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Tuolumne Utilities District 2010 Urban Water Management Plan

June 2011

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Prepared for

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K/J Project No. 1170021.00

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Abbreviations

ac-ft	acre-feet
ac-ft/yr	acre-feet per year
Act	Urban Water Management Planning Act
AWWA	American Water Works Association
BMPs	best management practices
CDPH	California Department of Public Health
cf	cubic feet
CII	commercial, industrial, institutional
CIMIS	California Irrigation Management Information System
COG	Council of Governments
County	Tuolumne County
CUWCC	California Urban Water Conservation Council
DBP	disinfection by-product
DMM	demand management measure
District (or TUD)	Tuolumne Utilities District
DWR	California Department of Water Resources
DWR Guidebook	DWR Guidebook to Assist Water Suppliers in the Preparation of a 2010 Urban Water Management Plan
E.coli	*Escherichia coli*
ERP	emergency response plan
ESFR	equivalent single family residences
ETo	evapotranspiration
gpm	U.S. gallons per minute
gpcd	gallons per capita day
GIS	geographic information system
HCD	State Department of Housing and Community Development

IRWM	integrated regional water management
JSD	Jamestown Sanitary District
LLC	Limited Liability Corporation
MG	million gallons
MGD	million gallons per day
MOU	Memorandum of Understanding Regarding Water Conservation in California
N/A	not available, not applicable
NPDES	National Pollutant Discharge Elimination System
No.	Number
PAC	Public Advisory Committee
PG&E	Pacific Gas and Electric Company
RHNA	Regional Housing Needs Assessment
RWQCB	Regional Water Quality Control Board
RWWTP	Regional Wastewater Treatment Plant
SBX7-7	Senate Bill X7-7, The Water Conservation Act of 2009
SEMS	standardized emergency management system
State	State of California
THCSD	Twain Harte Community Services District
TUD (or District)	Tuolumne Utilities District
TWSOP	Treated Water System Optimization Plan
UCCE	University of California Agriculture and Natural Resources Cooperative Extension
ULFT	ultra low flush toilet
UWMP	urban water management plan
WTP	water treatment plant
WWTP	wastewater treatment plant

Definitions

Chapter 2, Part 2.6, Division 6 of the California Water Code provides definitions for the construction of the Urban Water Management Plans. Appendix B contains the full text of the Urban Water Management Planning Act.

CHAPTER 2. DEFINITIONS

Section 10611. Unless the context otherwise requires, the definitions of this chapter govern the construction of this part.

Section 10611.5. "Demand management" means those water conservation measures, programs, and incentives that prevent the waste of water and promote the reasonable and efficient use and reuse of available supplies.

Section 10612. "Customer" means a purchaser of water from a water supplier who uses the water for municipal purposes, including residential, commercial, governmental, and industrial uses.

Section 10613. "Efficient use" means those management measures that result in the most effective use of water so as to prevent its waste or unreasonable use or unreasonable method of use.

Section 10614. "Person" means any individual, firm, association, organization, partnership, business, trust, corporation, company, public agency, or any agency of such an entity.

Section 10615. "Plan" means an urban water management plan prepared pursuant to this part. A plan shall describe and evaluate sources of supply, reasonable and practical efficient uses, and reclamation and demand management activities. The components of the plan may vary according to an individual community or area's characteristics and its capabilities to efficiently use and conserve water. The plan shall address measures for residential, commercial, governmental, and industrial water demand management as set forth in Article 2 (commencing with Section 10630) of Chapter 3. In addition, a strategy and time schedule for implementation shall be included in the plan.

Section 10616. "Public agency" means any board, commission, county, city and county, city, regional agency, district, or other public entity.

Section 10616.5. "Recycled water" means the reclamation and reuse of wastewater for beneficial use.

Section 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.

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Chapter 1: Plan Preparation

1.1 Background

This Urban Water Management Plan (UWMP) has been prepared for Tuolumne Utilities District (TUD or District) in compliance with Division 6, Part 2.6, of the California Water Code, Sections 10608 through 10657 as last amended by Senate Bill No. 7 (SBX7-7), Water Conservation Act of 2009. The original bill requiring preparation of an UWMP was enacted in 1983. SBX7-7, which became law in November 2009, requires increased emphasis on water demand management and requires the State of California (State) to achieve a 20 percent reduction in urban per capita water use by 31 December 2020.

Urban water suppliers having more than 3,000 service connections or supplying more than 3,000 acre-feet per year (ac-ft/yr) at retail or wholesale are required to submit a UWMP every 5 years to the California Department of Water Resources (DWR). The UWMP typically must be submitted by 31 December of years ending in 0 and 5. However SBX7-7 extended the UWMP deadline to 1 July 2011 to provide DWR time to develop evaluation methodologies for determining water demand reduction targets. TUD prepared an UWMP in 1985, 1990, 1995, 2000, and 2005. This 2010 UWMP is an update to the 2005 plan.

The portion of The Urban Water Management Planning Act (Act) that describes the purpose and intent of the UWMP states the following:

Section 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.

(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.

(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.

Section 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.

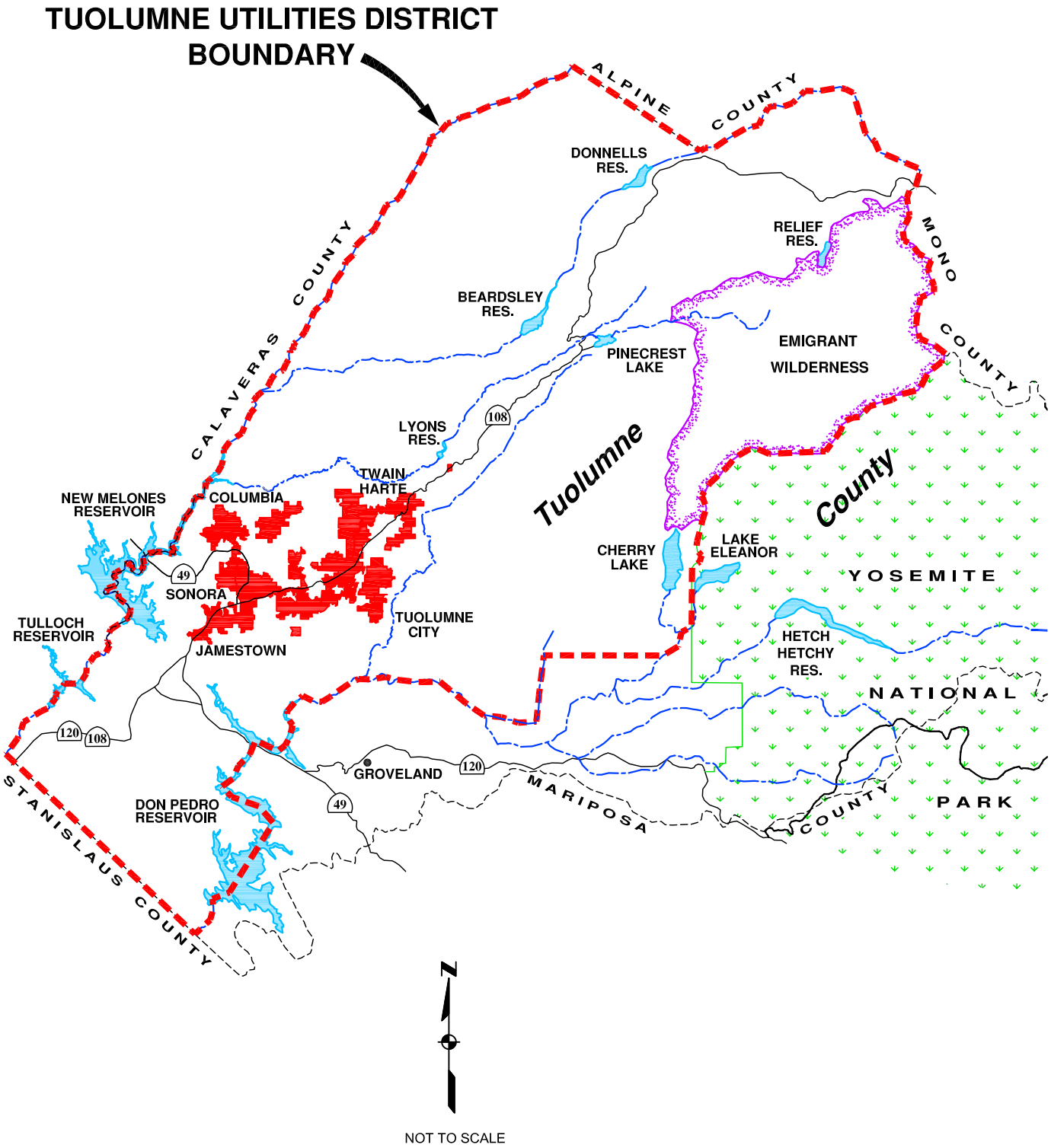
(b) The management of urban water demands and efficient use of urban water supplies shall be a guiding criterion in public decisions.

(c) Urban water suppliers shall be required to develop water management plans to actively pursue the efficient use of available supplies.

1.2 System Overview

TUD is a county water district organized and existing under Division 12 (Sections 30000 - 32554) of the California Water Code. The District occupies approximately the northerly two-thirds of Tuolumne County (County). As shown in Figure 1-1, TUD is bounded on the west by the North Fork and Main Stem of the Stanislaus River along the Tuolumne County and Calaveras County boundary, on the north by Alpine County, on the east by Mono County and Yosemite National Park, on the south by the Tuolumne River, and on the southwest by Stanislaus County. The total area within the TUD boundary is approximately 875,088 acres.

The TUD Treated Water Service Area constitutes a geographic area smaller in size than the total geographic area within the District's boundary as shown in Figure 1-1. This is due to the fact that not all the lands and residences within the District's boundary are served with retail municipal water supplies. Some areas, although inside the District boundary, are served by other small public or private water systems, or individual landowner wells as shown in Figure 1-2. The TUD Treated Water Service Area is primarily characterized by residential land use, with some commercial and industrial land use. As discussed in more detail below, TUD Treated Water System currently serves a population of approximately 29,000 persons and maintains over 13,000 active treated water service accounts, 14 surface water treatment plants (WTPs), 26 groundwater wells and approximately 315 miles of distribution.



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LEGEND

- TUOLUMNE UTILITIES DISTRICT BOUNDARY
- TUOLUMNE COUNTY LINE
- RIVER
- 108 HIGHWAY
- TUOLUMNE UTILITIES DISTRICT WATER SYSTEMS

TUOLUMNE UTILITIES DISTRICT
2010 UWMP

DISTRICT BOUNDARY

JUNE 2011

FIGURE 1-1

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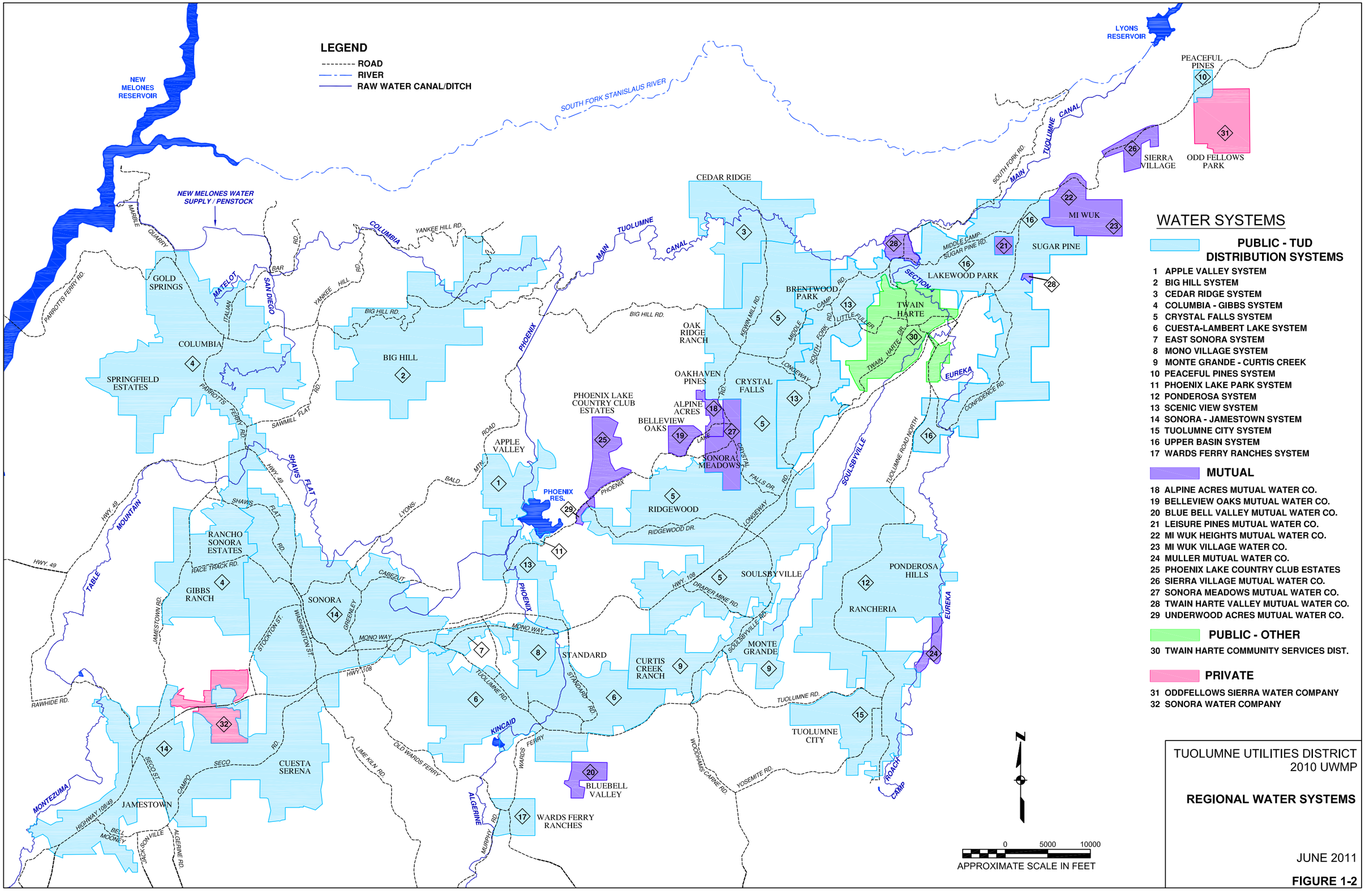

TUOLUMNE UTILITIES DISTRICT
2010 UWMP

REGIONAL WATER SYSTEMS

JUNE 2011

FIGURE 1-2

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1.3 Agency Coordination and Public Participation

The 2010 UWMP requirements for agency coordination and public participation include specific timetables and requirements as presented in this chapter. The required elements of the Act are as follows:

Section 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.

Section 10621.

(b) Every urban water supplier required to prepare a plan pursuant to this part shall, at least 60 days prior to 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.

Section 10635.

(b) 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.

Section 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 the plan. Prior to adopting a plan, the urban water supplier shall make the plan available for public inspection and shall hold a public hearing thereon. Prior to the hearing, notice of the time and place of 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 hearing to any city or county within which the supplier provides water supplies. A privately owned water supplier shall provide an equivalent notice within its service area.

Table 1-1 lists the agencies with which coordination occurred while preparing this 2010 UWMP. Table 1-1 also includes a checklist of agencies that have been provided the notifications and access to the documents. Notifications to the County, the City of Sonora, and other water agencies to which TUD supplies treated water were provided at least 60 days notice in advance of the public hearing as required by California Water Code Section 10642. In addition, Notices of Intent to Adopt were sent to the County and City of Sonora. All notices were sent by registered mail and proof of such notification is provided in Appendix C. The County and the City of Sonora are the only two land use planning agencies that have such responsibilities within TUD's Treated Water Service Area.

Table 1-1: Coordination with Agencies							
Agency	**Contacted for Assistance**	**Participated in UWMP Development**	**Commented on the Draft**	**Attended Public Meetings**	**Received Copy of the Draft UWMP**	**Sent Notice of Intent to Adopt UMWP**	**Not Involved/ No Information**
Tuolumne County	✓	✓	✓	✓	✓	✓	
City of Sonora	✓	✓			✓	✓	
Sonora Water Company	✓						
Sonora Meadows Water Company	✓						
Muller Mutual Water Company	✓						
Leisure Pines Mutual Water Company	✓						

Note:

1. This table is based on DWR's Guidebook to Assist Water Suppliers in the Preparation of a 2010 Urban Water Management Plan (DWR Guidebook) Table 1.

1.3.1 Public Advisory Committee

A Public Advisory Committee (PAC), comprised of a cross section of local parties representing various aspects of the District's service area, was formed on 30 March 2011 after a group of local governments, agricultural interests, conservation interests, customers, economic development and community interests were notified about the pending 2010 UWMP update. The PAC activities and involvement were consistent with the intent and objectives of California Water Code Section 10620(d)(2). Each of the 10 PAC representatives included in Table 1-2 was asked to participate by providing review and comment to draft versions of the UWMP prior to adoption by the TUD Board of Directors. Two meetings were held at the TUD office. The first meeting was held on 5 May 2011 and the second meeting was held on 7 June 2011. Elements of the UWMP, as well as background educational information about the TUD Treated Water System, were presented at the meetings, and feedback was solicited. Comments from each representative were noted and incorporated as appropriate in the UWMP. Correspondence to PAC members and PAC meeting minutes as well as Board of Director Committee Meeting minutes which included public participation are included as Appendix D.

Table 1-2: PAC Members		
Category	**Agency / Company / Group**	**Representative**
County	County of Tuolumne	Mike Laird
	Tuolumne County Economic Development Authority	Larry Cope
City	City of Sonora	Rachelle Kellogg
Public	Customers / General Public	Rick Breeze-Martin and John Maciel
Development Interests	Economic and Housing Interest	Karen Burkhardt
Conservation Interests	Tuolumne County Farm Bureau	Jesse Cover
	Tuolumne County Alliance for Resources & Environment (TuCare)	Melinda Fleming
	Sierra Club	Jon Sturtevant
Native American Tribal Interests	Local Tuolumne Band of Me Wuk Indians	Emily Stevens

1.3.2 Public Hearing

A public hearing to review the 2010 update of the TUD UWMP was held on 21 June 2011 at the TUD Board Room in Sonora, California. This public session was held for review and comment on the UWMP before approval by the TUD Board of Directors. Legal public notices for the public hearing were published in advance in the local newspaper, The Union Democrat, in accordance with Government Code Section 6066 on 6 June and 13 June 2011. Copies of the plan were available to the public for review at TUD's office and on the TUD website (http://www.tudwater.com/) prior to the public hearing. Appendix E includes the public hearing notification documentation, agenda, presentation and minutes, and Appendix F includes public comments and responses.

