used and this should be approximated or calculated if a sample of service line measurements has been gathered.

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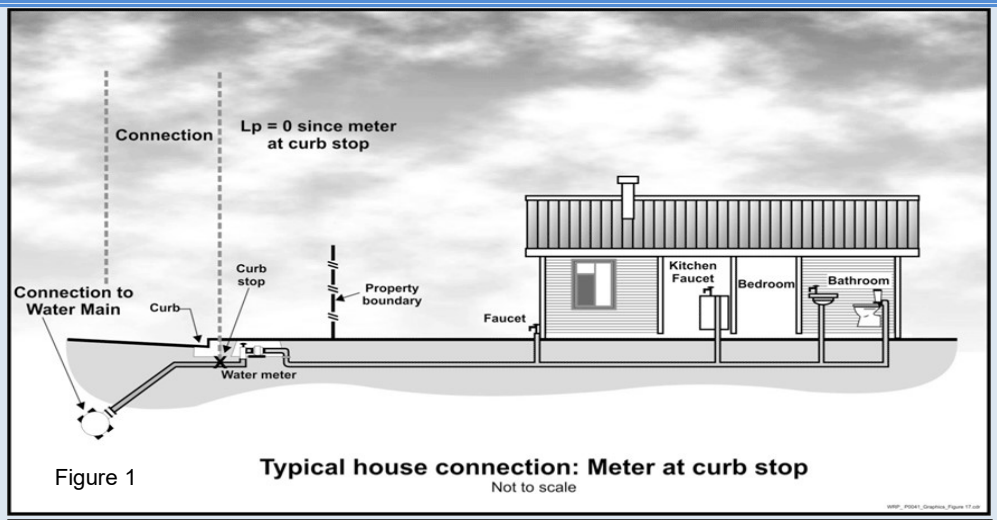


Figure 1 **Typical house connection: Meter at curb stop**
Not to scale

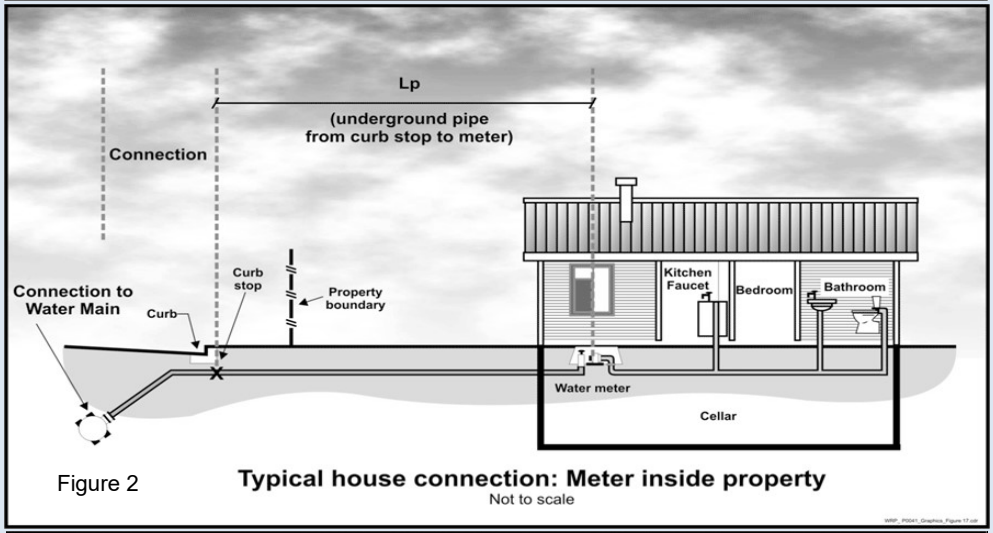


Figure 2 **Typical house connection: Meter inside property**
Not to scale

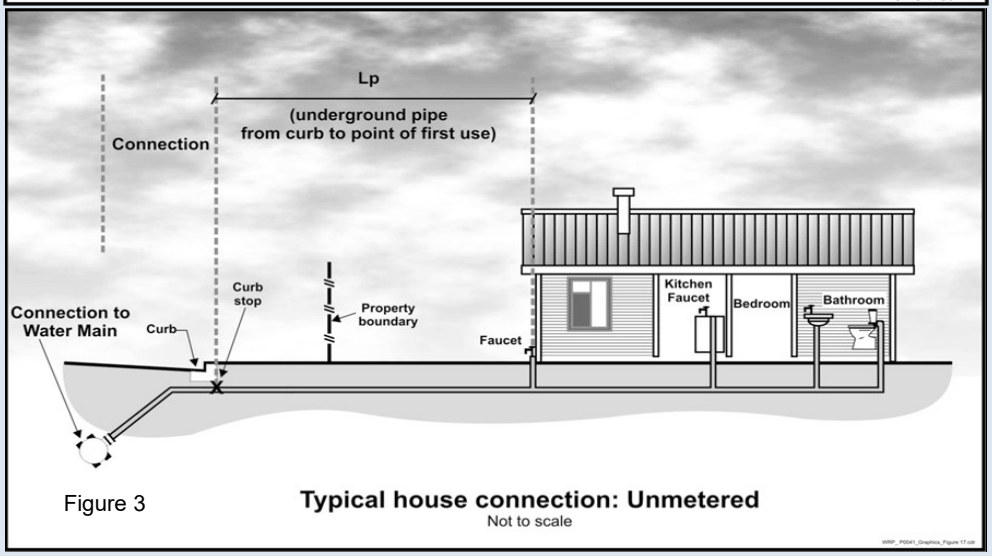


Figure 3 **Typical house connection: Unmetered**
Not to scale

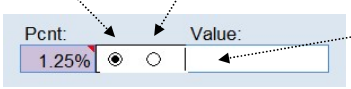
AWWA Free Water Audit Software: Definitions

WAS v5.0

Item Name	Description
Apparent Losses Find	= unauthorized consumption + customer metering inaccuracies + systematic data handling errors Apparent Losses include all types of inaccuracies associated with customer metering (worn meters as well as improperly sized meters or wrong type of meter for the water usage profile) as well as systematic data handling errors (meter reading, billing, archiving and reporting), plus unauthorized consumption (theft or illegal use). NOTE: Over-estimation of Apparent Losses results in under-estimation of Real Losses. Under-estimation of Apparent Losses results in over-estimation of Real Losses.
AUTHORIZED CONSUMPTION Find	= billed water exported + billed metered + billed unmetered + unbilled metered + unbilled unmetered consumption The volume of metered and/or unmetered water taken by registered customers, the water utility's own uses, and uses of others who are implicitly or explicitly authorized to do so by the water utility; for residential, commercial, industrial and public-minded purposes. Typical retail customers' consumption is tabulated usually from established customer accounts as billed metered consumption, or - for unmetered customers - billed unmetered consumption. These types of consumption, along with billed water exported, provide revenue potential for the water utility. **Be certain to tabulate the water exported volume as a separate component and do not "double-count" it by including in the billed metered consumption component as well as the water exported component.** Unbilled authorized consumption occurs typically in non-account uses, including water for fire fighting and training, flushing of water mains and sewers, street cleaning, watering of municipal gardens, public fountains, or similar public-minded uses. Occasionally these uses may be metered and billed (or charged a flat fee), but usually they are unmetered and unbilled. In the latter case, the water auditor may use a default value to estimate this quantity, or implement procedures for the reliable quantification of these uses. This starts with documenting usage events as they occur and estimating the amount of water used in each event. (See Unbilled unmetered consumption)
View Service Connection Diagram **Average length of customer service line** Find	This is the average length of customer service line, Lp, that is owned and maintained by the customer; from the point of ownership transfer to the customer water meter, or building line (if unmetered). The quantity is one of the data inputs for the calculation of Unavoidable Annual Real Losses (UARL), which serves as the denominator of the performance indicator: Infrastructure Leakage Index (ILI). The value of Lp is multiplied by the number of customer service connections to obtain a total length of customer owned piping in the system. The purpose of this parameter is to account for the unmetered service line infrastructure that is the responsibility of the customer for arranging repairs of leaks that occur on their lines. In many cases leak repairs arranged by customers take longer to be executed than leak repairs arranged by the water utility on utility-maintained piping. Leaks run longer - and lose more water - on customer-owned service piping, than utility owned piping. If the customer water meter exists near the ownership transfer point (usually the curb stop located between the water main and the customer premises) this distance is zero because the meter and transfer point are the same. This is the often encountered configuration of customer water meters located in an underground meter box or "pit" outside of the customer's building. The Free Water Audit Software asks a "Yes/No" question about the meter at this location. If the auditor selects "Yes" then this distance is set to zero and the data grading score for this component is set to 10. If water meters are typically located inside the customer premise/building, or properties are unmetered, it is up to the water auditor to estimate a system-wide average Lp length based upon the various customer land parcel sizes and building locations in the service area. Lp will be a shorter length in areas of high density housing, and a longer length in areas of low density housing and varied commercial and industrial buildings. General parcel demographics should be employed to obtain a composite average Lp length for the entire system. Refer to the "Service Connection Diagram" worksheet for a depiction of the service line/metering configurations that typically exist in water utilities. This worksheet gives guidance on the determination of the Average Length, Lp, for each configuration.
Average operating pressure Find	This is the average pressure in the distribution system that is the subject of the water audit. Many water utilities have a calibrated hydraulic model of their water distribution system. For these utilities, the hydraulic model can be utilized to obtain a very accurate quantity of average pressure. In the absence of a hydraulic model, the average pressure may be approximated by obtaining readings of static water pressure from a representative sample of fire hydrants or other system access points evenly located across the system. A weighted average of the pressure can be assembled; but be sure to take into account the elevation of the fire hydrants, which typically exist several feet higher than the level of buried water pipelines. If the water utility is compiling the water audit for the first time, the average pressure can be approximated, but with a low data grading. In subsequent years of auditing, effort should be made to improve the accuracy of the average pressure quantity. This will then qualify the value for a higher data grading.
Billed Authorized Consumption	All consumption that is billed and authorized by the utility. This may include both metered and unmetered consumption. See "Authorized Consumption" for more information.
Billed metered consumption Find	All metered consumption which is billed to retail customers, including all groups of customers such as domestic, commercial, industrial or institutional. **It does NOT include water supplied to neighboring utilities (water exported) which is metered and billed. Be sure to subtract any consumption for exported water sales that may be included in these billing roles. Water supplied as exports to neighboring water utilities should be included only in the Water Exported component.** The metered consumption data can be taken directly from billing records for the water audit period. The accuracy of yearly metered consumption data can be refined by including an adjustment to account for customer meter reading lag time since not all customer meters are read on the same day of the meter reading period. However additional analysis is necessary to determine the lag time adjustment value, which may or may not be significant.
Billed unmetered consumption Find	All billed consumption which is calculated based on estimates or norms from water usage sites that have been determined by utility policy to be left unmetered. This is typically a very small component in systems that maintain a policy to meter their customer population. However, this quantity can be the key consumption component in utilities that have not adopted a universal metering policy. **This component should NOT include any water that is supplied to neighboring utilities (water exported) which is unmetered but billed. Water supplied as exports to neighboring water utilities should be included only in the Water Exported component.**