1.4 Plan Adoption and Submittal

Plan adoption and submittal requirements are detailed in the following sections of the Act:

Section 10621.

(c) 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).

Section 10642. After the hearing, the plan shall be adopted as prepared or as modified after the hearing.

Section 10644.

(a) 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.

Section 10645. 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.

The TUD Board of Directors passed a resolution adopting the TUD 2010 UWMP on 28 June 2011 which is included as Appendix A.

The final 2010 UWMP, as adopted by the TUD Board of Directors, will be submitted to DWR, the California State Library, the City of Sonora, and the County within 30 days of adoption. Likewise, copies of any amendments or changes to the plan will be provided to the aforementioned entities within 30 days. This plan includes all information necessary to meet the requirements of California Water Code Division 6, Part 2.6 (Urban Water Management Planning). Adopted copies of this plan will be made available to the public at TUD's office no later than 30 days after submitting the final UWMP to DWR as required by Section 10645 of the Act.

1.5 UWMP Preparation

TUD prepared this UWMP with the assistance of its consultants including Kennedy/Jenks Consultants, the Offices of John Mills, and Solstice Geospatial, LLC as permitted by the following section of the Act:

> *Section 10620.*
>
> *(e) The urban water supplier may prepare the plan with its own staff, by contract, or in cooperation with other governmental agencies.*

During the preparation of the UWMP, documents that have been prepared through time by TUD and other entities were reviewed and information from those documents incorporated, as applicable, into this UWMP. Some of these documents have been included in the appendices to this document and a list of references is provided in Chapter 9.

1.6 UWMP Implementation

UWMP implementation requirements are detailed in the following section of the Act:

> *Section 10643.*
>
> *An urban water supplier shall implement its plan adopted pursuant to this chapter in accordance with the schedule set forth in its plan.*

TUD is committed to the implementation of this UWMP with the scheduled activities identified herein as required by Section 10643 of the Act.

1.7 Content of the UWMP

This UWMP addresses all subjects required by Section 10631 of the Act as defined by Section 10630 of the Act, which permits "levels of water management planning commensurate with the numbers of customers served and the volume of water supplied." All applicable sections of the Act are discussed in this UWMP, with chapters of the UWMP and DWR Guidebook Checklist cross-referenced against the corresponding provision of the Act in Table 1-3. Additionally, a completed copy of the 2010 Urban Water Management Plan Checklist organized by subject is included in Appendix G.

Table 1-3: Summary of UWMP Chapters and Corresponding Provisions of the Act

Chapter	Corresponding Provisions of the Act		UWMP Guidebook Checklist No.
Chapter 1: Plan Preparation	10642	Public participation	55
	10643	Plan implementation	58
	10644	Plan filing	59
	10645	Public review availability	60
	10620 (a)–(e)	Coordination with other agencies; document preparation	4
	10621 (a)–(c)	City and County notification; due date; review	6
	10620 (f)	Resource optimization	5
Chapter 2: System Description	10631 (a)	Area, demographics, population, and climate	8-12
Chapter 3: Water Use	10608	Urban water use targets	1
	10631 (e), (k)	Water use, data sharing	25 and 34
Chapter 4: Water Supply	10631 (b)–(d), (h), (k)	Water sources, reliability of supply, transfers and exchanges, supply projects, data sharing	13-21, 24, 33
	10631 (i)	Desalination	31
	10633	Recycled water	44-51
Chapter 5: Water Quality	10634	Water quality impacts on reliability	52
Chapter 6: Water Supply Reliability	10635 and 10631	Water supply reliability and vulnerability to seasonal or climatic shortage	30
Chapter 7: Conservation Program and Demand Management Measures	10631 (f)–(g), (j) and 10631.5	Conservation program and demand management measures implementation status	26-29, 32
Chapter 8: Water Shortage Contingency Plan	10632	Water shortage contingency plan	35-43

1.8 Resource Optimization

Section 10620 (f) of the Act asks urban water suppliers to evaluate water management tools and options to maximize water resources and minimize the need for imported water from other regions. TUD understands the limited nature of water supply in California and is committed to optimizing its available water resources. This commitment is demonstrated through TUD's use of water supplied from local sources. TUD is a regular participant in regional water resources planning efforts, and led the development of Tuolumne-Stanislaus Integrated Regional Water Management (IRWM) Group which will be working to develop the Tuolumne-Stanislaus IRWM Region's first IRWM Plan.

Chapter 2: System Description

The water system description requirements are detailed in the following section of the Act:

Section 10631

(a) Describe the service area of the supplier, including current and projected population, climate, and other 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.

2.1 Topography and Land Use

The topography of the County varies greatly from gently rolling terrain at the lower elevations, to steep hilly uplands deeply traversed by streams and tributaries that drain south to the Tuolumne River or north to the Stanislaus River. Two passes with paved roads cross the Sierras and are located within the County: Sonora Pass (9,628-feet) and Tioga Pass (9,941-feet). The high elevation to the east serves as the watershed for the TUD water supply with significant snow pack during the winter months.

Crop adaptability of the upland soils is largely restricted to irrigated pasture or various deciduous orchards. Both slope and soil-depth directly affect the degree of suitability of lands for irrigation or development, as does public land ownership.

In 1897, the lumber industry realized the commercial value of the trees in the higher elevations and has subsequently become a major industry for the County. Very large segments of irrigable land within TUD are presently forested and subject to forest and range management. This land possesses the slope and soil characteristics to sustain irrigable agriculture lands. However, climate conditions, location, and availability of water are expected to cause the lands to remain under some type of forest or range management program.

Much of the County is owned by the federal government, which will limit the extent of future development. The Stanislaus National Forest of the U.S. Forest Service, Emigrant Wilderness, and most of Yosemite National Park are located in the County.

A large number of TUD's Treated Water System customers reside in or near the community of Sonora which is situated at about 2,000 feet in elevation. The TUD Treated Water Service Area includes the lower elevation communities of Sonora, Jamestown, and Columbia which are rural to semi-rural in nature, and extends east to include higher elevation communities and semi-rural areas up to elevations of approximately 5,000 feet in the Sierra Nevada. TUD's Treated Water Service Area comprises predominantly single family residential housing density levels.

2.2 TUD Service Areas

TUD owns and operates treated water, wastewater, reclaimed water and raw water systems within the District boundary. Each of these various systems has a distinct service area as described below. For the purposes of this UWMP, the service area is defined as the Treated Water Service Area: the population and geographical area served by the TUD water distribution systems.

2.2.1 TUD Treated Water System

The TUD Treated Water System, also referred to as the "water distribution systems" due to the fact that TUD's water system does not contain transmission piping, is bounded by TUD's 14 surface WTPs, 26 water wells, and the treated water customer service meters. The TUD water distribution systems do not follow census tract boundaries, political boundaries, watersheds, or community boundaries. Rather the boundaries of the water distribution systems are irregular and represent those specific geographic areas which are served by one or more TUD municipal water supply treated water sources. Figure 1-2 illustrates the TUD Treated Water System Service Area. As shown in Figure 1-2, TUD operates and maintains 17 separate distribution systems which together form the Treated Water System. The 17 distribution systems and the respective water supply sources are summarized in Table 2-1. Figure 2-1 displays the layout of TUD's Treated Water System supply and storage facilities.

Table 2-1: TUD Distribution Systems and Potable Water Supply Sources

TUD Distribution System	Potable Water Supply Source	
	Surface Water	Groundwater
Apply Valley	None	Apple Valley Well #1 and WTP, Apple Valley Well #2 and Apple Valley Well #3
Big Hill	Big Hill WTP	None
Cedar Ridge	Cedar Ridge WTP	Cedar Ridge Springs Well and WTP
Columbia-Gibbs	Columbia WTP	Marble Quarry Well and WTP
Crystal Falls	Crystal Falls WTP, Brentwood WTP, and Willow Springs WTP	Brentwood Well(1), Crystal Falls Plant Well(1), Comstock Well, Oakridge Ranch Well and WTP, Caylor Well (standby), and Crystal Falls Business Park (standby)
Cuesta-Lambert Lake	Sonora WTP, and Greenley WTP	Cuesta Center Well, and Lambert Well
East Sonora	Sonora WTP, and Greenley WTP	Rybar Well #1, and Rybar Well #2 and WTP
Mono Village	Sonora WTP, Greenley WTP and Mono Village WTP	Mono Village Well #2 and #7 and WTP
Monte Grande-Curtis Creek	Monte Grande WTP	None
Peaceful Pines	None	Peaceful Pines Well
Phoenix Lake Park	None	Phoenix Lake Park Well and WTP

Table 2-1: TUD Distribution Systems and Potable Water Supply Sources		
TUD Distribution System	**Potable Water Supply Source**	
	Surface Water	**Groundwater**
Ponderosa	Ponderosa WTP	None
Scenic View	Scenic View WTP	Scenic View Well[1], and Scenic Brook #1 Well
Sonora-Jamestown	Sonora WTP, and Greenley WTP	None
Tuolumne City	Tuolumne WTP	None
Upper Basin	Upper Basin WTP	Confidence Well #1 and Confidence Well #2 (standby)
Wards Ferry Ranches	None	Wards Ferry Ranch Well #1, Ward Ferry Ranch Well #2 and Ward Ferry Ranch Well #4[2]

Notes:

1. Well blended at surface WTP.
2. Well owned by developer and operated by TUD.

2.2.2 TUD Regional Wastewater and Reclamation Systems

In addition to the Treated Water System, TUD also owns and operates the TUD Regional Wastewater System, which provides sewer collection and treatment to another distinct area within the District's boundary. The TUD Regional Wastewater Reclamation System provides service to a yet another subset area. Both of these systems are further discussed in Chapter 4. Figure 2-2 illustrates the service area of County's regional wastewater systems and the TUD Regional Wastewater Reclamation System.

2.2.3 TUD Raw Water System

The TUD Raw Water System conveys raw water by gravity to TUD's WTPs through a series of ditches. Raw water originates at two distinct diversion points along the Pacific Gas and Electric Company (PG&E) Main Tuolumne Canal and one point after the PG&E Phoenix Powerhouse. The system typically conveys between about 1 and 4 cubic feet per second in each ditch depending seasonal and water supply factors. The PG&E Main Tuolumne Canal originates at Lyons Dam located on the South Fork of the Stanislaus River. Figure 2-3 illustrates the locations and routing of the TUD Raw Water System and proximity of the TUD ditches to the PG&E Main Tuolumne Canal. Figure 2-1 illustrates the proximity of the TUD Treated Water Facilities to the Raw Water System.

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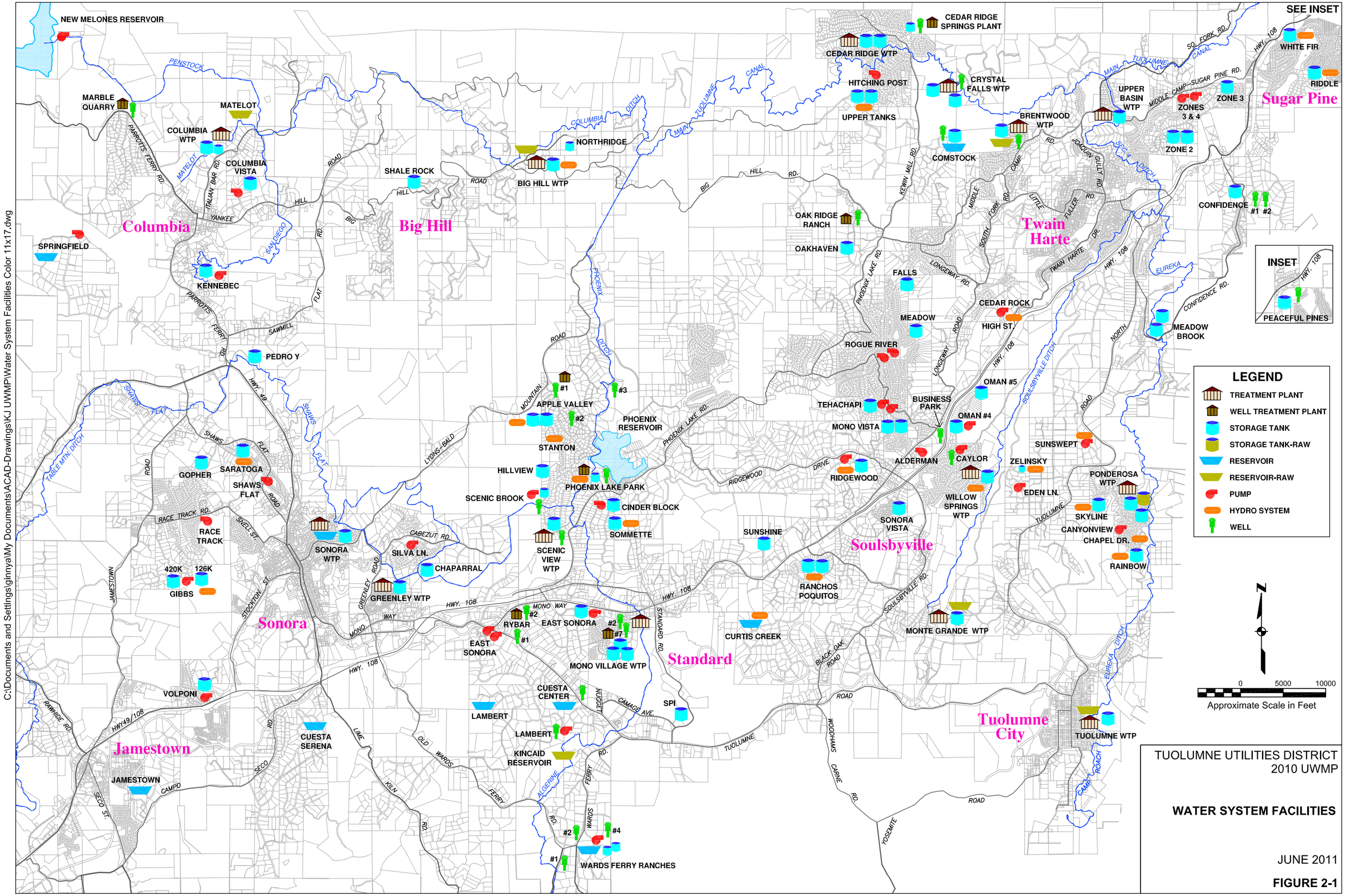

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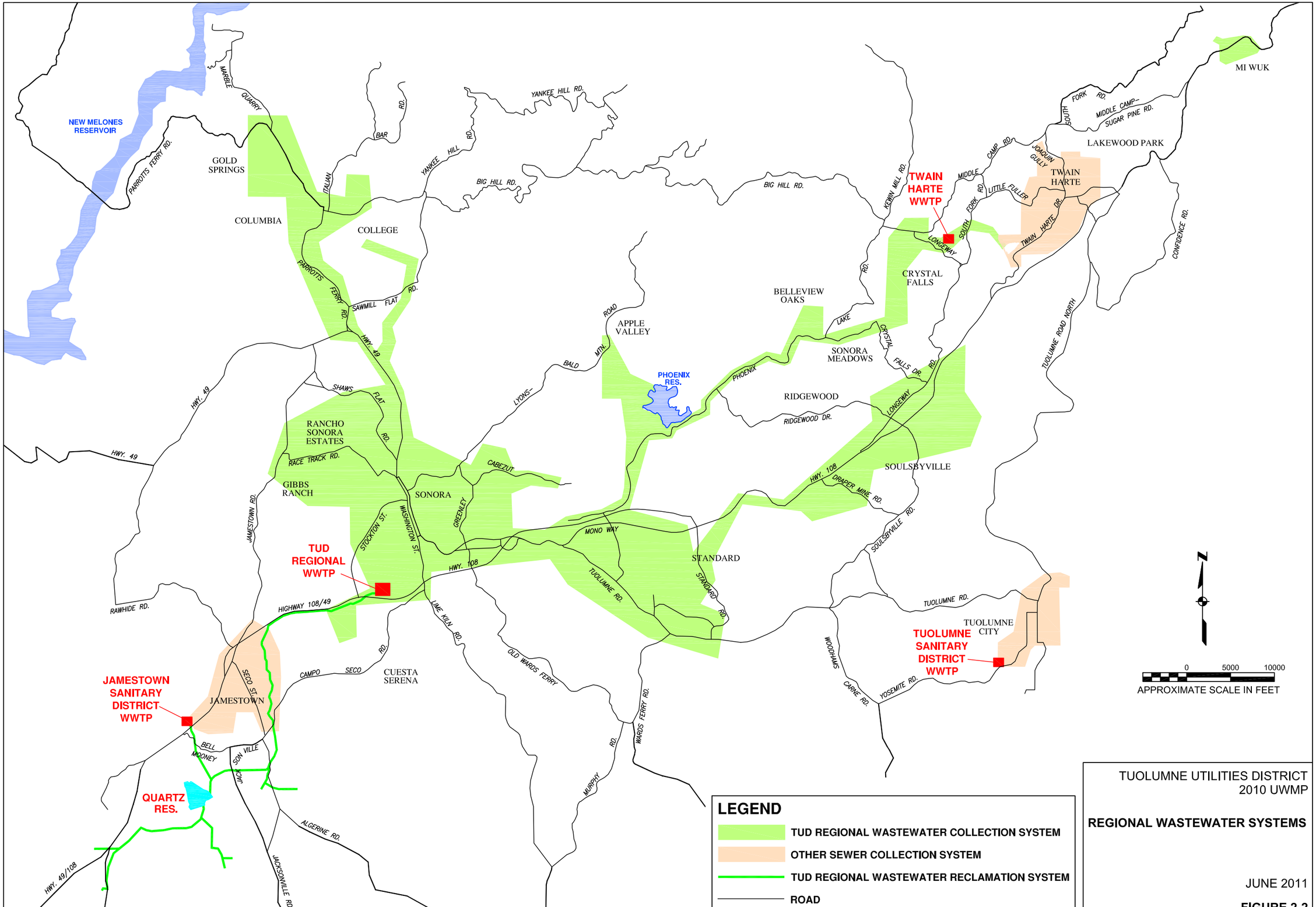
TUOLUMNE UTILITIES DISTRICT
2010 UWMP