Item Name	Description
Customer metering inaccuracies Find	Apparent water losses caused by the collective under-registration of customer water meters. Many customer water meters gradually wear as large cumulative volumes of water are passed through them over time. This causes the meters to under-register the flow of water. This occurrence is common with smaller residential meters of sizes 5/8-inch and 3/4 inch after they have registered very large cumulative volumes of water, which generally occurs only after periods of years. For meters sized 1-inch and larger - typical of multi-unit residential, commercial and industrial accounts - meter under-registration can occur from wear or from the improper application of the meter; i.e. installing the wrong type of meter or the wrong size of meter, for the flow pattern (profile) of the consumer. For instance, many larger meters have reduced accuracy at low flows. If an oversized meter is installed, most of the time the routine flow will occur in the low flow range of the meter, and a significant portion of it may not be registered. It is important to properly select and install all meters, but particularly large customer meters, size 1-inch and larger. The auditor has two options for entering data for this component of the audit. The auditor can enter a percentage under-registration (typically an estimated value), this will apply the selected percentage to the two categories of metered consumption to determine the volume of water not recorded due to customer meter inaccuracy. Note that this percentage is a composite average inaccuracy for all customer meters in the entire meter population. The percentage will be multiplied by the sum of the volumes in the Billed Metered and Unbilled Metered components. Alternatively, if the auditor has substantial data from meter testing activities, he or she can calculate their own loss volumes, and this volume may be entered directly. Note that a value of zero will be accepted but an alert will appear asking if the customer population is unmetered. Since all metered systems have some degree of inaccuracy, a positive value should be entered. A value of zero in this component is valid only if the water utility does not meter its customer population.
Customer retail unit cost Find	The Customer Retail Unit Cost represents the charge that customers pay for water service. This unit cost is applied routinely to the components of Apparent Loss, since these losses represent water reaching customers but not (fully) paid for. Since most water utilities have a rate structure that includes a variety of different costs based upon class of customer, a weighted average of individual costs and number of customer accounts in each class can be calculated to determine a single composite cost that should be entered into this cell. Finally, the weighted average cost should also include additional charges for sewer, storm water or biosolids processing, but only if these charges are based upon the volume of potable water consumed. For water utilities in regions with limited water resources and a questionable ability to meet the drinking water demands in the future, the Customer Retail Unit Cost might also be applied to value the Real Losses; instead of applying the Variable Production Cost to Real Losses. In this way, it is assumed that every unit volume of leakage reduced by leakage management activities will be sold to a customer. Note: the Free Water Audit Software allows the user to select the units that are charged to customers (either $/1,000 gallons, $/hundred cubic feet, or $/1,000 litres) and automatically converts these units to the units that appear in the "WATER SUPPLIED" box. The monetary units are United States dollars, $.
Infrastructure Leakage Index (ILI) Find	The ratio of the Current Annual Real Losses (Real Losses) to the Unavoidable Annual Real Losses (UARL). The ILI is a highly effective performance indicator for comparing (benchmarking) the performance of utilities in operational management of real losses.
Length of mains Find	Length of all pipelines (except service connections) in the system starting from the point of system input metering (for example at the outlet of the treatment plant). It is also recommended to include in this measure the total length of fire hydrant lead pipe. Hydrant lead pipe is the pipe branching from the water main to the fire hydrant. Fire hydrant leads are typically of a sufficiently large size that is more representative of a pipeline than a service connection. The average length of hydrant leads across the entire system can be assumed if not known, and multiplied by the number of fire hydrants in the system, which can also be assumed if not known. This value can then be added to the total pipeline length. Total length of mains can therefore be calculated as: Length of Mains, miles = (total pipeline length, miles) + [{(average fire hydrant lead length, ft) x (number of fire hydrants)} / 5,280 ft/mile] or Length of Mains, kilometres = (total pipeline length, kilometres) + [{(average fire hydrant lead length, metres) x (number of fire hydrants)} / 1,000 metres/kilometre]
NON-REVENUE WATER Find	= Apparent Losses + Real Losses + Unbilled Metered Consumption + Unbilled Unmetered Consumption. This is water which does not provide revenue potential to the utility.
Number of active AND inactive service connections Find	Number of customer service connections, extending from the water main to supply water to a customer. Please note that this includes the actual number of distinct piping connections, including fire connections, whether active or inactive. This may differ substantially from the number of customers (or number of accounts). **Note: this number does not include the pipeline leads to fire hydrants - the total length of piping supplying fire hyrants should be included in the "Length of mains" parameter.**
Real Losses Find	Physical water losses from the pressurized system (water mains and customer service connections) and the utility's storage tanks, up to the point of customer consumption. In metered systems this is the customer meter, in unmetered situations this is the first point of consumption (stop tap/tap) within the property. The annual volume lost through all types of leaks, breaks and overflows depends on frequencies, flow rates, and average duration of individual leaks, breaks and overflows.
Revenue Water	Those components of System Input Volume that are billed and have the potential to produce revenue.
Service Connection Density Find	=number of customer service connections / length of mains

Item Name	Description
Systematic data handling errors Find	Apparent losses caused by accounting omissions, errant computer programming, gaps in policy, procedure, and permitting/activation of new accounts; and any type of data lapse that results in under-stated customer water consumption in summary billing reports. **Systematic Data Handling Errors result in a direct loss of revenue potential. Water utilities can find "lost" revenue by keying on this component.** Utilities typically measure water consumption registered by water meters at customer premises. The meter should be read routinely (ex: monthly) and the data transferred to the Customer Billing System, which generates and sends a bill to the customer. Data Transfer Errors result in the consumption value being less than the actual consumption, creating an apparent loss. Such error might occur from illegible and mis-recorded hand-written readings compiled by meter readers, inputting an incorrect meter register unit conversion factor in the automatic meter reading equipment, or a variety of similar errors. Apparent losses also occur from Data Analysis Errors in the archival and data reporting processes of the Customer Billing System. Inaccurate estimates used for accounts that fail to produce a meter reading are a common source of error. Billing adjustments may award customers a rightful monetary credit, but do so by creating a negative value of consumption, thus under-stating the actual consumption. Account activation lapses may allow new buildings to use water for months without meter readings and billing. Poor permitting and construction inspection practices can result in a new building lacking a billing account, a water meter and meter reading; i.e., the customer is unknown to the utility's billing system. Close auditing of the permitting, metering, meter reading, billing and reporting processes of the water consumption data trail can uncover data management gaps that create volumes of systematic data handling error. Utilities should routinely analyze customer billing records to detect data anomalies and quantify these losses. For example, a billing account that registers zero consumption for two or more billing cycles should be checked to explain why usage has seemingly halted. Given the revenue loss impacts of these losses, water utilities are well-justified in providing continuous oversight and timely correction of data transfer errors & data handling errors. If the water auditor has not yet gathered detailed data or assessment of systematic data handling error, it is recommended that the auditor apply the default value of 0.25% of the the Billed Authorized Consumption volume. However, if the auditor has investigated the billing system and its controls, and has well validated data that indicates the volume from systematic data handling error is substantially higher or lower than that generated by the default value, then the auditor should enter a quantity that was derived from the utility investigations and select an appropriate grading. Note: negative values are not allowed for this audit component. If the auditor enters zero for this component then a grading of 1 will be automatically assigned.
Total annual cost of operating the water system Find	These costs include those for operations, maintenance and any annually incurred costs for long-term upkeep of the drinking water supply and distribution system. It should include the costs of day-to-day upkeep and long-term financing such as repayment of capital bonds for infrastructure expansion or improvement. Typical costs include employee salaries and benefits, materials, equipment, insurance, fees, administrative costs and all other costs that exist to sustain the drinking water supply. Depending upon water utility accounting procedures or regulatory agency requirements, it may be appropriate to include depreciation in the total of this cost. This cost should not include any costs to operate wastewater, biosolids or other systems outside of drinking water.
Unauthorized consumption Find	Includes water illegally withdrawn from fire hydrants, illegal connections, bypasses to customer consumption meters, or tampering with metering or meter reading equipment; as well as any other ways to receive water while thwarting the water utility's ability to collect revenue for the water. Unauthorized consumption results in uncaptured revenue and creates an error that understates customer consumption. In most water utilities this volume is low and, if the water auditor has not yet gathered detailed data for these loss occurrences, it is recommended that the auditor apply a default value of 0.25% of the volume of water supplied. However, if the auditor has investigated unauthorized occurrences, and has well validated data that indicates the volume from unauthorized consumption is substantially higher or lower than that generated by the default value, then the auditor should enter a quantity that was derived from the utility investigations. Note that a value of zero will not be accepted since all water utilities have some volume of unauthorized consumption occurring in their system. Note: if the auditor selects the default value for unauthorized consumption, a data grading of 5 is automatically assigned, but not displayed on the Reporting Worksheet.
Unavoidable Annual Real Losses (UARL) Find	UARL (gallons)=(5.41Lm + 0.15Nc + 7.5Lc) xP, or UARL (litres)=(18.0Lm + 0.8Nc + 25.0Lc) xP where: Lm = length of mains (miles or kilometres) Nc = number of customer service connections Lp = the average distance of customer service connection piping (feet or metres) (see the Worksheet "Service Connection Diagram" for guidance on deterring the value of Lp) Lc = total length of customer service connection piping (miles or km) Lc = Nc X Lp (miles or kilometres) P = Pressure (psi or metres) The UARL is a theoretical reference value representing the technical low limit of leakage that could be achieved if all of today's best technology could be successfully applied. It is a key variable in the calculation of the Infrastructure Leakage Index (ILI). Striving to reduce system leakage to a level close to the UARL is usually not needed unless the water supply is unusually expensive, scarce or both. NOTE: The UARL calculation has not yet been proven as fully valid for very small, or low pressure water distribution systems. If, in gallons: (Lm x 32) + Nc < 3000 or P <35psi in litres: (Lm x 20) + Nc < 3000 or P < 25m then the calculated UARL value may not be valid. The software does not display a value of UARL or ILI if either of these conditions is true.

Item Name	Description
Unbilled Authorized Consumption	All consumption that is unbilled, but still authorized by the utility. This includes Unbilled Metered Consumption + Unbilled Unmetered Consumption. See "Authorized Consumption" for more information. For Unbilled Unmetered Consumption, the Free Water Audit Software provides the auditor the option to select a default value if they have not audited unmetered activities in detail. The default calculates a volume that is 1.25% of the Water Supplied volume. If the auditor has carefully audited the various unbilled, unmetered, authorized uses of water, and has established reliable estimates of this collective volume, then he or she may enter the volume directly for this component, and not use the default value.
Unbilled metered consumption Find	Metered consumption which is authorized by the water utility, but, for any reason, is deemed by utility policy to be unbilled. This might for example include metered water consumed by the utility itself in treatment or distribution operations, or metered water provided to civic institutions free of charge. **It does not include water supplied to neighboring utilities (water exported) which may be metered but not billed.**
Unbilled unmetered consumption Find	Any kind of Authorized Consumption which is neither billed or metered. This component typically includes water used in activities such as fire fighting, flushing of water mains and sewers, street cleaning, fire flow tests conducted by the water utility, etc. In most water utilities it is a small component which is very often substantially overestimated. **It does NOT include water supplied to neighboring utilities (water exported) which is unmetered and unbilled – an unlikely case.** This component has many sub-components of water use which are often tedious to identify and quantify. Because of this, and the fact that it is usually a small portion of the water supplied, it is recommended that the auditor apply the default value, which is 1.25% of the Water Supplied volume. Select the default percentage to enter this value. If the water utility has carefully audited the unbilled, unmetered activities occurring in the system, and has well validated data that gives a value substantially higher or lower than the default volume, then the auditor should enter their own volume. However the default approach is recommended for most water utilities. Note that a value of zero is not permitted, since all water utilities have some volume of water in this component occurring in their system.
Units and Conversions	The user may develop an audit based on one of three unit selections: 1) Million Gallons (US) 2) Megalitres (Thousand Cubic Metres) 3) Acre-feet Once this selection has been made in the instructions sheet, all calculations are made on the basis of the chosen units. Should the user wish to make additional conversions, a unit converter is provided below (use drop down menus to select units from the yellow unit boxes): Enter Units: 1 — Convert From… Million Gallons (US) = **Converts to…..** 3.06888329 Acre-feet (conversion factor = 3.06888328973723)
Use of Option Buttons	To use the default percent value choose this button To enter a value choose this button and enter the value in the cell to the right  **NOTE:** For Unbilled Unmetered Consumption, Unauthorized Consumption and Systematic Data Handling Errors, a recommended default value can be applied by selecting the Percent option. The default values are based on fixed percentages of Water Supplied or Billed Authorized Consumption and are recommended for use in this audit unless the auditor has well validated data for their system. Default values are shown by purple cells, as shown in the example above. If a default value is selected, the user does not need to grade the item; a grading value of 5 is automatically applied (however, this grade will not be displayed).
Variable production cost (applied to Real Losses) Find	The cost to produce and supply the next unit of water (e.g., $/million gallons). This cost is determined by calculating the summed unit costs for ground and surface water treatment and all power used for pumping from the source to the customer. It may also include other miscellaneous unit costs that apply to the production of drinking water. It should also include the unit cost of bulk water purchased as an import if applicable. It is common to apply this unit cost to the volume of Real Losses. However, if water resources are strained and the ability to meet future drinking water demands is in question, then the water auditor can be justified in applying the Customer Retail Rate to the Real Loss volume, rather than applying the Variable Production Cost. The Free Water Audit Software applies the Variable Production costs to Real Losses by default. However, the auditor has the option on the Reporting Worksheet to select the Customer Retail Cost as the basis for the Real Loss cost evaluation if the auditor determines that this is warranted.
Volume from own sources Find	The volume of water withdrawn (abstracted) from water resources (rivers, lakes, streams, wells, etc) controlled by the water utility, and then treated for potable water distribution. Most water audits are compiled for utility retail water distribution systems, so this volume should reflect the amount of treated drinking water that entered the distribution system. Often the volume of water measured at the effluent of the treatment works is slightly less than the volume measured at the raw water source, since some of the water is used in the treatment process. Thus, it is useful if flows are metered at the effluent of the treatment works. If metering exists only at the raw water source, an adjustment for water used in the treatment process should be included to account for water consumed in treatment operations such as filter backwashing, basin flushing and cleaning, etc. If the audit is conducted for a wholesale water agency that sells untreated water, then this quantity reflects the measure of the raw water, typically metered at the source.