WATER SYSTEM FACILITIES

JUNE 2011

FIGURE 2-1



TUOLUMNE UTILITIES DISTRICT
2010 UWMP

REGIONAL WASTEWATER SYSTEMS

JUNE 2011

FIGURE 2-2

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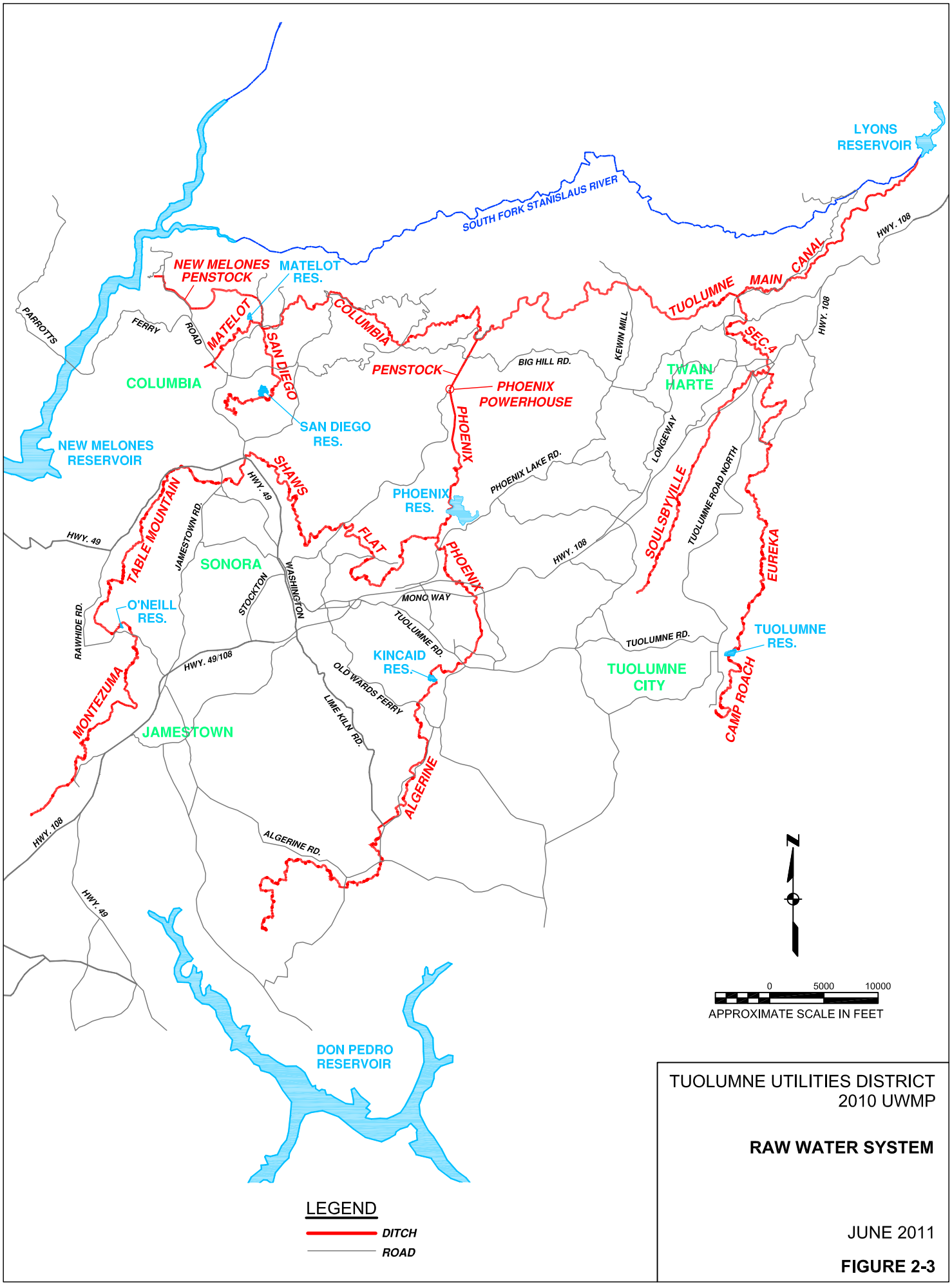

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TUOLUMNE UTILITIES DISTRICT
2010 UWMP

RAW WATER SYSTEM

JUNE 2011

FIGURE 2-3

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2.3 Demographics

The County is demographically representative of the TUD service area. According to 2000 U.S. Census data, the median age of County residents is 29.1 years. In addition, the County has an average household size of 2.36 people and a median household income of approximately $38,725 in 1999 dollars or $50,184 in 2010 dollars.

2.4 Population

The population of the area served by the TUD water distribution systems is the defined service area population for this UWMP. Population trends developed by state and federal agencies have historically been unrepresentative of the TUD service area. Therefore, TUD used its own record connection data; correlated and compared with Tuolumne County Community Development Department, as the basis for determining population projections for the service area.

2.4.1 Population Projection Development Methodology

Population projections were estimated using the directions outlined in Methodology 2: Service Area Population from the “Methodologies for Calculating Baseline and Compliance Urban Per Capita Water Use” by DWR. The per-connection methodology described in Appendix A of Technical Methodology 2 was used since annual estimates of direct service area population were not available. Through these directions, TUD was identified as a Category 2 water supplier, an agency with an electronic geographic information system (GIS) map of the water distribution area.

The population served by TUD is derived by using the 2000 U.S. Census Data overlaid onto a GIS map of distribution area boundaries. For the purposes of estimating the population, the TUD distribution areas are broken down into 19 separate polygons. Many of the individual 2000 U.S. Census block polygons reside completely within a TUD distribution area. Therefore, the population listed by the 2000 U.S. Census in these polygons is added, in full, to the total TUD Treated Water System population. However, census blocks polygons that span across the TUD water distribution boundaries are split and the population percentages residing inside or outside the service area are estimated according to the distribution of the parcels. A distribution of parcels was used because each 2000 U.S. Census block for the County and the TUD water distribution areas are very irregular in shape and the population within each census block is not evenly distributed. Therefore, the population that resides inside or outside of the TUD service area is estimated based on the distribution of the County Assessor’s Parcels for each 2000 U.S. Census block that spans the TUD water distribution boundary. The total TUD water distribution population is, therefore, based on the sum population of all individual polygon populations as derived above.

A persons-per-connection ratio of 2.54 is established using the 2000 U.S. Census population data (24,755) and the total number of TUD residential connections recorded for 2000 (9,756).

2.4.2 Growth Rates and Projections

Growth rates and projections presented below are based on TUD’s historical number of active treated water connections.

2.4.2.1 System Growth Rates

TUD has experienced two types of treated water system connection growth since its inception in 1992 including: 1) non-acquisition growth, which includes specific proposed developments and general growth resulting from population increases and hookups of parcels previously served by wells to the public water system; and 2) acquisition/merger growth, which is associated with the acquisition/merger of discrete private and mutual water companies. Table 2-2 summarizes the water connections added by year.

Table 2-2: TUD Treated Water Service Growth Statistics

Calendar Year	Total Number of Active Connections[1]	Non-Acquisition Water Connections Added	System Acquisitions Connections Added	Total Number of New Connections	Percent Increase due to Non-Acquisition Connections	Percent increase due to System Acquisition Connections	Percent Increase due to Total Growth
1993	8,754	73	0	73	0.84%	0%	0.84%
1994	8,808	54	0	54	0.62%	0%	0.62%
1995	9,215	58	349	407	0.66%	3.96%	4.62%
1996	9,857	57	585	642	0.62%	6.35%	6.97%
1997	9,938	81	0	81	0.82%	0%	0.82%
1998	10,578	104	536	640	1.05%	5.39%	6.44%
1999	10,690	112	0	112	1.06%	0%	1.06%
2000	10,838	148	0	148	1.38%	0%	1.38%
2001	11,292	149	305	454	1.37%	2.81%	4.19%
2002	11,449	157	0	157	1.39%	0%	1.39%
2003	11,663	214	0	214	1.87%	0%	1.87%
2004	12,122	184	275	459	1.58%	2.36%	3.94%
2005	12,289	167	0	167	1.38%	0%	1.38%
2006	12,588	118	181	299	0.96%	1.47%	2.43%
2007	12,666	78	0	78	0.62%	0%	0.62%
2008	12,722	56	0	56	0.44%	0%	0.44%
2009	12,744	22	0	22	0.17%	0%	0.17%
2010	12,759	15	0	15	0.12%	0%	0.12%
Total		**1,847**	**2,231**	**4,078**			
Average					**1.08%**	**1.28%**	**2.16%**

Note:

1. Wholesale, fire, and inactive connections are not included within the Total Number of Active Connections.

As shown in Table 2-2 above, TUD added a total of 4,078 active connections to the Treated Water System between 1992 and 2010. Of those, 1,847 (45 percent) were categorized as non-acquisition growth and 2,231 (55 percent) were associated with acquisition/merger growth. Non-acquisition growth from 1992 to 2010 averaged 1.08 percent annually. Acquisition/merger growth from 1992 to 2010 averaged 1.28 percent annually. The combined connection growth rate from 1992 to 2003 averages 2.16 percent annually.

There are many remaining smaller water systems located in the proximity of the TUD water system boundary. TUD's Treated Water System Optimization Plan Projected 20-Year Growth Rates in Active Water Service Connection by Water Service Area Memo (TWSOP Growth Memo) included in Appendix H provides a detailed summary of these systems. As stated in the TWSOP Growth Memo, based on the aging infrastructure and increasing regulatory demands placed on these smaller water systems, TUD assumes that it will acquire all of these systems by 2030. Based on this assumption, the estimated acquisition growth rate between 2010 and 2030 is projected to be 1.50 percent which is slightly higher than the historic acquisition growth rate of 1.28 percent presented in Table 2-2 above. Therefore, TUD is conservatively anticipating an annual growth rate of 2.34 percent will take place between 2010 and 2030 which includes a non-acquisition general population growth rate of 1.08 percent combined with the anticipated acquisition growth rate of 1.50 percent. After 2030, a historic annual connection growth rate of 1.08 percent is anticipated.

2.4.2.2 Account Category Growth Rates

TUD provides treated water to single family, multi-family, commercial, industrial, institutional, and landscape customers as shown in Table 2-3. Historic growth rates for each customer category were used to project the number of multi-family, commercial, industrial, institutional, and landscape connections for 2011 through 2035. As stated previously, TUD anticipates that the projected growth rate will increase slightly over the historic growth rate. It is assumed that this increase in growth rate will mainly affect single family connections. Therefore, for this UWMP, single family connections account for the difference between the projected and historical total connection growth to meet the established total active connection combined growth rate of 2.34 percent. Table 2-3 summarizes the growth rates established by account category and total number of historic and projected connections.

Table 2-3: Number of Connections and Growth Rate by Account Category							
	Account Category						
Year	Single Family	Multi-family	Commercial	Industrial	Institutional/ Government	Landscape	Total Active Connections
1992	7,564	144	567	17	331	58	8,681
2010	11,137	291	858	19	384	70	12,759
Historic Growth Rate (1992-2010)	2.17%	3.99%	2.33%	0.62%	0.83%	1.05%	2.16%
2015	12,510	354	963	20	400	74	14,320
2020	14,047	430	1,080	20	417	78	16,072
2025	15,767	523	1,212	21	435	82	18,039
2030	17,690	636	1,360	21	453	86	20,246
Projected Growth Rate (2010-2030)	2.34%	3.99%	2.33%	0.62%	0.83%	1.05%	2.34%
2035	18,669	671	1,435	22	472	91	21,360
Projected Growth Rate (2030-2035)	1.08%	1.08%	1.08%	0.62%	0.83%	1.05%	1.08%

Notes:

1. Wholesale and fire connections are not considered active connections and are not included in the Total Active Connections numbers.
2. The growth rates in bold were used to project account category connections.

Based on the system and account classification growth rates, residential connections were projected through 2035. The estimated persons per connection ratio of 2.54 was used to establish the service area population shown in Table 2-4. A summary of historic and projected residential connections and population is presented in Table 2-4.

Table 2-4: Historical and Projected Population			
Year[1]	**Service Area Population[4]**	**Residential Connections[5]**	**Data Source**
2005	27,927	11,006	2000 U.S. Census
2010	28,997	11,428	TUD projections
2015	32,641	12,864	See note below
2020	36,735	14,477	See note below
2025	41,333	16,290	See note below
2030	46,499	18,326	See note below
2035	49,074	19,340	See note below

Notes:

1. This table is based on the DWR Guidebook Table 2.
2. Based on calendar year.
3. Dashed line represents division between historic and projected data.
4. 2010 to 2030 residential connections are based on an annual increase of 2.34 percent in connections, then an increase of 1.08 percent between 2030 and 2035.
5. Service area population is derived from the 2.54 persons per connection ratio established based on 2000 U.S. Census for the TUD distribution areas.

2.5 Climate

The Western Regional Climate Center has maintained historical climate records for the past 100 years for the City of Sonora and is currently shown on their website (www.wrcc.dri.edu). This website does not include data for any other community within the TUD service area. Based on this lack of available data and since a large portion of TUD's customers reside in or near the City of Sonora, the Western Regional Climate Center 100 year data for the City of Sonora has been included in Table 2-5.

Similar to the Western Regional Climate Center, the California Irrigation Management Information System (CIMIS) web site (http://www.cimis.water.ca.gov) tracks and maintains records of evapotranspiration (ETo) for select cities only. ETo statistics used for TUD come from the foothill region as there are no CIMIS stations located in Tuolumne County. It assumed that the foothill region stations (Camino, Shenandoah Valley, Browns Valley, Auburn, Plymouth, and Diamond Springs) will be representative of the TUD distribution area. The average ETo included in Table 2-5 is calculated from the foothill stations, with historical records ranging from 1 to 28 years.

The average monthly rainfall included in Table 2-5 is based on records dating back to as early as 1887. TUD maintains current rainfall data as measured at the TUD Regional Wastewater Treatment Plant (RWWTP). The rainy season in this area is generally from about November to March. Monthly precipitation during the winter months ranges from approximately 3 to 6 inches. Low humidity generally occurs in the summer months from about June to September. The combination of hot and dry weather during the summer months typically results in higher water demand usage by TUD customers.

Table 2-5: Monthly Average Climate Data Summary				
Month	**Standard Monthly Average ETo[1] (inches)**	**Average Total Rainfall[2] (inches)**	**Average Temperature[3] (degrees Fahrenheit) Max**	**Min**
January	1.21	6.3	55	34
February	1.77	5.7	58	36
March	3.02	5.4	63	38
April	4.54	2.8	69	42
May	5.92	1.3	77	47
June	7.34	0.3	86	53
July	8.64	< 0.1	95	59
August	7.83	0.1	93	57
September	5.88	0.4	87	53
October	4.04	1.7	76	45
November	1.86	3.5	64	38
December	1.21	5.2	56	34

Notes:

1. Evapotranspiration (ETo) based on foothill region data from http://www.cimis.water.ca.gov/cimis/welcom.jsp.
2. Average total rainfall based on TUD records since 1887.
3. Average temperatures based on City of Sonora 100 year data from www.wrcc.dri.edu.

Chapter 3: Water Use

Section 10631 (e) of the Act requires that an evaluation of water use be performed for the TUD Treated Water System. The Act states the following:

> *Section 10631.*
>
> *(e)*
>
> *(1) 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, identifying the uses among water-use sectors including, but not necessarily limited to, all of the following uses:*
>
> *(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.*
>
> *(2) The water-use projections shall be in the same five-year increments described in subdivision (a).*

In addition, Section 10631 (k) of the Act directs urban water suppliers to provide existing and projected water-use information to wholesale agencies from which water deliveries are obtained. The Act states the following:

> *Section 10631.*
>
> *Urban water suppliers that rely 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 (c). 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 (c), including, but not limited to, ocean water, brackish water, and groundwater, as a long-term supply.*

In conjunction with projecting total water demand, each urban water retail supplier must develop urban water use targets and an interim urban water use target in accordance with SBX7-7. SBX7-7 amends the Act requiring statewide water savings of 20 percent by the year 2020. The bill sets specific methods for calculating both the baseline water usage and water use targets in gallons per capita day (gpcd).

Section 10608.20(e) states the following:

> *An urban retail water supplier shall include in its urban water management plan required pursuant to Part 2.6 (commencing with Section 10610) due in 2010 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.*

This chapter presents an analysis of urban water use data with the resulting projections for future water needs and water use targets in accordance with SBX7-7 for the TUD service area.

For the purposes of this UWMP, TUD urban water use is defined as treated water use. Total urban water demand is the total quantity of water produced from the WTPs and groundwater wells within the TUD water distribution systems. TUD also provides untreated water to customers for agricultural irrigation and for water supply to other water systems not owned or operated by TUD. The untreated water quantities are not included in TUD's urban water use as these quantities are not a reflection of TUD's residential, commercial, or industrial customer usage. This chapter, therefore, discusses treated urban water use only.

3.1 Historical Water Use

Historical water use data from 1999 to 2010 were analyzed in order to provide an overview of historical water usage for the TUD Treated Water System. Figure 3-1 shows the historical number of active metered connections and water use from 1999 through 2010.

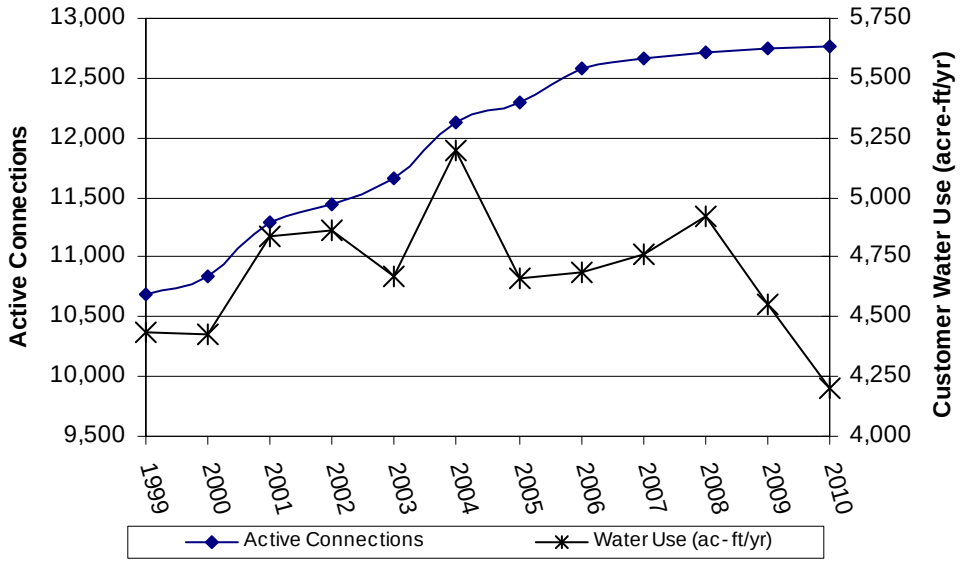

Figure 3-1: Historical Number of Metered Service Connections and Water Use

Figure 3-1 shows a peak in water use in 2004 and over a 14 percent decline from 2008 to 2010. Review of similar data from other systems suggests that the recent decline in water use has been widespread and is not isolated to the TUD Treated Water System. The decline in recent water use is not yet fully understood, but may be a result of several factors including: cool summers and wet seasons that extended into late spring, a statewide drought that forced

mandatory water reductions and conservation in many areas, and an economic downturn that has caused many businesses to close and increased housing vacancies.

Table 3-1 shows the historical water use by customer type for 2005 through 2010.

Table 3-1: Historical Water Use by Customer Type

Year[1]	Water Use by Customer Type (ac-ft)						Total
	Single Family	Multi Family	Commercial	Industrial	Institutional/ Government	Landscape	
2005	3,486	356	347	3	390	80	4,662
2006	3,485	357	370	3	389	80	4,684
2007	3,543	363	376	3	396	81	4,762
2008	3,663	375	389	3	409	84	4,924
2009	3,388	347	360	3	379	77	4,554
2010	3,106	319	351	3	347	71	4,197

Note:
1. Based on calendar year.

3.2 Water Use Targets

This section includes documentation of the water use targets commensurate with enactment of SBX7-7. The 2010 UWMP update is the first in which such targets have been documented. The projected water use for each urban water supplier is required to be reduced by a total of up to 20 percent by the year 2020 from a calculated baseline gpcd as required by SBX7-7. The steps described throughout this section follow the guideline methodologies developed by DWR over the past year, as documented in Section D of the DWR Guidebook. The three overall steps to determine the 2020 water use target are as follows:

- Step 1 – Calculate the baseline per capita water use, using the required methodologies.
- Step 2 – Calculate the per capita water use reduction for the four methodologies (including the minimum reduction target – which is a provision included to ensure all agencies achieve a minimum level of water savings).
- Step 3 – Select the target reduction methodology and set interim (2015) and compliance (2020) water use targets. The chosen methodology is the responsibility of the water supplier and may be revised in 2015.

The Act now stipulates that DWR shall review the progress made towards reaching the statewide water savings targets as reported in the 2015 UWMP updates. Currently, no single

urban water supplier is required to conserve more than 20 percent. However there are provisions in the law that could require additional conservation after 2015 if it is found that the state is not on track to reach 20 percent statewide water savings by 2020.

3.2.1 Baseline Per Capita Water Use

The first step in the process of determining the water use target is calculation of the baseline per capita water use (baseline gpcd). In order to calculate the baseline gpcd, service area population within the TUD service area was estimated and compared to actual water use records. The following baseline gpcd calculations identified in SBX7-7 were evaluated for the TUD system:

- 10- to 15-year base period – Average water use over a continuous 10-year period ending no earlier than 31 December 2004 and no later than 31 December 2010. For retailers with at least 10 percent of 2008 demand served by recycled water (either retail or wholesale-provided), this calculation may be extended to include an additional 5 years.

- 5-year base period – Estimate of average gross water use reported in gpcd and calculated over a continuous 5-year period ending no earlier than 31 December 2007 and no later than 31 December 2010.

The baseline periods were evaluated using water supply data for the years ending 31 December 1999 through 31 December 2010. The base water use was calculated for each year commencing with 1999. Table 3-2 below presents the base period ranges, total water deliveries, and the volume of recycled water delivered in 2008; in order to determine the number of years that can be included in the base period range. The TUD Treated Water System currently provides no recycled water; therefore a 10-year base period was utilized. Also shown in Table 3-2 is the actual start and end years for the selected base period range.

Table 3-2: Base Period Ranges

Base Period	Parameter	Value	Units
10-year base period	2008 total water deliveries	5,890	ac-ft
	2008 total volume of delivered recycled water	0	ac-ft
	2008 recycled water as a percent of total deliveries	0	percent
	Number of years in base period	10	Years
	Year beginning base period range	1999	
	Year ending base period range	2008	
5-year base period	Number of years in base period	5	Years
	Year beginning base period range	2003	
	Year ending base period range	2007	

Note:
Table format based on DWR Guidebook Table 13.

The average annual daily per capita water use in GPCD is provided in Table 3-3.

Table 3-3: 1999-2010 Average Annual Daily Use			
Calendar Year	**Estimated System Population**	**MG/year[2]**	**Annual Daily per Capita Water Use, gpcd**
1999	24,415	1,677	188
2000	24,755	1,718	190
2001	25,803	1,867	198
2002	26,163	1,892	198
2003	26,658	1,821	187
2004	27,541	1,982	197
2005	27,927	1,787	175
2006	28,604	1,868	179
2007	28,782	1,819	173
2008	28,911	1,919	182
2009	28,962	1,839	174
2010	28,997	1,669	158

Notes:
1. Table format based on DWR Guidebook Tables 14 and 15.
2. Usage in units of million gallons per year (MG) per year provided by TUD.

The 10-year average gpcd available for TUD to select is presented in Table 3-4; and the 5-year rolling averages are shown in Table 3-5. The 1999-2008 10-year and 2003-2007 5-year average base daily usages of 187 and 182 gpcd were selected, respectively.

Table 3-4: 10-Year Average Base Daily Per Capita Water Use	
10-Year Period	**Average Base Daily per Capita Water Use (gpcd)**
1999-2008	**187**
2000-2009	185
2001-2010	182

Note:
1. The period in bold was selected as the 10-year base period.

Table 3-5: 5-Year Average Base Daily Per Capita Water Use	
5-Year Period	**Average Base Daily per Capita Water Use (gpcd)**
2003-2007	**182**
2004-2008	181
2005-2009	177
2006-2010	173

Note:
1. The period in bold was selected as the 5-year base period.

3.2.2 Urban Water Use Target Calculation

Retail suppliers must identify their demand reduction targets by utilizing one of four compliance methods identified in SBX7-7. The four compliance methods are as follows:

- Compliance Method 1 – 80 percent of baseline gpcd water use.
- Compliance Method 2 – The sum of the following performance standards: indoor residential use (provisional standard set at 55 gpcd); plus landscape use, including dedicated and residential meters or connections equivalent to the State Model Landscape Ordinance (70 percent of reference ETo); plus 10 percent reduction in baseline commercial, industrial institutional (CII) water use by 2020.
- Compliance Method 3 – 95 percent of the applicable state hydrologic region target as identified in the 2020 Conservation Plan (DWR, 2010).
- Compliance Method 4 – A provisional method identified and developed by DWR through a public process released 16 February 2011, which aims to achieve a cumulative statewide 20 percent reduction. The method assumes water savings will be obtained through metering of unmetered water connections and achieving water conservation measures in three water use categories: (1) indoor residential, (2) landscape, water loss and other unaccounted for water and (3) commercial, industrial and institutional.

Due to the data requirements of Methods 2 and 4, which are not currently available to TUD, it elected to evaluate Methods 1 and 3 for selecting urban water use targets for the 2010 plan. The following section provides an explanation of the target calculations and a summary of the interim and compliance water use targets.

Compliance Method 1 Calculation Summary

The Method 1 2020 water use target was calculated by multiplying the base daily gpcd by 80 percent. A 20 percent reduction in baseline use would require a reduction of 38 gpcd by 2020 as shown in Table 3-6. The 2015 interim target would be 168 gpcd and water use target of 149 gpcd by 2020. Table 3-6 provides a summary of the reduction requirements.

Table 3-6: 2020 Water Use Target Method 1 Calculation Summary				
Description	**Units**	**Baseline**	**2015 Interim Target**	**2020 Compliance Target**
Per Capita Water Use	**gpcd**	**187**	**168**	**149**
Percent Reduction	%	n/a	10%	20%

Compliance Method 3 Calculation Summary

The Method 3 2020 water use target was calculated by multiplying the respective hydrologic region target by 95 percent. TUD is located in the San Joaquin River hydrologic region (Region 4), which has a hydrologic region target of 174 gpcd. Ninety-five (95) percent of the hydrologic region target results in a 2020 compliance target of 165 gpcd. Table 3-7 presents the results of the Method 3 calculation:

Table 3-7: 2020 Water Use Target Method 3 Calculation Summary				
Description	**Units**	**10 year Baseline**	**2015 Interim Target**	**2020 Compliance Target**
Per Capita Water Use	**gpcd**	**187**	**176**	**165**
Percent Reduction	%	n/a	6%	12%

Minimum Compliance Reduction Target

Systems with a baseline per capita water use of greater than 100 gpcd must calculate a minimum water use reduction, which the 2020 water use target cannot exceed. The minimum water use reduction compliance target is 95 percent of the 5-year rolling average base daily per capita water use (ending no earlier than 31 December 2007 and no later than 31 December 2010). By this method, the minimum 2020 reduction compliance target for TUD is 173 gpcd, as presented in Table 3-8 below:

Table 3-8: Minimum Water Use Reduction				
Description	**Units**	**5 year Baseline**	**2015 Interim Target**	**2020 Compliance Target**
Minimum Allowable 2020 Target	**gpcd**	**182**	**178**	**173**
Percent Reduction	%	n/a	3%	5%

3.2.3 Interim and Compliance Water Use Targets

The interim and compliance water use targets are provided per Section 10608.20(e) of the Act. Since both the Method 1 and 3 compliance targets are less than the minimum reduction; Compliance Method 3 was selected by TUD. As a result, Table 3-9 shows the 2020 SBX7-7 compliance target for the TUD Treated Water System is 165 gpcd and the 2015 interim water use target is 176 gpcd. The implementation plan for achieving these targets is described in Chapter 7, Conservation Programs and Demand Management Measures.

Table 3-9: SBX7-7 Water Use Reduction Targets (gpcd)

Baseline	2015 Interim Target	2020 Compliance Target
187	176	165

3.3 Projected Water Use

Growth projections for the number of service connections and volume of water use were calculated for the years 2015 through 2035, in 5-year increments. Future water demands were estimated using historical-trend growth rates and water use records.

Historical water use records from 2005 through 2010 were analyzed to generate estimates of future water demands. The water sales data were sorted by customer type using the assigned North American Industry Classification System codes. The sorted water sales data were then further grouped into the following six categories: single family, multi-family, industrial, commercial, institutional/government, and landscape.

A water use factor was calculated for each category in order to quantify the average water used per metered connection. For a given customer type, the unit water use factor is calculated as the total water sales for the category divided by the number of active service connections for that category. The unit water use factors for each customer type were averaged over the data range in order to obtain a representative water use factor that can be used for determining water demand projections by customer type. Table 3-10 presents the water use factors, in units of ac-ft/yr per connection, calculated for each customer category.

Table 3-10: Average Water Use Factors

	Account Category					
	Single Family	Multi-family	Commercial	Industrial	Institutional/ Government	Landscape
Water Use Factor [1] (ac-ft/yr per connection)	0.313	1.231	0.431	0.167	1.009	1.131

Note:
1. Based on an average of customer water use data from calendar years 2005 through 2010.

The historical-trend water use projections are based on the historical number of metered service connections by account category. The average growth rates established by historical trends were applied to the number of connections in each customer category to project the future number of service connections, as discussed in Chapter 2. The historical-trend projected water use was then estimated by multiplying the number of projected active service connections for each customer category with the corresponding customer average water use factor calculated above. The methodology and the derivation of all applicable growth rates used for service connection projections are discussed in more detail in Chapter 2.

Figure 3-2 shows the population based water use projections by customer type.

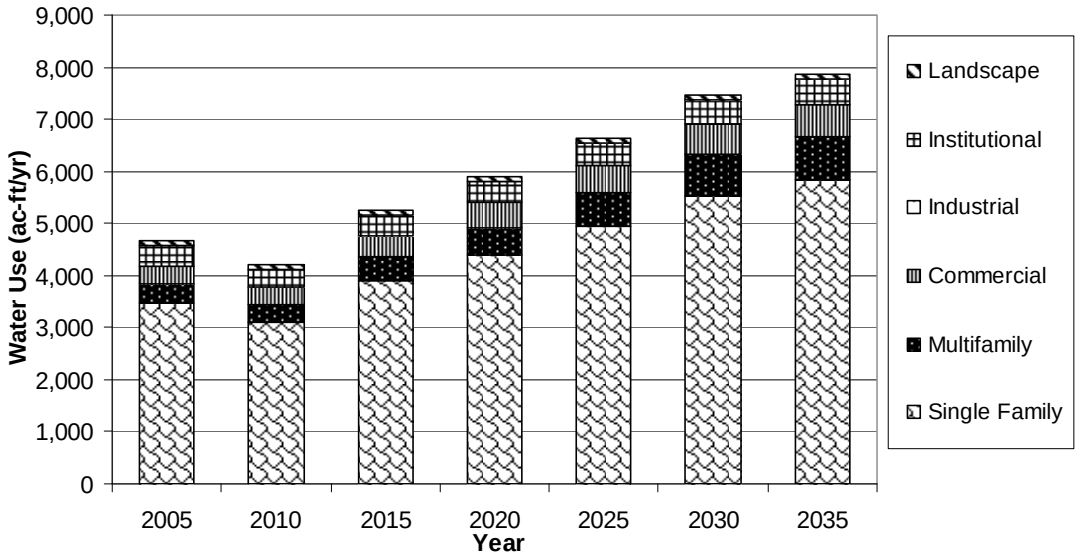

Figure 3-2: Projected Water Use by Customer Type

The population-based projections of the number of service connections, and the resulting water demand, are provided in Table 3-11.

Table 3-11: Projections of the Number of Service Connections and Water Use								
		Account Category						
Year[2]	Projection Type	Single Family	Multi-family	Commercial	Industrial	Institutional/ Government	Landscape	Total
2005	No. of Accounts	10,731	275	822	19	374	68	12,289
	Water Use (ac-ft)	3,486	356	347	3	390	80	4,662
2010	No. of Accounts	11,137	291	858	19	384	70	12,759
	Water Use (ac-ft)	3,106	319	351	3	347	71	4,197
2015	No. of Accounts	12,510	354	963	20	400	74	14,320
	Water Use (ac-ft)	3,916	436	415	3	404	83	5,257
2020	No. of Accounts	14,047	430	1,080	20	417	78	16,072
	Water Use (ac-ft)	4,397	530	465	3	421	88	5,904
2025	No. of Accounts	15,767	523	1,212	21	435	82	18,039
	Water Use (ac-ft)	4,935	644	522	3	439	93	6,636
2030	No. of Accounts	17,690	636	1,360	21	453	86	20,246
	Water Use (ac-ft)	5,537	783	586	4	457	98	7,465
2035	No. of Accounts	18,669	671	1,435	22	472	91	21,360
	Water Use (ac-ft)	5,843	826	618	4	476	103	7,870

Notes:
1. This table is based on the DWR Guidebook Tables 3 through 7.
2. Based on calendar year.
3. All connections are metered.

3.4 Sales to Other Agencies

TUD sells treated water to five (5) water companies within the County: Sonora Water Company, Sonora Meadows Mutual Water Company, Muller Mutual Water Company, Leisure Pines Mutual Water Company, and Tamarron Mobile Home Park. It is expected that these companies will experience approximately the same annual growth rate of 1.08 percent that TUD has identified for non-acquisition growth in Chapter 2. The historic and projected volume of water delivered to these other agencies is summarized in Table 3-12.

Table 3-12: Sales to Other Agencies (ac-ft/yr)							
Water Distributed	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**
Sonora Water Company	145	111	153	162	171	180	190
Sonora Meadows Mutual Water Company	116	81	115	121	128	135	142
Muller Mutual Water Company	17	16	20	21	22	24	25
Leisure Pines Mutual Water Company(3)	0	0	0	0	0	0	0
Tamarron Mobile Home Park(3)	0	1	1	1	1	1	1
Total	279	208	289	305	321	339	358

Notes:
1. This table is based on the DWR Guidebook Table 9.
2. Based on calendar year.
3. Leisure Pines Mutual Water Company and Tamarron Mobile Home Park use TUD connections for emergency purposes only.

SBX7-7 defines a wholesale urban water supplier as an urban water supplier which supplies more than 3,000 ac-ft annually for wholesale potable municipal use. As shown in Table 3-12, TUD does not meet this definition and therefore is not considered a wholesale urban water supplier.

3.5 Other Water Uses and Unaccounted-for Water

Table 3-13 provides a summary of projected other water uses and unaccounted-for water in the TUD Treated Water System.

In order to estimate total water demand, other water uses must be added to the customer demands. State regulation requires water suppliers to quantify any additional water uses not included as a part of water use by customer type. TUD estimates other water uses as: fire department fire hydrant testing, distribution flushing, and use of hydrants for County and contractor construction. These other water uses total approximately 5 MG annually and are projected to increase with the listed population growth through 2035.