Item Name	Description
Volume from own sources: Master meter and supply error adjustment Find	An estimate or measure of the degree of inaccuracy that exists in the master (production) meters measuring the annual Volume from own Sources, and any error in the data trail that exists to collect, store and report the summary production data. This adjustment is a weighted average number that represents the collective error for all master meters for all days of the audit year and any errors identified in the data trail. Meter error can occur in different ways. A meter or meters may be inaccurate by under-registering flow (did not capture all the flow), or by over-registering flow (overstated the actual flow). Data error can occur due to data gaps caused by temporary outages of the meter or related instrumentation. All water utilities encounter some degree of inaccuracy in master meters and data errors in archival systems are common; thus a value of zero should not be entered. Enter a negative percentage or value for metered data under-registration; or, enter a positive percentage or value for metered data over-registration.
Water exported Find	The Water Exported volume is the bulk water conveyed and sold by the water utility to neighboring water systems that exists outside of their service area. Typically this water is metered at the custody transfer point of interconnection between the two water utilities. Usually the meter(s) are owned by the water utility that is selling the water: i.e. the exporter. If the water utility who is compiling the annual water audit sells bulk water in this manner, they are an exporter of water. Note: The Water Exported volume is sold to wholesale customers who are typically charged a wholesale rate that is different than retail rates charged to the retail customers existing within the service area. Many state regulatory agencies require that the Water Exported volume be reported to them as a quantity separate and distinct from the retail customer billed consumption. For these reasons - and others - the Water Exported volume is always quantified separately from Billed Authorized Consumption in the standard water audit. **Be certain not to "double-count" this quantity by including it in both the Water Exported box and the Billed Metered Consumption box of the water audit Reporting Worksheet. This volume should be included only in the Water Exported box.**
Water exported: Master meter and supply error adjustment Find	An estimate or measure of the volume in which the Water Exported volume is incorrect. This adjustment is a weighted average that represents the collective error for all of the metered and archived exported flow for all days of the audit year. Meter error can occur in different ways. A meter may be inaccurate by under-registering flow (did not capture all the flow), or by over-registering flow (overstated the actual flow). Error in the metered, archived data can also occur due to data gaps caused by temporary outages of the meter or related instrumentation. All water utilities encounter some degree of error in their metered data, particularly if meters are aged and infrequently tested. Occasional errors also occur in the archived data. Thus, a value of zero should not be entered. Enter a negative percentage or value for metered data under-registration; or enter a positive percentage or value for metered data over-registration. If regular meter accuracy testing is conducted on the meter(s) - which is usually conducted by the water utility selling the water - then the results of this testing can be used to help quantify the meter error adjustment. Corrections to data gaps or other errors found in the archived data should also be included as a portion of this meter error adjustment.
Water imported Find	The Water Imported volume is the bulk water purchased to become part of the Water Supplied volume. Typically this is water purchased from a neighboring water utility or regional water authority, and is metered at the custody transfer point of interconnection between the two water utilities. Usually the meter(s) are owned by the water supplier selling the water to the utility conducting the water audit. The water supplier selling the bulk water usually charges the receiving utility based upon a wholesale water rate.
Water imported: Master meter and supply error adjustment Find	An estimate or measure of the volume in which the Water Imported volume is incorrect. This adjustment is a weighted average that represents the collective error for all of the metered and archived imported flow for all days of the audit year. Meter error can occur in different ways. A meter may be inaccurate by under-registering flow (did not capture all the flow), or by over-registering flow (overstated the actual flow). Error in the metered, archived data can also occur due to data gaps caused by temporary outages of the meter or related instrumentation. All water utilities encounter some level of meter inaccuracy, particularly if meters are aged and infrequently tested. Occasional errors also occur in the archived metered data. Thus, a value of zero should not be entered. Enter a negative percentage or value for metered data under-registration; or, enter a positive percentage or value for metered data over-registration. If regular meter accuracy testing is conducted on the meter(s) - which is usually conducted by the water utility selling the water - then the results of this testing can be used to help quantify the meter error adjustment.
WATER LOSSES Find	= apparent losses + real losses Water Losses are the difference between Water Supplied and Authorized Consumption. Water losses can be considered as a total volume for the whole system, or for partial systems such as transmission systems, pressure zones or district metered areas (DMA); if one of these configurations are the basis of the water audit.

AWWA Free Water Audit Software:
Determining Water Loss Standing

WAS v5.0

Water Audit Report for: Marin Municipal Water District (2110002)
Reporting Year: 2019 | 1/2019 - 12/2019
Data Validity Score: 62

Water Loss Control Planning Guide

Functional Focus Area	Water Audit Data Validity Level / Score				
	Level I (0-25)	**Level II** (26-50)	**Level III** (51-70)	**Level IV** (71-90)	**Level V** (91-100)
Audit Data Collection	Launch auditing and loss control team; address production metering deficiencies	Analyze business process for customer metering and billing functions and water supply operations. Identify data gaps.	Establish/revise policies and procedures for data collection	Refine data collection practices and establish as routine business process	Annual water audit is a reliable gauge of year-to-year water efficiency standing
Short-term loss control	Research information on leak detection programs. Begin flowcharting analysis of customer billing system	Conduct loss assessment investigations on a sample portion of the system: customer meter testing, leak survey, unauthorized consumption, etc.	Establish ongoing mechanisms for customer meter accuracy testing, active leakage control and infrastructure monitoring	Refine, enhance or expand ongoing programs based upon economic justification	Stay abreast of improvements in metering, meter reading, billing, leakage management and infrastructure rehabilitation
Long-term loss control		Begin to assess long-term needs requiring large expenditure: customer meter replacement, water main replacement program, new customer billing system or Automatic Meter Reading (AMR) system.	Begin to assemble economic business case for long-term needs based upon improved data becoming available through the water audit process.	Conduct detailed planning, budgeting and launch of comprehensive improvements for metering, billing or infrastructure management	Continue incremental improvements in short-term and long-term loss control interventions
Target-setting			Establish long-term apparent and real loss reduction goals (+10 year horizon)	Establish mid-range (5 year horizon) apparent and real loss reduction goals	Evaluate and refine loss control goals on a yearly basis
Benchmarking			Preliminary Comparisons - can begin to rely upon the Infrastructure Leakage Index (ILI) for performance comparisons for real losses (see below table)	Performance Benchmarking - ILI is meaningful in comparing real loss standing	Identify Best Practices/ Best in class - the ILI is very reliable as a real loss performance indicator for best in class service

For validity scores of 50 or below, the shaded blocks should not be focus areas until better data validity is achieved.

Once data have been entered into the Reporting Worksheet, the performance indicators are automatically calculated. How does a water utility operator know how well his or her system is performing? The AWWA Water Loss Control Committee provided the following table to assist water utilities is gauging an approximate Infrastructure Leakage Index (ILI) that is appropriate for their water system and local conditions. The lower the amount of leakage and real losses that exist in the system, then the lower the ILI value will be.

Note: this table offers an approximate guideline for leakage reduction target-setting. The best means of setting such targets include performing an economic assessment of various loss control methods. However, this table is useful if such an assessment is not possible.

General Guidelines for Setting a Target ILI (without doing a full economic analysis of leakage control options)

Target ILI Range	Financial Considerations	Operational Considerations	Water Resources Considerations
1.0 - 3.0	Water resources are costly to develop or purchase; ability to increase revenues via water rates is greatly limited because of regulation or low ratepayer affordability.	Operating with system leakage above this level would require expansion of existing infrastructure and/or additional water resources to meet the demand.	Available resources are greatly limited and are very difficult and/or environmentally unsound to develop.
>3.0 -5.0	Water resources can be developed or purchased at reasonable expense; periodic water rate increases can be feasibly imposed and are tolerated by the customer population.	Existing water supply infrastructure capability is sufficient to meet long-term demand as long as reasonable leakage management controls are in place.	Water resources are believed to be sufficient to meet long-term needs, but demand management interventions (leakage management, water conservation) are included in the long-term planning.
>5.0 - 8.0	Cost to purchase or obtain/treat water is low, as are rates charged to customers.	Superior reliability, capacity and integrity of the water supply infrastructure make it relatively immune to supply shortages.	Water resources are plentiful, reliable, and easily extracted.
Greater than 8.0	Although operational and financial considerations may allow a long-term ILI greater than 8.0, such a level of leakage is not an effective utilization of water as a resource. Setting a target level greater than 8.0 - other than as an incremental goal to a smaller long-term target - is discouraged.		
Less than 1.0	If the calculated Infrastructure Leakage Index (ILI) value for your system is 1.0 or less, two possibilities exist. a) you are maintaining your leakage at low levels in a class with the top worldwide performers in leakage control. b) A portion of your data may be flawed, causing your losses to be greatly understated. This is likely if you calculate a low ILI value but do not employ extensive leakage control practices in your operations. In such cases it is beneficial to validate the data by performing field measurements to confirm the accuracy of production and customer meters, or to identify any other potential sources of error in the data.		

Example 1a: Million Gallons: | **Example 1b**: Million Gallons: Performance Indicators | **Example 2a**: Megalitres: Reporting Worksheet | **Example 2b**: Megalitres: Reporting Worksheet

Example Audit 1a:

AWWA Free Water Audit Software: Reporting Worksheet

WAS v5.0

? Click to access definition
+ Click to add a comment

Water Audit Report for: City of Asheville (01-11-010)
Reporting Year: 2013 7/2012 - 6/2013

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (n/a or 1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades

All volumes to be entered as: MILLION GALLONS (US) PER YEAR

To select the correct data grading for each input, determine the highest grade where the utility meets or exceeds all criteria for that grade and all grades below it.

<----------- Enter grading in column 'E' and 'J' ---------->

WATER SUPPLIED

Item	Grade	Value	Unit	Master Meter Error Adjustments: Grade	Pcnt	Value	Unit
Volume from own sources:	7	7,352.880	MG/Yr	3		285.450	MG/Yr
Water imported:	n/a	0.000	MG/Yr				MG/Yr
Water exported:	n/a	0.000	MG/Yr				MG/Yr
WATER SUPPLIED:		**7,067.430**	MG/Yr				

Enter negative % or value for under-registration
Enter positive % or value for over-registration

AUTHORIZED CONSUMPTION

Click here: ? for help using option buttons below

Item	Grade	Value	Unit	Pcnt	Value	Unit
Billed metered:	8	4,782.250	MG/Yr			
Billed unmetered:	n/a	0.000	MG/Yr			
Unbilled metered:	7	27.757	MG/Yr			
Unbilled unmetered:	8	157.790	MG/Yr		157.790	MG/Yr
AUTHORIZED CONSUMPTION:		**4,967.797**	MG/Yr			

Unbilled Unmetered volume entered is greater than the recommended default value

Use buttons to select percentage of water supplied **OR** value

WATER LOSSES (Water Supplied - Authorized Consumption)

2,099.633 MG/Yr

Apparent Losses

Item	Grade	Value	Unit	Pcnt	Value	Unit
Unauthorized consumption:		17.669	MG/Yr	0.25%		MG/Yr
Customer metering inaccuracies:	7	111.220	MG/Yr	2.26%		MG/Yr
Systematic data handling errors:	5	11.956	MG/Yr	0.25%		MG/Yr
Apparent Losses:		**140.844**	MG/Yr			

Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed

Default option selected for Systematic data handling errors - a grading of 5 is applied but not displayed

Real Losses (Current Annual Real Losses or CARL)

Item	Value	Unit
Real Losses = Water Losses - Apparent Losses:	**1,958.789**	MG/Yr
WATER LOSSES:	**2,099.633**	MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: **2,285.180** MG/Yr

= Water Losses + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

Item	Grade	Value	Unit
Length of mains:	4	1,236.5	miles
Number of active AND inactive service connections:	7	55,256	
Service connection density:		45	conn./mile main
Are customer meters typically located at the curbstop or property line?		Yes	
Average length of customer service line:			(length of service line, beyond the property boundary, that is the responsibility of the utility)
Average operating pressure:	4	145.3	psi

Average length of customer service line has been set to zero and a data grading score of 10 has been applied

COST DATA

Item	Grade	Value	Unit
Total annual cost of operating water system:	10	$33,630,676	$/Year
Customer retail unit cost (applied to Apparent Losses):	10	$3.22	$/100 cubic feet (ccf)
Variable production cost (applied to Real Losses):	6	$335.94	$/Million gallons

☐ Use Customer Retail Unit Cost to value real losses

WATER AUDIT DATA VALIDITY SCORE:

***** YOUR SCORE IS: 72 out of 100 *****

A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION:

Based on the information provided, audit accuracy can be improved by addressing the following components:

1: Volume from own sources
2: Variable production cost (applied to Real Losses)
3: Unauthorized consumption

Example Audit 1b:

AWWA Free Water Audit Software:
System Attributes and Performance Indicators

Water Audit Report for: City of Asheville (01-11-010)
Reporting Year: 2013 | 7/2012 - 6/2013

*** YOUR WATER AUDIT DATA VALIDITY SCORE IS: 72 out of 100 ***

System Attributes:

	Apparent Losses:	140.844	MG/Yr
+	Real Losses:	1,958.789	MG/Yr
=	**Water Losses:**	**2,099.633**	MG/Yr
?	Unavoidable Annual Real Losses (UARL):	794.34	MG/Yr
	Annual cost of Apparent Losses:	$606,265	
	Annual cost of Real Losses:	$658,036	Valued at **Variable Production Cost**

Return to Reporting Worksheet to change this assumpiton

Performance Indicators:

Financial:	Non-revenue water as percent by volume of Water Supplied:	32.3%	
	Non-revenue water as percent by cost of operating system:	3.9%	Real Losses valued at Variable Production Cost
Operational Efficiency:	Apparent Losses per service connection per day:	6.98	gallons/connection/day
	Real Losses per service connection per day:	97.12	gallons/connection/day
	Real Losses per length of main per day*:	N/A	
	Real Losses per service connection per day per psi pressure:	0.67	gallons/connection/day/psi
	From Above, Real Losses = Current Annual Real Losses (CARL):	1,958.79	million gallons/year
?	Infrastructure Leakage Index (ILI) [CARL/UARL]:	2.47	

* This performance indicator applies for systems with a low service connection density of less than 32 service connections/mile of pipeline

Example Audit 2a:

AWWA Free Water Audit Software: Reporting Worksheet

WAS v5.0

? Click to access definition
+ Click to add a comment

Water Audit Report for: The City of Calgary
Reporting Year: 2013 (1/2013 - 12/2013)

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (n/a or 1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades

All volumes to be entered as: MEGALITRES (THOUSAND CUBIC METRES) PER YEAR

To select the correct data grading for each input, determine the highest grade where the utility meets or exceeds all criteria for that grade and all grades below it.

Master Meter Error Adjustments

WATER SUPPLIED

<---------- Enter grading in column 'E' and 'J' ----------> Pcnt: Value:

Volume from own sources:	7	174,324.000	ML/Yr	7	1.00%		ML/Yr
Water imported:	n/a	0.000	ML/Yr				ML/Yr
Water exported:	7	8,190.131	ML/Yr	7	1.00%		ML/Yr

Enter negative % or value for under-registration
Enter positive % or value for over-registration

WATER SUPPLIED: 164,488.979 ML/Yr

AUTHORIZED CONSUMPTION

Click here: ? for help using option buttons below

				Pcnt:	Value:
Billed metered:	6	125,111.268	ML/Yr		
Billed unmetered:	8	3,503.386	ML/Yr		
Unbilled metered:	7	166.157	ML/Yr		
Unbilled unmetered:	6	1,444.000	ML/Yr		1,444.000 ML/Yr

Use buttons to select percentage of water supplied OR value

AUTHORIZED CONSUMPTION: 130,224.811 ML/Yr

WATER LOSSES (Water Supplied - Authorized Consumption)

34,264.168 ML/Yr

Apparent Losses

				Pcnt:	Value:
Unauthorized consumption:		411.222	ML/Yr	0.25%	ML/Yr

Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed

Customer metering inaccuracies:	6	1,265.429	ML/Yr	1.00%	ML/Yr
Systematic data handling errors:		312.778	ML/Yr	0.25%	ML/Yr

Default option selected for Systematic data handling errors - a grading of 5 is applied but not displayed

Apparent Losses: 1,989.429 ML/Yr

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses: 32,274.739 ML/Yr

WATER LOSSES: 34,264.168 ML/Yr

NON-REVENUE WATER

NON-REVENUE WATER: 35,874.325 ML/Yr

= Water Losses + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

Length of mains:	8	4,945.0	kilometers
Number of active AND inactive service connections:	8	312,075	
Service connection density:		63	conn./km main
Are customer meters typically located at the curbstop or property line?		No	
Average length of customer service line:	8	12.0	metres (length of service line, beyond the property boundary, that is the responsibility of the utility)
Average operating pressure:	8	50.8	metres (head)

COST DATA

Total annual cost of operating water system:	9	$169,973,759	$/Year	
Customer retail unit cost (applied to Apparent Losses):	9	$2.35	$/1000 litres	
Variable production cost (applied to Real Losses):	9	$73.54	$/Megalitre	☑ Use Customer Retail Unit Cost to value real losses

WATER AUDIT DATA VALIDITY SCORE:

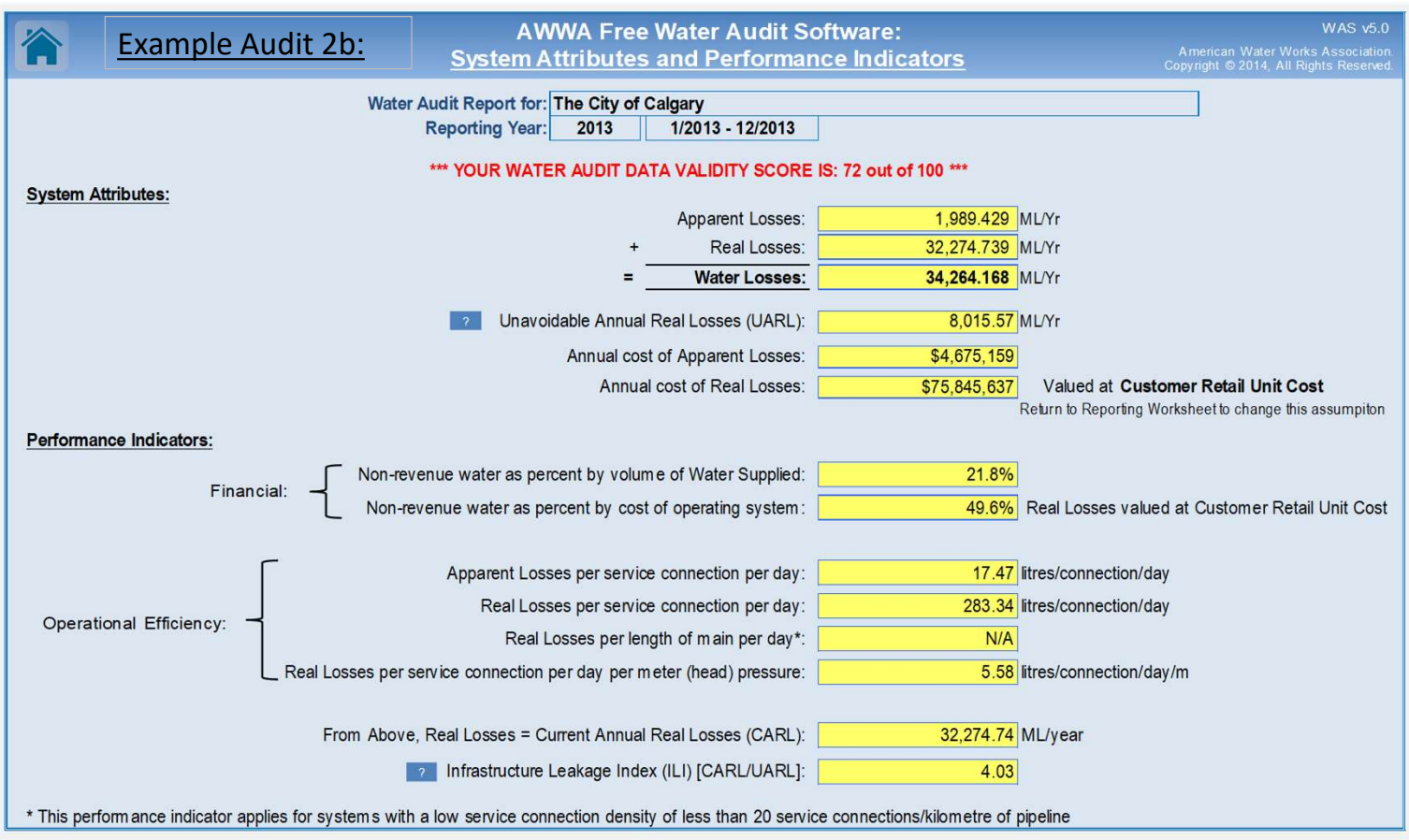
***** YOUR SCORE IS: 72 out of 100 *****