Unaccounted-for water must also be incorporated when projecting total water demand. Unaccounted-for water is defined as the difference between annual production and supply and annual sales. Included in the unaccounted-for water are system losses due to leaks, tank/reservoir overflows, or inaccurate meters, and water used in operations. In 2005 and 2010, unaccounted-for water averaged approximately 16 percent of the total production; therefore, this rate was used for unaccounted-water projections. Table 3-13 provides a summary of the projected unaccounted-for water within TUD Treated Water System.

Table 3-13: Additional Water Uses and Losses (ac-ft/yr)							
Water-Use Type	**2005[2]**	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**
Other Water Uses	15	15	17	19	21	24	25
Unaccounted-for System Losses[3]	806	911	1,000	1,123	1,263	1,420	1,497
Total	821	926	1,017	1,142	1,284	1,444	1,522

Notes:

1. This table is based on the DWR Guidebook Table 10.
2. Based on calendar year.
3. Unaccounted-for water includes system losses due to leaks, reservoir/tank overflows, inaccurate meters, unauthorized connections, line breaks, as well as water used in operations.

3.6 Total Water Demand

As described above, other water uses, as well as unaccounted-for water, must be added to the customer demand in order to project total water demand. The projected water sales and additional water uses and losses were added to estimate the total baseline water demand shown in Table 3-14.

Table 3-14 also includes a comparison of total baseline water demand to the estimated total water demand with SBX7-7 compliance. The baseline demand projections below do not include water use reductions due to additional implementation of Demand Management Measures (DMM) or other conservation activities discussed in Chapter 7. Conservation-based demand projections are provided for reference purposes and assume full compliance with the SBX7-7 interim and compliance targets identified in this chapter. Baseline demands are used for supply reliability evaluation purposes throughout this UWMP in order to provide a conservative estimate of water supplies that may be required to meet system demands for the next 25 years. As shown in Table 3-14, TUD's total baseline water demand is less than the required interim 2015 SBX7-7 target; however, the projections indicate that TUD will need to implement additional conservation to meet the SBX7-7 2020 compliance target. TUD does plan to continue and expand implementation of DMMs, as further discussed in Chapter 7, to help meet the SBX7-7 2020 target.

Table 3-14: Projected Water Sales, Additional Water Uses and Losses, and Total Water Demand in ac-ft/yr					
Year[(2)]	**Projected Water Sales**	**Additional Water Uses and Losses**	**Total Projected Water Demand**	**Conservation to Meet SBX7-7**	**Total Target Water Demand Required by SBX7-7**
2005	4,662	821	5,483	-	5,483
2010	4,197	926	5,123	-	5,123
2015	5,257	1,017	6,274	0	6,438
2020	5,904	1,142	7,046	244	6,802
2025	6,636	1,284	7,920	267	7,653
2030	7,465	1,444	8,909	299	8,610
2035	7,870	1,522	9,392	305	9,087

Notes:
1. This table is based on the DWR Guidebook Table 11.
2. Based on calendar year.

Figure 3-3 shows the projected total baseline water demand through 2035 compared to the total water demand required by SBX7-7 with conservation.

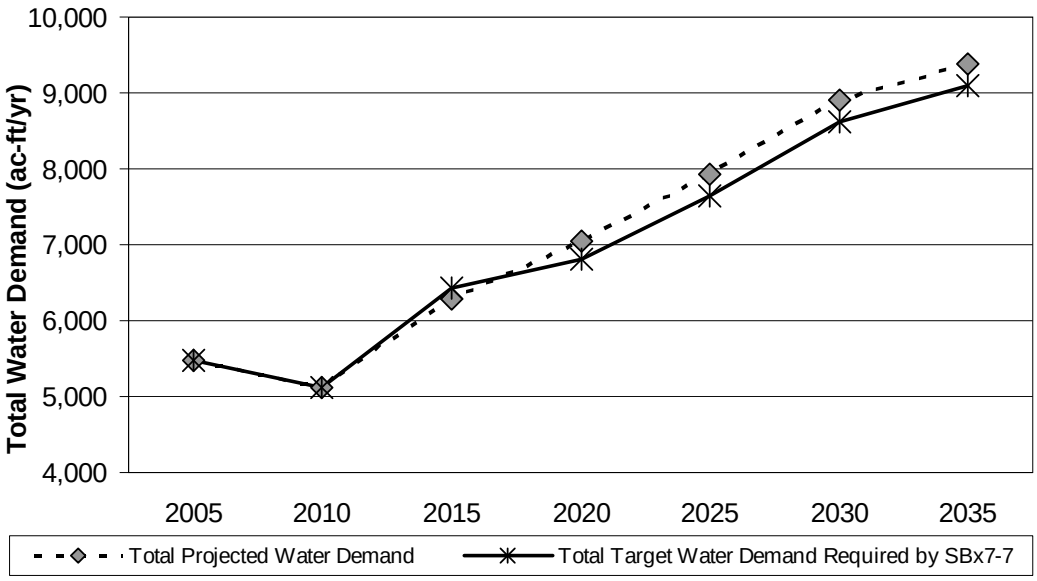

Figure 3-3: Total Water Demand

3.7 Disadvantaged Community Water Use Projections

Section 10631.1 (a). Include projected water use for single-family and multi-family residential housing needed for lower income households, as identified in the housing element of any city, county, or city and county in the service area of the supplier.

3.7.1 Lower Income Water Use Projections

Senate Bill 1087 requires that water use projections of a UWMP include the projected water use for single family and multi-family residential housing for lower income households as identified in the housing element of any city, county, or other applicable general plan.

Housing elements rely on the Regional Housing Needs Assessment (RHNA) generated by the State Department of Housing and Community Development (HCD) to allocate the regional need for housing to the regional COG (or HCD for cities and counties not covered by a COG) for incorporation into housing element updates. Before the housing element is due, the HCD determines the total regional housing need for the next planning period for each region in the state and allocates that need. The COGs then allocate to each local jurisdiction its "fair share" of the RHNA, broken down by income categories; very low, low, moderate, and above moderate, over the housing element's planning period.

The County last updated Chapter 3, Housing Element, of the Tuolumne County General Plan in July 2010. The County's Housing Element identifies the target number of low income households from 2007 to 2014 as 17 percent of the population and very low income as 22 percent. The County is assumed to be demographically representative of the TUD service area. Therefore, water use projections for single and multi-family households based on the low and very low income categories (39 percent), classification percentage, and calculated demand projections are shown in Table 3-15 below.

Table 3-15: Lower Income Demand Projections (ac-ft/yr)

	2015	2020	2025	2030	2035
Single Family Residence	1,527	1,715	1,925	2,159	2,279
Multi-Family Residence	170	207	251	305	322
Total	1,697	1,922	2,176	2,465	2,601

Note:
1. This table is based on the DWR Guidebook Table 8.
2. Calculations based on 2009 Adopted Tuolumne County General Plan Chapter 3, Housing Element allocation for very low income (22 percent) and low income (17 percent) for a total lower income population percentage of 39 percent.

3.7.2 Lower Income Preference Policy

Pursuant to Government Code Section 65589.7, it is TUD's policy to grant a priority to proposed developments seeking water or sewer service that includes housing units affordable to lower income households. To further this policy, TUD adopted the following procedures:

TUD will not deny or condition the approval of an application for services to, or reduce the amount of service by, a proposed development that includes housing units affordable to lower income households unless TUD makes a specific written finding that the denial, condition, or reduction is necessary due to the existence of one or more of the following:

1. TUD does not have “sufficient water supply” as defined in paragraph (2) of subdivision (a) of Government Code Section 66473.7, or is operating under a water shortage emergency as defined in Section 350 of the California Water Code, or does not have sufficient water treatment or distribution capacity, to serve the needs of the proposed development, as demonstrated by a written engineering analysis and report.

2. TUD is subject to a compliance order issued by the State Department of Health Services that prohibits new water connections.

3. The proposed development is seeking sewer service, and TUD does not have sufficient collection, treatment, or reclamation capacity, as demonstrated by a written engineering analysis and report on the condition of the collection, treatment, or reclamation works, to serve the needs of the proposed development.

4. The proposed development is seeking sewer service, and TUD is under an order issued by a Regional Water Quality Control Board (RWQCB) that prohibits new sewer connections.

5. The applicant failed to agree to reasonable terms and conditions relating to the provision of service generally applicable to development projects seeking service from TUD, including but not limited to the requirements of local, state, or federal laws, and regulations or payment of a fee or charge.

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Chapter 4: Water Supply

A detailed evaluation of water supply is required by the Act. Sections 10631 (b) through (d) and (h) of the Act state the following:

Section 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). If groundwater is identified as an existing or planned source of water available to the supplier, all of the following information shall be included in the plan:

(1) A copy of 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.

(2) A description of any groundwater basin or basins from which the urban water supplier pumps groundwater. 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 urban water supplier has the legal right to pump under the order or decree. For basins that have not been adjudicated, 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 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 eliminate the long-term overdraft condition.

(3) 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.

(4) 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) (1) Describe the reliability of the water supply and vulnerability to seasonal or climatic shortage, to the extent practicable, and provide data for each of the following:

(A) An average water year.

(B) A single dry water year.

(C) Multiple dry water years.

(2) For any water source that may not be available at a consistent level of use, given specific legal, environmental, water quality, or climatic factors, describe plans to supplement or replace that source with alternative sources or water demand management measures, to the extent practicable.

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

(h) 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, other than the demand management programs identified pursuant to paragraph (1) of subdivision (f), that the urban water supplier may implement to increase the amount of the water supply available to the urban water supplier in average, single dry, and multiple dry 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.

This chapter addresses the TUD water supply sources. The following chapter provides details in response to those requirements of this portion of the Act.

4.1 Water Sources

TUD currently obtains its water supply from two primary sources: surface water from the South Fork of the Stanislaus River under TUD's Agreement with PG&E, and TUD operated groundwater wells. TUD also uses disinfected secondary treated recycled wastewater to offset the use of untreated surface water for irrigation to agriculture lands. The recycled water supply does not replace treated water, but replaces raw water supply to agricultural customers which allows more raw water to become available for potable treatment. Recycled water is discussed more in section 4.6 below.

The surface water supply from the South Fork of the Stanislaus River accounts for 89 percent of the total water supply and 95 percent of the supply available for potable use. Groundwater in the County is limited due to the hard, impermeable bedrock that covers the majority of the County. The current and planned water from PG&E is based on the minimum available water supply as calculated during critical dry years. A more detailed description of how this minimum volume is calculated is provided in Chapter 6. The minimum water supply from PG&E is calculated to be 24,500 ac-ft as summarized in Table 4-1.

A third component of TUD's water supplies, as shown in Table 4-1, is from recycled water in the form of disinfected secondary treated wastewater to customers for agriculture irrigation uses. This recycled water displaces raw water that would otherwise be supplied for agriculture irrigation purposes. While recycled water is included in the total water supply, TUD recognizes that the recycled water supply can never exceed the agriculture irrigation use demands.

Table 4-1: Current and Planned Water Supplies (ac-ft/yr)

Source	2010	2015	2020	2025	2030	2035
Water planned from PG&E	24,500	24,500	24,500	24,500	24,500	24,500
Groundwater	1,311	1,311	1,311	1,311	1,311	1,311
Recycled water	1,850	2,308	2,421	2,540	2,664	2,794
Total	27,662	28,119	28,232	28,351	28,475	28,606

Notes:
1. Table format based on DWR Guidebook Table 16.
2. Years are reported in calendar years.

4.1.1 Surface Water

Surface water is supplied to TUD from the South Fork of the Stanislaus River under a 1983 Agreement with PG&E (1983 Agreement). Under the 1983 Agreement, PG&E transferred ownership of the Tuolumne Water System to the County. The water system and the PG&E water supply Agreement was transferred from the County to TUD in 1992. The 1983 Agreement provides that PG&E will continue to provide in perpetuity a water supply to the TUD Water System under PG&E's water rights in the South Fork of the Stanislaus River, including PG&E's Lyons Reservoir and Pinecrest Lake (also known as Strawberry Reservoir), and delivered through PG&E's Main Tuolumne Canal. The Main Tuolumne Canal is used to deliver water to the Phoenix Power House where TUD then takes delivery of water for Sonora and Jamestown.

The 1983 Agreement states that PG&E will provide a "base supply" delivered to diversion points along the Main Tuolumne Canal prior to the head-works of the Phoenix Penstock to supply the higher elevation regions of the TUD Water System. The agreement provides that a “supplemental supply" volume of water be delivered through Lyons Reservoir and Pinecrest Lake storage typically occurring after Labor Day and through the end of the calendar year of each year. The volume of water under the Agreement each year are not quantified, but are formula-determined, based on the amount of natural flow of the South Fork of the Stanislaus River and what can be made available to the TUD water system each year from PG&E's facilities on the South Fork of the Stanislaus River. Additional water is available for purchase depending on timing of runoff in each year. A copy of the 1983 Agreement with PG&E is available at the District office. The South Fork of the Stanislaus River watershed has an average annual yield of approximately 100,000 ac-ft. Lyons Reservoir and Pinecrest Lake have a combined storage of approximately 24,000 ac-ft.

As discussed above, the minimum surface water supply from PG&E is calculated to be approximately 24,500 ac-ft based on the available water supply during critical dry years. A more detailed description of critical dry year volume is provided in Chapter 6.

4.1.2 Groundwater

Groundwater from TUD wells provides approximately five (5) percent of the domestic water supplied annually to TUD customers. The majority of available groundwater is transient and found in fractured rock. The County is located within the foothills and higher elevations of the Sierra Nevada where the subsurface material consists primarily of impermeable granitic and greenstone bedrock which can result in a low groundwater yield. DWR’s Bulletin 118 provides a detailed description of groundwater basins in California, but the DWR Bulletin does not identify or describe any groundwater basins in the County.

Current, non-critical year pumping of TUD wells produces an average 1,311 acre-ft/yr. Table 4-2 shows TUD's wells and their estimated potential annual yield.

Table 4-2: Estimate Groundwater Well Capacity	
TUD Groundwater Well Name	**Estimated Well Capacity (acre-ft/yr)**
Apple Valley #1	73
Apple Valley #2	128
Apple Valley #3	150
Brentwood	29
Caylor	95
Cedar Ridge Springs	120
Comstock	15
Confidence #1	18
Confidence #2	29
Crystal Falls Business Park	29
Crystal Falls Plant	95
Cuesta Center	10
Lambert	10
Marble Quarry	80
Mono Village #2	80
Mono Village #7	72
Oakridge Ranch	26
Peaceful Pines	19
Phoenix Lake	62
Rybar #1	20
Rybar #2	10
Scenic Brook #1	13
Scenic View	30
Wards Ferry #1	22
Wards Ferry #2	25
Wards Ferry #4	20
Maximum Production	**1,311**

TUD will continue to use the limited groundwater supply available from its wells as needed each year. Table 4-3 provides a summary of TUD's groundwater pumping history from the calendar years 2005 through 2010. TUD has not adopted a groundwater management plan under Part 2.75 (commencing with Section 10750) of the California Water Code nor has the groundwater supply in the District been subject to any adjudication.

Table 4-3: Groundwater Pumping History by TUD (ac-ft)

Basin Name	Metered or Unmetered	2005	2006	2007	2008	2009	2010
N/A	Metered	275	288	245	301	199	163
Percent of Total Water Supply		1%	1%	1%	1%	1%	1%

Notes:
1. Table format based on DWR Guidebook Table 18.
2. Years are reported in calendar years.

TUD projects that well usage will increase at approximately the same rate as the overall population growth rate described in Chapter 2. It is assumed that communities dependent on groundwater wells will continue to be dependent on these sources as growth occurs in these areas. As small systems are acquired, it is assumed that wells associated with those systems will also be acquired; however, this additional groundwater supply is not included in this UWMP. The projected groundwater pumping volumes through 2035 summarized in Table 4-4 are well below the potential annual yield listed in Table 4-2 above.

Table 4-4: Projected Groundwater Pumping Amounts by TUD System to 2035 (ac-ft)

Basin Name	2010	2015	2020	2025	2030	2035
N/A	163	267	296	329	365	385
Percent of Total Water Supply	1%	1%	1%	1%	1%	1%

Notes:
1. Table format based on DWR Guidebook Table 19.
2. Years are reported in calendar years.

4.2 Transfers and Exchanges

TUD is not pursuing water transfers or exchanges at this time; therefore Table 4-5 has been left blank. The current terms of the 1983 Agreement with PG&E appear to provide sufficient water for TUD's current and projected needs. TUD would consider any future opportunities for short-term water transfers and/or exchanges with others if TUD would benefit from such an agreement.

Table 4-5: Transfer and Exchange Opportunities

Source Transfer Agency	Transfer or Exchange	Short Term	Proposed Quantities	Long Term	Proposed Quantities
N/A	N/A	N/A	N/A	N/A	N/A

Note:
Table format based on DWR Guidebook Table 20.

4.3 Planned Water Supply Projects and Programs

TUD recently permitted a new water supply well, Apple Valley Well #3 with approximately 181 ac-ft/yr yield located within the Apple Valley Estates area. It will supplement the region of the Apple Valley System located within TUD's Treated Water Service Area and has already been included in the total potential annual yield for groundwater supply (Table 4-2).

TUD is evaluating the potential for filing and securing area of origin water rights on the Stanislaus River system at New Melones Reservoir (owned by the United States and operated by the Bureau of Reclamation) as an element of a long-term solution to water supplies for the District. TUD already owns pumping facilities located in the reservoir that could be used to pump the water from New Melones Reservoir into the TUD Water System. The timeline for this effort is unknown due to the nature of this process. The goal will be to secure roughly 5,000 ac-ft/yr of water from New Melones Reservoir to be delivered into the TUD Water System for local storage annually for all years independent of weather conditions. Due to the unknown timeline and conceptual nature of the potential New Melones Reservoir supply, it is not included as a future water supply project at this time. As there are no other water supply projects planned at this time, Table 4-6 has been left blank.

Table 4-6: Future Water Supply Projects (ac-ft)

Project Name	Normal Year	Single Dry Year	Multiple Dry Years		
			Year 1	Year 2	Year 3
None	N/A	N/A	N/A	N/A	N/A

Note:
This table is based on the DWR Guidebook Table 26.

4.4 Wholesale Agency Supply Data

There are no direct deliveries of imported water supply to the TUD Water System, therefore, Table 4-7, Table 4-8, and Table 4-9 have been left blank.

Table 4-7: Existing and Planned Water Sources Available to TUD System as Identified by Wholesaler (ac-ft/yr)

Wholesaler Sources	Contracted Volume	2010		2015		2020		2025		2030		2035	
		Existing	Planned	Existing	Planned	Existing	Planned	Existing	Planned	Existing	Planned	Existing	Planned
N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Note:
Table format based on DWR Guidebook Table 17.

Table 4-8: Reliability of Wholesale Supply for Year 2035 (ac-ft/yr)

			Multiple-Dry Water Years		
Wholesaler	Average / Normal Water Year Supply	Single Dry	Year 1	Year 2	Year 3
N/A	N/A	N/A	N/A	N/A	N/A
Percent Normal	N/A	N/A	N/A	N/A	N/A

Note:
Table format based on DWR Guidebook Table 31.

Table 4-9: Factors Affecting Wholesale Supply

Name of Supply	Legal	Environmental	Water Quality	Climatic
N/A	N/A	N/A	N/A	N/A

Note:
Table format based on DWR Guidebook Table 29.

4.5 Desalination

Section 10631 (i) of the Act requires an evaluation of desalination opportunities. The Act states the following:

> *Section 10631.*
>
> *(i) Describe the opportunities for development of desalinated water, including, but not limited to, ocean water, brackish water, and groundwater, as a long-term supply.*

Per requirements of 10631(i) of the Act, this section presents opportunities to use desalinated water as a future water supply source for TUD.

Water sources available for development in the County are groundwater, surface water and related recycled water. None of those sources have quality limitations due to salinity levels. Groundwater wells in this area that yield water that is either unfit for consumption or laden with naturally occurring minerals, such as arsenic, are not in use. Surface water is diverted from the South Fork of the Stanislaus River and is treated to municipal standards through conventional methods. All recycled water is used for permitted uses on agriculture irrigation fields. Since there are no opportunities for development of desalinated water within the service area, Table 4-10 has been left blank.

Table 4-10: Summary of Opportunities for Water Desalination

Source of Water	Yield (ac-ft/yr)	Start Date	Type of Use	Other
None	N/A	N/A	N/A	N/A

4.6 Recycled Water Plan

This chapter covers Section 10633 of the Act which details the requirements of the Recycled Water Plan. The Act states the following:

> *Section 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 and shall include all of the following:*
>
> *(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.*
>
> *(b) 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.*
>
> *(c) 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, and other appropriate uses, and a determination with regard to the technical and economic feasibility of serving those uses.*

(d) 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.

(e) 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.

(f) 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.

A large portion of the wastewater in the County is collected, treated and used for irrigation of agricultural lands through TUD's Regional Wastewater System and Water Reclamation System. The Regional Wastewater System agency coordination, current operating system, future use and potential optimization of recycled water use are described below.

4.6.1 Agency Coordination

Table 4-11 summarizes the role of the agencies that participated in the development of recycled water plans that affect the TUD Regional Wastewater System and Water Reclamation System.

Table 4-11: Role of Participating Agencies in the Development of Recycled Water Plans

Participating Agencies	Role in Plan Development
Water Agencies	TUD is responsible for planning recycled water distribution for their service area in coordination with Twain Harte Community Services District (THCSD) and Jamestown Sanitary District (JSD).
Wastewater Agencies	THCSD is responsible for collecting and conveying their community's wastewater to TUD and coordinating with TUD for disposal. TUD and JSD are responsible for obtaining Title 22 permits to meet recycled water quality standards.
Groundwater Agencies	TUD operates groundwater wells as part of the Treated Water System
Planning Agencies	None

Note:
This table is based on the DWR Guidebook Table 32.

4.6.2 Description of Wastewater and Wastewater Reclamation System

TUD owns and operates the RWWTP in Sonora and an associated wastewater collection and disposal system which is described below.

Regional Wastewater System

The RWWTP has a design capacity of 2.6 million gallons per day (MGD). The RWWTP is a secondary level WWTP that utilizes screening, grit removal, primary clarification, trickling filtration, secondary clarification, effluent ponds, and disinfection. The RWWTP receives flow from both the TUD and THCSD wastewater collection systems.

Regional Wastewater Reclamation System

TUD's existing Regional Wastewater Reclamation System provides the conveyance of treated wastewater from the RWWTP and Jamestown Sanitary District (JSD) WWTP to private landowners for irrigation of approximately 713 acres of farm and pastureland.

The JSD WWTP is a secondary level WWTP with a design capacity of 0.42 MGD. The JSD WWTP serves the community of Jamestown. JSD has no facilities for effluent disposal and has contracted with TUD for its effluent disposal. The JSD WWTP effluent is conveyed by a TUD pump station to the Quartz Reservoir where the flow mixes with the RWWTP effluent before disposal through the Regional Wastewater Reclamation System to land, or to Woods Creek if land/storage capacity is not available. Seasonal surface water discharge to Woods Creek is regulated under RWQCB Order No. R5-2008-0162. Operation of the Regional Wastewater Reclamation System and discharges to land are currently regulated under RWQCB Order No. R5-2002-0202.

TUD's existing Regional Wastewater Reclamation System consists of the following primary elements: approximately 9 miles of interceptor and collector pipelines, from 6- to 24-inch diameter; Quartz Reservoir which contains approximately 1,416 ac-ft of usable storage; and a 60-horsepower pumping plant located at the JSD WWTP.

During the winter months, all the WWTP effluent is stored in Quartz Reservoir. During the irrigation season, the Regional Wastewater Reclamation System discharges through irrigation turnouts to 28 customers along the Upper and Lower Pipeline route. Recycled water irrigation outlets have metering equipment and control valves operated by TUD's Regional Wastewater Reclamation System personnel.

4.6.3 Wastewater Reclamation System Flows and Uses

The RWWTP and JSD WWTP treat wastewater for a separate population than exists in the TUD Treated Water System. Therefore, the population and flow rates presented below are based on TUD's October 2009 Updated Draft Small Community Wastewater Grant TUD Regional WWTP and Disposal System Feasibility Report (Wastewater Feasibility Report). The Wastewater Feasibility Report assumed a 0.96 percent population growth rate and determined wastewater flow projections based on equivalent single family residences (ESFR). Table 4-12 summarizes the estimates of existing and projected volumes of wastewater collected and treated in the TUD, JSD and THCSD wastewater service areas.

Table 4-12: Estimates of Existing and Projected Wastewater Flow from the TUD RWWTP and the JSD WWTP						
	2010[(2)]	**2015**	**2020**	**2025**	**2030**	**2035**
Projected population in service areas	22,243	23,332	24,473	25,671	26,927	28,244
Projected ESFR in service areas	12,346	12,950	13,583	14,248	14,945	15,676
Wastewater collected & treated in service areas (ac-ft/yr)	1,850	2,308	2,421	2,540	2,664	2,794
Quantity that meets recycled water standard (ac-ft/yr)	1,850	2,308	2,421	2,540	2,664	2,794

Notes:

1. This table is based on the DWR Guidebook Table 21.
2. 2010 flows are based on actual calendar years.
3. Values within this table are based on data developed for the Wastewater Feasibility Report with the exception of 2010 flows which are based on TUD recorded flows.

Table 4-13 lists the existing recycled water use by TUD customers.

Table 4-13: Existing Recycled Water Use in the TUD System		
Type of Use	**Treatment Level**	**2010 Use (ac-ft/yr)**
Land Application for Agriculture	secondary	1,850

Although it is TUD's intent to utilize all the recycled water through agriculture uses, the Wastewater Feasibility Report water balance calculations show that TUD's existing Regional Wastewater Reclamation System is deficient in storage capacity and land disposal area to sustain average water year conditions beyond 2018. Table 4-14 summarizes the projected discharge to Woods Creek based on utilization of the existing reclamation system through the year 2035.

Table 4-14: Estimates of Existing and Projected Disposal of Non-Recycled Wastewater for the Existing TUD Wastewater Reclamation System (ac-ft/yr)							
Method of Disposal	**Treatment Level**	**2010(2)**	**2015**	**2020**	**2025**	**2030**	**2035**
Woods Creek Discharge	secondary	0	0	50	180	310	350

Notes:
1. This table is based on the DWR Guidebook Table 22.
2. Based on actual year.
3. Projections based on water balance calculations for the existing reclamation system utilizing assumptions used in the Wastewater Feasibility Report.

In the years prior to 2018, small amounts of treated wastewater effluent may be needed to be discharged under the National Pollution Discharge Elimination System (NPDES) permit, if the existing TUD Wastewater Reclamation System is not upgraded, due to significant and multiple wet water year events. During high precipitation years, excess water that is stored in Quartz Reservoir is seasonally discharged downstream to Woods Creek. However, this potential discharge only occurs during relatively wet years when the supply of effluent exceeds the contracted irrigation demand, and only when the flow in the creek is high, such that the effluent receives at least a 20:1 dilution. The discharge of treated wastewater from Quartz Reservoir to Woods Creek is only permitted between 1 December and 15 May each year.

Woods Creek has a small watershed and base flows can be very low. Consequently, the maximum volume that the District would reasonably discharge to Woods Creek is on the order of 300 ac-ft/yr. The downstream receiving reservoir is New Don Pedro Reservoir with gross pool storage of over 2,000,000 ac-ft. Thus, the total discharge in wet year conditions would amount to a total of 0.00015 percent of New Don Pedro Reservoir storage. This percentage does not include “pass through” runoff in New Don Pedro Reservoir that would come from upstream and be moved through the facility to generate hydropower below the dam. By any standard the amount of District discharge to the Tuolumne River watershed during wet years is statistically insignificant.

4.6.4 Potential and Projected Use

TUD’s NPDES permit was renewed by the RWQCB in 2008. The new permit has surface water discharge effluent limitations that cannot be met with the current treatment processes. TUD has investigated alternatives to upgrade the treatment plants, build new carry over storage facilities, and contract with additional recycled water reclamation customers, which could result in the complete elimination of discharge to surface waters. In addition, TUD has investigated tertiary wastewater treatment alternatives to allow for a combination of land application for agricultural uses and surface water discharge. However remediation with disinfected secondary effluent of agricultural lands is currently the District’s preferred alternative. If upgrades to the RWWTP are made to allow TUD to maintain its NPDES permit, the volume of treated tertiary wastewater to be recycled is projected to remain between 80 percent and 100 percent annually.

TUD does not currently have plans to increase the level of treatment of the RWWTP beyond disinfected secondary nor does TUD plan to revise the current uses beyond land application for agricultural uses. Therefore, Table 4-16 summarizes TUD projected use of the full disinfected

secondary recycled water effluent from the RWWTP and the JSD WWTP for land application as summarized in Table 4-12. Once the Regional Wastewater Reclamation System storage and land use disposal area is increased, projected discharges to Woods Creek shown in Table 4-14 will be eliminated.

Table 4-15: Potential Future Recycled Water Uses (ac-ft/yr)

Type of Use	Treatment Level	Description	Feasibility	2010[(2)]	2015	2020	2025	2030	2035
Land Application for Agriculture	Secondary	Increase storage and land disposal of existing system	High	1,850	2,308	2,421	2,540	2,664	2,794

Notes:
1. This table is based on the DWR Guidebook Table 23.
2. Based on actual year.

Table 4-16 provides a comparison of recycled water uses projected for 2010 in the TUD 2005 UWMP to actual 2010 recycled water uses. The 2005 UWMP projected that 100 percent of the available recycled water would be used in 2010. The actual recycled water used in 2010 was also 100 percent of the available recycled water with actual flow being a slightly less (approximately two percent) than the projected flow.

Table 4-16: Comparison of Recycled Water Uses—Year 2005 Projections versus 2010 Actual

Type of Use	2005 Projection for 2010	2010 Actual Use
Land Application for Agriculture (acre-ft/yr)	1,891	1,850
Percent of Available Recycled Water	100%	100%

Note:
This table is based on the DWR Guidebook Table 24.

4.6.5 Optimization and Incentives for Recycled Water Use

Contracts are currently in place between TUD and local ranchers downstream of Quartz Reservoir to provide recycled water for general agricultural irrigation use. The contracts state that TUD will, in brief, capitalize the recycled water distribution systems of individual agricultural properties, in order to irrigate fields and to grow live-stock feed. The property owners repay the capital costs of the irrigation system over the course of the contract, through water use credits, until such time that the District's initial investment has been completely recovered.

The results of these actions and incentives are quantified by the growth of the recycled water use. In 2010 all of the recycled water produced by the RWWTP and JSD WWTP was used beneficially in this method. Agriculture is a significant source of revenue for the County, as noted in the Tuolumne County General Plan, a firm supply of irrigation water to those users is a positive community benefit. It is forecast that all future treated wastewater will be recycled using

this method. Therefore, the resulting projected recycled water use in Table 4-17 is the same as the projected amounts listed earlier in Table 4-12 and Table 4-16.

Table 4-17: Methods to Encourage Recycled Water Use and the Resulting Projected Use (ac-ft/yr)

Actions	2015	2020	2025	2030	2035
Water Use Credits	2,308	2,421	2,540	2,664	2,794

Note:
This table is based on the DWR Guidebook Table 25.

Chapter 5: Water Quality

This chapter describes the water quality of TUD's Treated Water System, surface water and groundwater supplies, and the effects of water quality on the reliability of those supplies as required by Section 10634 of the Act. The Act states the following:

> *Section 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.*

TUD's Consumer Confidence Report for 2009, entitled Annual Quality Report, states that "water quality results met or exceeded state standards" in the TUD Treated Water System in 2009. TUD's 2010 sampling results met state standards with the exception of secondary standards for iron and manganese on a few groundwater wells. Based on TUD's ability to provide surface water treatment and groundwater treatment where necessary and current projects designed to address existing water quality concerns, TUD does not expect water quality to impact its ability to provide treated water to its customers during the UWMP 25-year projection period between 2010 and 2035.

5.1 Surface Water Quality

TUD's water supply originates from rainfall and run off from the Sierra Nevada Mountain snowpack and travels through the watershed of the South Fork of the Stanislaus River to Pinecrest Lake and Lyons Reservoir. From Lyons Reservoir, water is conveyed through a series of open ditches, flumes and reservoirs prior to reaching the 14 surface WTPs. The largest raw water reservoir that feeds TUD's Treated Water System is Phoenix Lake. The open ditch/flume conveyance infrastructure and Phoenix Lake have the potential to degrade the quality of any water it carries simply due the runoff of contaminates and sediment into the ditch/flume system.

Overall, this supply is characterized as good quality water with variable turbidity and temperature. As shown in Table 5-1, currently surface water can be treated to meet all drinking water standards using conventional or alternative treatment processes. No persistently present constituents have been identified in the surface water requiring additional treatment processes, with the exception of *Cryptosporidium*, *Giardia lamblia* and *E.coli* which has been detected through Long Term 2 Enhanced Surface Water Treatment Rule (LT2) sampling. TUD is currently evaluating treatment options and is planning to upgrade treatment at three (3) existing water treatment plants including Columbia WTP, Monte Grande WTP and Ponderosa WTP to treat these microorganisms and to address the LT2 requirements.

Table 5-1: Summary of Surface Water Quality Assessment					
Surface Water Treatment Plant	**Capacity (gpm)**	**Certification Grade**	**Water Quality Issue/Concern**	**Existing Treatment**	**Recommendation**
Big Hill	350	2	None	Alternative Technology	Continue or upgrade/replace treatment as necessary
Brentwood[(1)]	50	2	None	Conventional with Upflow Clarifier	Continue or upgrade/replace treatment as necessary
Cedar Ridge	150	2	None	Conventional with Upflow Clarifier	Continue or upgrade/replace treatment as necessary
Columbia	1,080	3	*Cryptosporidium*, and *E.coli*	Alternative Technology	Evaluate treatment options and o upgrade treatment as required to meet LT2
Crystal Falls	684	3	None	Conventional with Upflow Clarifier	Continue or upgrade/replace treatment as necessary
Greenly	700	3	None	Alternative Technology	Continue or upgrade/replace treatment as necessary
Mono Village	70	2	None	Conventional with Sedimentation Basin	Continue or upgrade/replace treatment as necessary
Monte Grande	350	2	*Cryptosporidium*, and *E.coli*	Alternative Technology	Evaluate treatment options and o upgrade treatment as required to meet LT2
Ponderosa	300	2	*Cryptosporidium*, and *E.coli*	Conventional with Tube Settlers	Evaluate treatment options and o upgrade treatment as required to meet LT2
Scenic View	150	2	None	Conventional with Sedimentation Basin	Continue or upgrade/replace treatment as necessary
Sonora	2,800	3	None	Conventional with Sedimentation Basin	Continue or upgrade/replace treatment as necessary
Tuolumne	1,296	3	None	Conventional with Sedimentation Basin	Continue or upgrade/replace treatment as necessary
Upper Basin	600	3	None	Conventional with Upflow Clarifier	Continue or upgrade/replace treatment as necessary
Willow Springs	140	2	None	Conventional with Tube Settlers	Continue or upgrade/replace treatment as necessary

Note:
1. WTP is used only during a ditch outage.

In addition to TUD's plans to upgrade the three (3) WTPs to address LT2 issues, TUD is currently working on three (3) studies related to water quality. Two studies are focused on addressing water quality issues in the ditch system while the other is focused on water quality in Phoenix Lake. Each of these three studies is described below:

- Through a State of California Sierra Nevada Conservancy Grant, the TUD Tuolumne Ditch System Sustainability Project is currently funding the evaluation of water quality related to TUD's ditch system. Significant components of the study will include the identification of locations along the ditch where water quality degradation is occurring. The project includes mapping of storm drains, run-off from developed properties and septic system leach fields, evaluating the ditch system in terms of its function as a storm water conveyance structure, developing a long-term ditch operations and maintenance strategy, and preparing a capital improvement program to help eliminate pollution sources and reduce flood water related ditch failures.