A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION:

Based on the information provided, audit accuracy can be improved by addressing the following components:

1: Volume from own sources
2: Billed metered
3: Customer metering inaccuracies



Example Audit 2b:

AWWA Free Water Audit Software:
System Attributes and Performance Indicators

WAS v5.0

Water Audit Report for: The City of Calgary
Reporting Year: 2013 | 1/2013 - 12/2013

*** YOUR WATER AUDIT DATA VALIDITY SCORE IS: 72 out of 100 ***

System Attributes:

	Apparent Losses:	1,989.429	ML/Yr
+	Real Losses:	32,274.739	ML/Yr
=	**Water Losses:**	**34,264.168**	ML/Yr
?	Unavoidable Annual Real Losses (UARL):	8,015.57	ML/Yr
	Annual cost of Apparent Losses:	$4,675,159	
	Annual cost of Real Losses:	$75,845,637	Valued at **Customer Retail Unit Cost**

Return to Reporting Worksheet to change this assumpiton

Performance Indicators:

Financial:	Non-revenue water as percent by volume of Water Supplied:	21.8%	
	Non-revenue water as percent by cost of operating system:	49.6%	Real Losses valued at Customer Retail Unit Cost
Operational Efficiency:	Apparent Losses per service connection per day:	17.47	litres/connection/day
	Real Losses per service connection per day:	283.34	litres/connection/day
	Real Losses per length of main per day*:	N/A	
	Real Losses per service connection per day per meter (head) pressure:	5.58	litres/connection/day/m
	From Above, Real Losses = Current Annual Real Losses (CARL):	32,274.74	ML/year
?	Infrastructure Leakage Index (ILI) [CARL/UARL]:	4.03	

* This performance indicator applies for systems with a low service connection density of less than 20 service connections/kilometre of pipeline

AWWA Water Audit Software Version 5.0 Developed by the Water Loss Control Committee of the American Water Works Association August, 2014

This software is intended to serve as a basic tool to compile a preliminary, or "top-down", water audit. It is recommended that users also refer to the current edition of the AWWA M36 Publication, Water Audits and Loss Control Programs, for detailed guidance on compiling a comprehensive, or "bottom-up", water audit using the same water audit methodology.

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- AWWA Water Audits and Loss Control Programs, M36 Publication, 3rd Edition, 2009

- Service Connection Diagrams courtesy of Ronnie McKenzie, WRP Pty Ltd.

VERSION HISTORY:

Version:	Release Date:	Number of Worksheets:	Key Features and Developments
v1	2005/ 2006	5	The AWWA Water Audit Software was piloted in 2005 (v1.0 beta). The early versions (1.x) of the software restricted data entry to units of Million Gallons per year. For each entry into the audit, users identified whether the input was measured or estimated.
v2	2006	5	The most significant enhancement in v2 of the software was to allow the user to choose the volumetric units to be used in the audit, Million Gallons or Thousand Cubic Metres (megalitres) per year. Two financial performance indicators were added to provide feedback to the user on the cost of Real and Apparent losses.
v3	2007	7	In v3, the option to report volumetric units in acre-feet was added. Another new feature in v3 was the inclusion of default values for two water audit components (unbilled unmetered and unauthorized consumption). v3 also included two examples of completed audits in units of million gallons and Megalitres. Several checks were added into v3 to provide instant feedback to the user on common data entry problems, in order to help the user complete an accurate water audit.
v4 - v4.2	2010	10	v4 (and versions 4.x) of the software included a new approach to data grading. The simple "estimated" or "measured" approach was replaced with a more granular scale (typically 1-10) that reflected descriptions of utility practices and served to describe the confidence and accuracy of the input data. Each input value had a corresponding scale fully described in the Grading Matrix tab. The Grading Matrix also showed the actions required to move to a higher grading score. Grading descriptions were available on the Reporting Worksheet via a pop-up box next to each water audit input. A water audit data validity score is generated (max = 100) and priority areas for attention (to improve audit accuracy) are identified, once a user completes the requied data grading. A service connection diagram was also added to help users understand the impact of customer service line configurations on water losses and how this information should be entered into the water audit software. An acknoweldgements section was also added. Minor bug fixes resulted in the release of versions 4.1 and 4.2. A French language version was also made available for v4.2.
v5	2014	12	In v5, changes were made to the way Water Supplied information is entered into software, with each major component having a corresponding Master Meter Error Adjustment entry (and data grading requirement). This required changes to the data validity score calculation; v5 of the software uses a weighting system that is, in part, proportional to the volume of input components. The Grading Matrix was updated to reflect the new audit inputs and also to include clarifications and additions to the scale descriptions. The appearance of the software was updated in v5 to make the software more user-friendly and several new features were added to provide more feedback to the user. Notably, a dashboard tab has been added to provide more visual feedback on the water audit results and associated costs of Non-Revenue Water. A comments sheet was added to allow the user to track notes, comments and to cite sources used.

Appendix L

Resolutions 8638 and 8639 on UWMP and WSCP 2020 Update

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