- Through a Proposition 50 Grant, TUD's Surface Water Contamination Detection Project will monitor both ditch water pH levels and provide flow monitoring at over 20 stations on the ditch system. By monitoring the pH of the water entering the WTPs, contamination detection will cause the WTP to shut down and send an alarm through the existing telemetry system if the pH is outside of acceptable pH ranges. The telemetry alarms are continuously monitored 24 hours a day, 7 days a week. If required, District personal would be able to take appropriate action as outlined in the District's Emergency Response Plan (ERP). This would prevent the potently contaminated water from entering the drinking water distribution systems.

- Through a State of California Sierra Nevada Conservancy Grant, TUD's Phoenix Lake Preservation and Restoration Plan Project includes development of conceptual plans to address project goals of improving the water quality, increasing water storage and reducing future silt buildup within Phoenix Lake, as well as educating surrounding property owners about appropriate land maintenance practices. Water quality of the lake is marginal at times and is declining due to contamination, siltation and invasive exotic aquatic vegetation. Water quality concerns due to taste and odor within downstream distribution systems are often attributed to the water quality within Phoenix Lake. It is TUD's goal to use this project to begin design and implementation of improvements and practices that will improve water quality and storage within their Treated Water System.

In addition to the above projects, TUD is a regular participant in regional water resources planning efforts, and has led the development of Tuolumne-Stanislaus IRWM Group. This group will be working to develop the Tuolumne-Stanislaus IRWM Region's first IRWM Plan. This plan will be used to develop projects and policies that are focused on regional management of water resources which will include a focus on sustaining and improving water quality within the upper Tuolumne River and Stanislaus River watersheds.

Based on TUD's ability to provide surface water treatment and current projects designed to address existing surface water quality concerns, TUD does not expect water quality to impact its ability to provide treated water to its customers.

5.2 Groundwater Quality

Groundwater from TUD's 26 wells provides approximately five (5) percent of the domestic water supplied annually to TUD customers. The majority of available groundwater is transient and found in fractured rock. The TUD Treated Water System and its well supplies are located within the foothills and higher elevations of the Sierra Nevada where the subsurface material consists primarily of impermeable granitic and greenstone bedrock. The quality of the groundwater has generally been good. As shown in Table 5-2, some of the wells require only chlorination while others require additional treatment due to naturally occurring constituents in the groundwater such as iron and manganese.

Table 5-2: Summary of Ground Water Quality Assessment

Groundwater Well	Estimated Well Capacity (acre-ft/yr)	Status	Water Quality Issue/Concern	Existing Treatment[3]	Recommendations
Apple Valley #1	73	Active	Iron and Manganese	Sodium Hexametaphosphate	Continue treatment
Apple Valley #2	128	Active	None	None	None
Apple Valley #3	150	Active	None	None	None
Brentwood	29	Active[1]	Iron and Manganese	Blended at Brentwood WTP Tank	Continue blending
Caylor	95	Standby	Iron and Manganese	Sodium Hexametaphosphate	Install filter before use
Cedar Ridge Springs	120	Active	Iron and Manganese	Sodium Hexametaphosphate	Continue treatment
Comstock	15	Active	Iron and Manganese	Blended at Comstock Tank	Continue blending
Confidence #1	18	Active[1]	None	None	None
Confidence #2	29	Active[1]	None	None	None
Crystal Falls Business Park	95	Standby	Freon	None	Install treatment for Freon contamination before use
Crystal Falls Plant	29	Active[1]	Iron and Manganese	Treated at Crystal Falls WTP	Continue treatment
Cuesta Center	10	Active	Low pH	None	Adjust pH as necessary
Lambert	10	Active	Low pH	None	Adjust pH as necessary
Marble Quarry	80	Active	Iron and Manganese	Filter	Continue treatment
Mono Village #2	80	Active	Iron and Manganese	Filter	Continue treatment

Table 5-2: Summary of Ground Water Quality Assessment					
Groundwater Well	**Estimated Well Capacity (acre-ft/yr)**	**Status**	**Water Quality Issue/Concern**	**Existing Treatment[3]**	**Recommendations**
Mono Village #7	72	Active	Iron and Manganese	Filter	Continue treatment
Oakridge Ranch	26	Active[1]	Iron and Manganese	Sodium Hexametaphosphate	Continue treatment
Peaceful Pines	19	Active	None	None	None
Phoenix Lake Park	62	Active	Iron and Manganese	Filter	Continue treatment
Rybar #1	20	Active	None	None	None
Rybar #2	10	Active	Perchloroethylene	Filter with Granular activated carbon media	None
Scenic Brook #1	13	Active	None	None	None
Scenic View	30	Active	Groundwater under the influence of surface water	Treated at Scenic View WTP	Continue treatment
Wards Ferry #1	22	Active	None	None	None
Wards Ferry #2	25	Active	Bacteriological Contaminates	None	Monitor closely for contaminates and install treatment or contaminate source control as necessary
Wards Ferry #4	20	Active[2]	None	None	None

Notes:
1. Well is used only during a ditch outage.
2. Well is owned by a developer and TUD is under contract to use it.
3. All wells have chlorine disinfection.

TUD will continue to install treatment as required to address water quality concerns at each of the groundwater wells as necessary. TUD does not expect groundwater quality to impact its ability to provide treated water to its customers.

5.3 Distribution Systems Water Quality

Water distribution system monitoring is performed for several water quality parameters within the TUD water distribution systems, including general physical properties, presence of coliform bacteria, disinfectants and disinfection by-product (DBP) levels. All monitoring parameters and levels currently meet drinking water standards.

Bacteriological sampling and analysis are performed monthly and DBP sampling and analysis is performed quarterly in accordance with TUD's sampling plan and State water quality testing guidelines. Each distribution system is unique and may differ in terms of the number and locations of samples analyzed.

State drinking water standard levels for DBPs may be lowered in the future in accordance with the Stage 2 Disinfectant and Disinfection Byproducts Rule. TUD is actively evaluating this new legislation and maintains close communications with local California Department of Public Health (CDPH) representatives as this rule may affect the current treatment techniques in place on several TUD distribution systems; specifically in the Columbia-Gibbs and Sonora-Jamestown systems as these span relatively larger areas with longer distribution pipelines. TUD is planning to upgrade these affected water systems with water treatment strategies and technologies that will meet these new, more stringent, water quality standards.

TUD maintains a comprehensive cross-connection control program to reduce the hazards associated with backflow and back-siphonage. These programs are required to comply with CDPH regulations on Waterworks Standards and Cross Connection Control.

TUD does not expect distribution system water quality to impact their ability to provide treated water to their customers.

5.4 Projected Impacts of Water Quality on Supply

Impacts to the water supplies due to water quality issues are not expected based on known and proposed drinking water regulations. No change in the quantity of delivered treated surface water is projected due to water quality issues. In addition, groundwater sources do not appear to be impacted by known or proposed drinking water regulations as they relate to water quality issues. Therefore, the sources of water supply to the TUD Treated Water System are not expected to change in either quality or supply in the future, as summarized in Table 5-3.

Table 5-3: Summary of Projected Water Supply Changes Due to Water Quality Issues

Water Source	Description of Condition	2010	2015	2020	2025	2030	2035
Treated Surface Water Projected Change (percent)	None	0	0	0	0	0	0
Treated Groundwater (total of 26 wells) Projected Change (percent)	None	0	0	0	0	0	0

Note:
Table format based on DWR Guidebook Table 30.

Chapter 6: Water Supply Reliability

Sections 10631 and 10635 of the Act require that an assessment of water service reliability for various climatic conditions be undertaken. The Act states:

Section 10631.

(c) (1) Describe the reliability of the water supply and vulnerability to seasonal or climatic shortage, to the extent practicable, and provide data for each of the following:

(A) An average water year.

(B) A single dry water year.

(C) Multiple dry water years.

(2) For any water source that may not be available at a consistent level of use, given specific legal, environmental, water quality, or climatic factors, describe plans to supplement or replace that source with alternative sources or water demand management measures, to the extent practicable.

Section 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 total projected water use over the next 20 years, in five-year increments, for a normal water year, a single dry water year, and multiple dry 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.

This chapter provides a water supply and demand assessment for TUD for a normal year, a single-dry year, and multiple-dry years. The following is a summary of the water supply reliability of the TUD Treated Water System sources:

6.1 Reliability of Supply

As discussed in Chapter 4, TUD receives water for the Treated Water System from two (2) primary sources: surface water through the Agreement with PG&E and groundwater. TUD also uses disinfected secondary treated recycled wastewater to offset the use of untreated surface water for irrigation to agriculture lands. The recycled water supply does not replace treated water, but replaces raw water supply to agricultural customers which allows more raw water to become available for potable treatment.

The surface water supply from the South Fork of the Stanislaus River accounts for approximately 89 percent of the total available water supply and 95 percent of the supply available for potable use. In general, TUD's supply is expected to be 100 percent reliable through 2035 in normal years. This reliability is a result of the historic reliability and availability of the South Fork of the Stanislaus River, groundwater supply, and recycled water for agricultural irrigation. The reliability and vulnerability of the water supply to TUD are discussed below in terms of seasonal and climatic shortages.

6.1.1 Surface Water Supply Reliability

Information presented below is from hydrologic data compiled for the Federal Energy Regulatory Commission (FERC) relicensing efforts for the PG&E Spring Gap Hydroelectric Project #2130 (Spring Gap Project) for the South Fork of the Stanislaus River for the period 1974 to 1999. The Spring Gap Project, in part, diverts water from the South Fork of the Stanislaus River to the Middle Fork of the Stanislaus River for power generation. As part of the collaborative process for the competing interests in the river water, careful considerations are provided and conditions are placed on the operations of these hydroelectric facilities to benefit all interests, including the domestic water supply for the County. Based on the Spring Gap Project data, the vulnerability of the water supply is due primarily to restrictions in water storage in Lyons Reservoir and water elevation at Pinecrest Lake at Labor Day.

Historically, Lyons Reservoir and Pinecrest Lake fill to spill conditions and support TUD's surface water supply following the end of snow runoff each year, including critical dry years. Lyons Reservoir storage typically supplies water to TUD from about 1 July through Labor Day. TUD requires delivery of water from Pinecrest Lake, typically starting after Labor Day in each year. In a dry year, an early runoff will place more demand on the stored water requiring an earlier diversion from Pinecrest Lake.

The Simulation Analysis of the South Fork Stanislaus River System Report, included in Appendix I, summarizes the results for conservation modeling performed to determine TUD's surface water availability under historical drought conditions. The modeling was developed to maintain a minimum target storage levels within Lyons Reservoir and Pinecrest Lake according to water planning which include a minimum targeted storage level of 1,200 ac-ft at Lyons Reservoir and 3,500 ac-ft at Pinecrest Lake. Based on these minimum targeted storage levels, the report estimates TUD's available surface water supply during multiple-dry water years to be between 26,600 and 27,650 ac-ft/yr. TUD has historically used 24,500 ac-ft/yr as the minimum volume of available surface water and has thus elected to continue to use 24,500 ac-ft/yr in this UWMP update as a conservative minimum available surface water volume. Each year, the annual snow and precipitation amounts have filled both Lyons Reservoir and Pinecrest Lake to capacity and in-effect "reset" the supply prior to each irrigation season. Therefore, TUD believes that the normal year, single dry year and each year of the multiple-dry year have the same available water supply. TUD uses the water available in a dry year to analyze the affects on water supply for all water year scenarios. However, the actual available supply during a normal water year is expected to be much higher.

6.1.2 Groundwater Supply Reliability

The pumping amounts for the TUD groundwater wells are adequate and reliable. TUD is conservatively assuming that the wells could be impacted by reduction in capacity to seasonal or climatic changes in precipitation levels for the reliability calculations presented below. When calculating sustained pumping during a critical dry year, TUD assumes that District wells could sustain 50 percent of the total potential annual yield, equating to approximately 656 ac-ft/yr. TUD assumes a 50 percent reduction in groundwater availability due to the lack of available data on Sierra foothills wells. However, TUD will continue to monitor the capacities of their groundwater wells to try to better estimate the climate and seasonal variations on groundwater well production.

Approximately 210 customers rely on isolated groundwater well systems as their primary source of water within the TUD system. Table 6-1 provides a comparison of the four (4) isolated groundwater distribution systems potential annual yield to projected demands for each system. As shown in Table 6-1, each isolated groundwater system has adequate supply to meet the dry weather condition assumption of 50 percent reduction in the well system's potential annual yield to meet demand projections through the year 2035.

Table 6-1: Isolated Groundwater Distribution System Supply and Demand Comparison

Isolated Groundwater Distribution System	Potential Annual Yield (ac-ft/yr)	Total Demand (ac-ft/yr)						2035 Surplus		Treatment
		2010	2015	2020	2025	2030	2035	ac-ft/yr	% of Annul Yield	
Apply Valley	382	58	61	65	68	72	76	306	80%	Iron and Manganese
Peaceful Pines	19	7	8	8	8	9	9	10	51%	None
Phoenix Lake Park	62	7	8	8	8	9	9	53	85%	None
Wards Ferry	67	17	18	19	20	21	22	45	67%	None

6.1.3 Recycled Water Reliability

TUD's Regional Wastewater Reclamation System will continue to receive disinfected secondary wastewater as shown in Chapter 4 (Table 4-12). The amount of water the reclamation system will receive will continue to increase as the County population increases. The reclamation system receives secondary treated wastewater from two WWTPs which are reliant on land discharge for disposal. With TUD's plans to increase available reclamation system storage and the agricultural community's interest in using recycled water for irrigation, TUD will continue to expand the use of recycled water in the County, thus making more water available for potable uses.

Flow available for recycle water use will be affected by seasonal and climatic changes. Recycled water availability will increase with wet years and decrease with dry years due to sewer collection system infiltration, precipitation and runoff/inflow into storage and treatment facilities, and reservoir evaporation. Based on TUD's RWWTP and Disposal System Feasibility Report, recycled water flows during dry years are projected to be approximately 80% of the projected flow for a normal year.

6.1.4 Water Supply Reliability Analysis

The actual volume of surface water available through the PG&E Agreement each year is formula-determined based on the amount of natural flow of the South Fork of the Stanislaus River measured through Goodwin Dam. The 2004 calendar year was determined to be representative of an average year and the 1977 calendar year was determined to be representative of the single driest year based on the Spring Gap Project data. The representative multiple-dry water year is identified as 1 June 1976 to 31 May 1978, the critical

period of record for the TUD Water System. Table 6-2 lists TUD's single-dry year and multiple-dry year periods for both groundwater and surface water supplies.

Table 6-2: Basis of Water Year Data		
Water Year Type	**Base Year(s)**	**Historical Sequence**
Surface Water and Groundwater		
Normal Water Year	2004	1976-2010
Single-Dry Water Year	1977	1976-2010
Multiple-Dry Water Years	1976-1978	1976-2010

Note:
Table format based on DWR Guidebook Table 27.

Water supply projections for surface water, groundwater, and recycled water sources during normal year, single-dry year, and multiple-dry year scenarios based on the reliability discussions presented above are summarized in Table 6-3 for the TUD Water System for 2035. The normal-year supply represents the expected supply under average hydrologic conditions, the dry-year supply represents the expected supply under the single driest hydrologic year, and the multiple-dry year supply represents the expected supply during a period of three consecutive dry years.

Table 6-3: Supply Reliability for the TUD Water System for Year 2035 (ac-ft/yr)					
Source	**Normal Water Year**	**Single-Dry Water Year**	**Multiple-Dry Water Years**		
			Year 1	**Year 2**	**Year 3**
Surface Water	24,500	24,500	24,500	24,500	24,500
Groundwater	1,311	656	656	656	656
Recycled Water	2,794	2,217	2,217	2,217	2,217
Total	28,606	27,372	27,372	27,372	27,372
Percent of Normal		96%	96%	96%	96%

Note:
Table format based on DWR Guidebook Table 28.

As discussed above, TUD's surface water supply from the South Fork of the Stanislaus River, which accounts for 89 percent of the total available water supply and 95 percent of the supply available for potable use, is expected to be 100 percent reliable. As shown in Table 6-3, TUD total water supply is projected to be 96 percent reliable for the Year 2035.

6.1.5 Factors Resulting in Inconsistency of Supply

Table 6-4 presents factors that could potentially result in inconsistency of supply for the TUD System. However, the water supply projections presented in this chapter have been established to eliminate the inconsistency of supply included within this table.

Table 6-4: Factors Resulting in Inconsistency of Supply

Name of Supply	Legal	Environmental	Water Quality	Climatic
PG&E Surface Water	Agreement is based on the natural flow of the South Fork of the Stanislaus River which is variable	None, targeted minimum lake levels have been established to support beneficial uses	None, treatment is provided as required to sustain necessary water supply	Climatic changes affect the amount of natural flow in the South Fork of the Stanislaus River which affect available supplies
Groundwater	None	None	None, treatment is provided as required to sustain necessary water supply	TUD assumes that groundwater may be reduced by up to 50 percent during dry years
Recycled Water	None.	None	If the RWWTP was upgraded to tertiary treatment, supply could be discharged to Woods Creek rather than agricultural irrigation customers; however TUD does not anticipate upgrading the RWWTP to a tertiary level	Flow increase with wet years and decrease with dry years due to collection system infiltration, precipitation and runoff/inflow into storage, and reservoir evaporation.

Note:
Table format based on DWR Guidebook Table 29.

6.2 Total Water Demand

As discussed previously, the water demand discussed in Chapter 3 represents the treated water demand only. TUD provides raw water to customers for agriculture irrigation and wholesale water customers which were not quantified in urban treated water demand. Table 6-5 summarizes all of the treated water and raw water demands and additional uses to calculate the projected water demand total for TUD.

Table 6-5: Projected Treated and Untreated Water Sales, Additional Water Uses and Losses, and Total Water Demand (ac-ft/yr)								
	Treated Water			Raw and Recycled Water				
Year	Treated Water Sales	Additional Treated Water Uses and Losses[2]	Wholesale Deliveries	Agriculture Irrigation as Raw Water	Agriculture Irrigation as Recycled Water	Wholesale Deliveries	Additional Raw Water Uses and Losses[3]	Water Demand Total
2010[1]	4,197	926	208	2,366	1,850	501	5,465	15,513
2015	5,257	1,017	289	2,829	2,308	575	6,645	18,920
2020	5,904	1,142	305	2,985	2,421	607	7,295	20,659
2025	6,636	1,284	321	3,149	2,540	641	8,021	22,592
2030	7,465	1,444	339	3,322	2,664	676	8,831	24,741
2035	7,870	1,522	358	3,505	2,794	713	9,312	26,074

Notes:
1. Based on actual year.
2. Additional treated water uses and losses are described in Section 3.5 and Table 3-13.
3. Water loss through ditch conveyance system is assumed to be 40% of surface water supply based on historical data.

6.3 Normal Water Year Analysis

Table 6-6 summarizes the service reliability assessment for a normal water year based on water supply and water demand projections.

Table 6-6: Comparison of Projected Normal Year Supply and Demand (ac-ft/yr)					
	2015	2020	2025	2030	2035
Water Supply Total [1]	28,119	28,232	28,351	28,475	28,606
Water Demand Total	18,920	20,659	22,592	24,741	26,074
Difference (supply minus demand)	9,200	7,573	5,759	3,735	2,532
Difference as Percent of Supply	33%	27%	20%	13%	9%
Difference as Percent of Demand	49%	37%	25%	15%	10%

Notes:
1. Increase in water supply total is due to increase in available recycled water, see Chapter 4.8 and Table 4-12.
2. Table format based on DWR Guidebook Table 32.

6.4 Single Dry-Year Analysis

Table 6-7 demonstrates the reliability of water supplies to meet projected annual water demands for the TUD System in a single-dry year.

Table 6-7: Comparison of Projected Supply and Demand for Single Dry Year (ac-ft/yr)

	2015	2020	2025	2030	2035
Water Supply Total [1]	26,993	27,084	27,182	27,284	27,372
Water Demand Total	18,920	20,659	22,592	24,741	26,074
Difference (supply minus demand)	8,073	6,425	4,590	2,543	1,298
Difference as Percent of Supply	30%	24%	17%	9%	5%
Difference as Percent of Demand	43%	31%	20%	10%	5%

Notes:

1. Increase in water supply total is due to increase in available recycled water, see Chapter 4.8 and Table 4-12.
2. Table format based on DWR Guidebook Table 33.

6.5 Multiple Dry-Year Analysis

Table 6-8 presents the projected multiple-dry year water supply and demand assessment.

Table 6-8: Projected Multiple-Dry Year Water Supply and Demand Assessment (ac-ft/yr)

Year	Supply[1]	Demand	Difference	Difference as Percent of Supply	Difference as Percent of Demand
2011					
2012					
2013	26,958	17,902	9,055	34%	51%
2014	26,975	18,411	8,564	32%	47%
2015	26,993	18,920	8,073	30%	43%
2016					
2017					
2018	27,047	19,960	7,087	26%	36%
2019	27,065	20,309	6,756	25%	33%
2020	27,084	20,659	6,425	24%	31%
2021					
2022					
2023	27,142	21,814	5,328	20%	24%
2024	27,161	22,202	4,959	18%	22%

Table 6-8: Projected Multiple-Dry Year Water Supply and Demand Assessment (ac-ft/yr)					
Year	**Supply[1]**	**Demand**	**Difference**	**Difference as Percent of Supply**	**Difference as Percent of Demand**
2025	27,182	22,592	4,590	17%	20%
2026					
2027					
2028	27,242	23,879	3,364	12%	14%
2029	27,263	24,308	2,955	11%	12%
2030	27,284	24,741	2,543	9%	10%
2031					
2032					
2033	27,336	25,538	1,799	7%	7%
2034	27,354	25,806	1,548	6%	6%
2035	27,372	26,074	1,298	5%	5%

Notes:
1. Increase in water supply total is due to increase in available recycled water, see Chapter 4.8 and Table 4-12.
2. This assessment is based on the 3-year multiple-dry year period ending in 2015, 2020, 2025, 2030, and 2035.
3. Table format based on DWR Guidebook Table 34.

As shown in Table 6-6, Table 6-7, and Table 6-8, TUD's combined water supplies of surface water, groundwater and recycled water are able to meet demand projections through 2035 under the normal, single dry-year and multiple dry-year scenarios.

Chapter 7: Conservation Program and Demand Management Measures

This chapter addresses the water conservation requirements of the Act for TUD and includes a summary of current and planned DMM implementation. It also provides an overview of the proposed TUD program for compliance with SBX7-7, which requires 20 percent statewide reduction in urban water use by 2020. The DMM portions of the Act state the following:

Section 10631.

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

(1) A description of each water demand management measure that is currently being implemented, or scheduled for implementation, including the steps necessary to implement any proposed measures, including, but not limited to, all of the following:

(A) Water survey programs for single-family residential and multifamily residential customers.

(B) Residential plumbing retrofit.

(C) System water audits, leak detection, and repair.

(D) Metering with commodity rates for all new connections and retrofit of existing connections.

(E) Large landscape conservation programs and incentives.

(F) High-efficiency washing machine rebate programs.

(G) Public information programs.

(H) School education programs.

(I) Conservation programs for commercial, industrial, and institutional accounts.

(J) Wholesale agency programs.

(K) Conservation pricing.

(L) Water conservation coordinator.

(M) Water waste prohibition.

(N) Residential ultra-low-flush (ULF) toilet replacement programs.

(2) A schedule of implementation for all water demand management measures proposed or described in the plan.

(3) A description of the methods, if any, that the supplier will use to evaluate the effectiveness of water demand management measures implemented or described under the plan.

(4) An estimate, if available, of existing conservation savings on water use within the supplier's service area, and the effect of the savings on the supplier's ability to further reduce demand.

(g) An evaluation of each water demand management measure listed in paragraph (1) of subdivision (f) that is not currently being implemented or scheduled for implementation. In the course of the evaluation, first consideration shall be given to water demand management measures, or combination of measures, that offer lower incremental costs than expanded or additional water supplies. This evaluation shall do all of the following:

(1) Take into account economic and noneconomic factors, including environmental, social, health, customer impact, and technological factors.

(2) Include a cost-benefit analysis, identifying total benefits and total costs.

(3) Include a description of funding available to implement any planned water supply project that would provide water at a higher unit cost.

(4) Include a description of the water supplier's legal authority to implement the measure and efforts to work with other relevant agencies to ensure the implementation of the measure and to share the cost of implementation.

(j) For purposes of this part, urban water suppliers that are members of the California Urban Water Conservation Council shall be deemed in compliance with the requirements of subdivisions (f) and (g) by complying with all the provisions of the "Memorandum of Understanding Regarding Urban Water Conservation in California," dated December 10, 2008, as it may be amended, and by submitting the annual reports required by Section 6.2 of that memorandum.

7.1 Conservation Program Background

In 1991, TUD became a signatory to the Memorandum of Understanding Regarding Water Conservation in California (MOU) and a member of the California Urban Water Conservation Council (CUWCC), establishing a firm commitment to the implementation of the Best Management Practices (BMPs) or DMMs. The CUWCC is a consensus-based partnership of agencies and organizations concerned with water supply and conservation of natural resources in California. By becoming a signatory, the District committed to implement a specific set of locally cost-effective conservation practices in its service areas.

The MOU and associated BMPs were revised by the CUWCC in 2008, which is equated to the DMMs per Section 10631(j) of the Act. The revised BMPs now contain a category of "Foundational BMPs" that signatories are, for the first time and with few exceptions, expected to implement as a matter of their regular course of business. These revised BMPs include enhanced Utility Operations (metering, water loss control, pricing, conservation coordinator, wholesale agency assistance programs, and water waste ordinances) and Public Education (public outreach and school education programs). The remaining BMPs are called Programmatic BMPs and are divided into Residential, Large Landscape, and Commercial, Industrial, and Institutional (CII) categories. A summary of the DMMs described in the Act and the current CUWCC BMP organization is presented in Table 7-1 for reference.

Table 7-1: CUWCC BMP and UWMP DMMs Organization and Names					
CUWCC BMP Organization and Names (2009 MOU)				**UWMP DMMs**	
Type	Category	BMP #	BMP name	DMM #	DMM name
Foundational	Operations Practices	1.1.1	Conservation Coordinator	L	Water conservation coordinator
		1.1.2	Water Waste Prevention	M	Water waste prohibition
		1.1.3	Wholesale Agency Assistance Programs	J	Wholesale agency programs
		1.2	Water Loss Control	C	System water audits, leak detection, and repair
		1.3	Metering with Commodity Rates for All New Connections and Retrofit of Existing Connections	D	Metering with commodity rates for all new connections and retrofit of existing connections
		1.4	Retail Conservation Pricing	K	Conservation pricing
	Education Programs	2.1	Public Information Programs	G	Public information programs
		2.2	School Education Programs	H	School education programs
Programmatic	Residential	3.1	Residential Assistance Program	A	Water survey programs for single family residential and multi-family residential customers(1)
				B	Residential plumbing retrofit
		3.2	Landscape Water Survey	A	Water survey programs for single family residential and multi-family residential customers(1)
		3.3	High-Efficiency Clothes Washing Machine Financial Incentive Programs	F	High-efficiency washing machine rebate programs
		3.4	WaterSense Specification (WSS) Toilets	N	Residential ultra-low-flush toilet replacement programs
	Commercial, Industrial, and Institutional	4	Commercial, Industrial, and Institutional	I	Conservation programs for commercial, industrial, and institutional accounts
	Landscape	5	Landscape	E	Large landscape conservation programs and incentives

Note:

1. Components of DMM A (Water survey programs for single family residential and multi-family residential customers) applies to both BMP 3.1 (Residential assistance program) and BMP 3.2 (Landscape water survey).

7.2 Implementation of BMPs/DMMs

TUD is an original MOU signatory but is not participating in CUWCC BMP reporting. Instead, TUD has met DMM requirements by reporting to DWR through the UWMP updates. For the purposes of this UWMP, this chapter includes a summary of BMP implementation activity from 2006 to 2010. TUD is currently implementing all Foundational BMPs. The cost effective Programmatic BMPs are currently being implemented through a traditional BMP approach. The SBX7-7 water conservation goals and proposed implementation plans are discussed further in Section 7.5.

The following DMM/BMP descriptions are organized according to the revised CUWCC MOU format:

7.3 Foundational DMMs

All eight (8) of the Foundational DMMs are currently being implemented by TUD, with the exception of Wholesale Agency Assistance Programs, which is not applicable to retail urban water suppliers. Each Foundational DMM is described below and includes a description of TUD's program and implementation schedule as applicable.

7.3.1 Operations Practices

7.3.1.1 Conservation Coordinator (DMM L)

Since 1996, implementing the various details of the UWMP has required the effort of several TUD staff members. Currently, TUD has designated a member of the engineering staff as Conservation Coordinator. The Conservation Coordinator has the responsibility of compiling program information received from conservation staff, tracking, and reporting on DMM implementation.
Staff members spend time each month administering the TUD water conservation program. The conservation staff members, under supervision of the Conservation Coordinator are responsible for the following activities:

- Support staff processes water conservation kits and toilet rebate programs.
- Executive Secretary to the TUD General Manager manages the School Education Program and contracts with outside consultant/instructor.
- Public Relations Director implements most of the media, shows, web site and related community education efforts.
- Engineering Technicians compile water flow information to analyze water consumption, account sectors, and related efforts.
- Outside consultants process much of the water survey and water conservation public information under TUD staff contract administration.

<u>Implementation Steps and Schedule</u>

TUD currently fully implements this DMM

7.3.1.2 Water Waste Prevention (DMM M)

Regulation No. 12, the conservation section of TUD's Water Rules and Regulations adopted on 12 October 2010 (Regulation No. 12), provides specific ongoing water management actions during normal, low water supply, and critical drought water years. Water year type is determined based on a March snow survey of the South Fork of the Stanislaus River and a forecast of anticipated annual yield. The water management actions are intended to help prevent water waste. In critical water years, enforcement is in a "three step" violation process with appropriate restrictions and fines by the District on the customer. Regulation No. 12 sets forth water use violation fines and the period during which mandatory conservation and rationing measures will be in effect. TUD's Regulation No. 12 is included in Appendix J. Water conservation restrictions include:

- Postponement of irrigation season.
- Use of potable water which results in flooding or runoff in gutters or streets.
- Use of potable water for washing aircraft, cars, buses, boats, trailers or other vehicles.
- Use of potable water for washing buildings structures, driveways, street cleaning or other hard-surfaced areas.
- Use of potable water for decorative fountains, lakes, or ponds.
- Use of potable water for sewer flushing, dust control, earth compaction, and other construction purposes.
- Use of potable water for filling or refilling of swimming pools.

Regulation No. 12 prohibits negligent or wasteful use of water, creates a process for mandatory conservation and rationing, and promotes the use of water saving devices.

<u>Implementation Steps and Schedule</u>

This DMM is currently fully implemented by the District. TUD plans to continue to implement this DMM and provide updates to Regulation No. 12 as necessary.

7.3.1.3 Wholesale Agency Assistance Programs (DMM J)

SBX7-7 defines a wholesale urban water supplier as an urban water supplier which supplies more than 3,000 ac-ft annually for wholesale potable municipal use. This definition does not apply to TUD; therefore, this BMP is not applicable.

7.3.1.4 Water Loss Control (DMM C)

Water audits are performed each year by comparing annual water production volumes, volumes of water transferred to and from the TUD Treated Water System, and total consumption volumes based on customer meter readings. This comparison is performed in order to estimate the volume of unaccounted water in the TUD Treated Water System. Leaks reported by the public are typically repaired immediately. Apparent leaks identified on the customer's side of the meter are also noted and reported to the affected customer.

The District maintains three leak detection devices used in circumstances where leaks are suspected to exist but are not obvious by site evidence. TUD WTPs are continuously evaluated for backwash water recycling. Many other components and factors are considered and inspected such as water theft, use of unmetered water for construction, and unmetered use by other agencies.

The TUD Treated Water System consists of 17 distribution systems, identified in Chapter 2, which have been acquired and integrated into the Treated Water System over the course of decades. Each water system acquired by TUD was typically outdated and consisted of aging infrastructure in poor to very poor condition. Each distribution system has required significant expenditures to renovate in an already disadvantaged community. In terms of system water audits and water conservation, significant progress has been achieved over the past few decades in renovating them to a higher performing state of operation and regulatory compliance. At the same time, there are many remaining deficiencies requiring significant renovation including aged tanks, aged pumping stations, and general water treatment operations and processes requiring new design or complete replacement. TUD's focus has been to make improvements to correct each deficiency based on priorities due to limited resources.

Prescreening for water losses is conducted by comparing the total volume of water sales and other verifiable uses against the total water supply into the treated water system. A full audit is triggered if the total sales and verifiable uses is less than 81 percent of the total treated water supply (unaccounted-for-water exceeds 19 percent). Table 7-2 summarizes these results.

Table 7-2: Water Loss Control Evaluation Summary

Report Year	Prescreen Completed	Prescreen Result (percent)
2006	Yes	17.4
2007	Yes	14.1
2008	Yes	15.7
2009	Yes	18.4
2010	Yes	17.4

Water loss figures are reported to the TUD Operations Group to prioritize field crews to locate potential problem components and implement repairs. Leaks are repaired under priority status of population and severity of loss. The focus for TUD is to capitalize repairs or undertake replacement of infrastructure known to be in poor condition. Recently, TUD has taken over the Matt Dillon and Big Hill water systems, which required significant renovations. TUD recently completed major improvements to the Big Hill System and does not yet have a complete year of water use data to evaluate the water efficiency of the new system.

Implementation Steps and Schedule

TUD plans to begin implementing the American Water Works Association (AWWA) M36 Standard Water Audit methodology in Fiscal Year (FY) 2011/2012 for the water systems with

the highest unaccounted-for water. This approach consists of developing a water balance to determine water losses, quantification of the water loss into “revenue” and “non-revenue” categories, and an economic analysis of recoverable loss and yields. Over the next 5 years, the program will be expanded to cover the water systems with the highest unaccounted-for water use.

7.3.1.5 Metering with Commodity Rates for All New Connections and Retrofit of Existing Connections (DMM D)

The TUD Treated Water System has been fully metered since 2000. All new connections are required to have meters and all landscape water users must have dedicated meters. Customers are billed volumetrically and meters are read on a bimonthly basis according to type and customer category using in-line mechanical meters of differing sizes. TUD uses a base rate and tiered usage rate for all connections. Section 7.3.1.6 describes the usage rates in more detail.

Implementation Steps and Schedule

TUD is currently implementing a meter replacement program to retrofit manual read water meters with proximity read meters throughout the Treated Water System. The District currently schedules all meters to be replaced every ten years.

7.3.1.6 Retail Conservation Pricing (DMM K)

All metered customers in the District are charged volumetrically. TUD uses a tiered water rate structure as outlined in the TUD Water Regulations. All water use types are listed separately and the tiered rates apply accordingly. TUD incorporates a base rate and stepped usage rate, which charges a higher rate as the user consumes more water. The base rates and quality rates are included in Appendix K, the Water Services Charges and Rates section of TUD’s Water Rules and Regulations adopted 12 October 2010. TUD maintains a conservation rate for customers who consistently use less than 500 cubic-feet per month. The billing unit for most accounts is by 100 cubic foot increments within tiered blocks.

A summary of the total fixed and volumetric charges incurred in the District between 2006 and 2010 is provided in Table 7-3. Volumetric pricing made up 42 to 48 percent of the District’s revenues in the past 5 years.

Table 7-3: Commodity Pricing Summary

	2006	2007	2008	2009	2010
Fixed Charges	$4,200,000	$4,300,000	$4,300,000	$4,300,000	$4,300,000
Volumetric Charges	$3,900,000	$3,700,000	$4,000,000	$3,800,000	$3,100,000
Percent Volumetric	48	46	48	47	42

Note:
1. Fixed and volumetric charges prior to 2009 were estimated based on water production and population.

7.3.2 This DMM is currently fully implemented by the District per DWR requirements. Education Programs

7.3.2.1 Public Information Programs (DMM G)

TUD has been implementing their Public Information Program since 1991. Part of this program includes regularly attending the local annual home and garden show where information packages are made available to the local community. Water conservation information and kits are made available at the front counter at the TUD main office. Water conservation kits consist of toilet dye tablets, faucet and showerhead flow restrictors, and information how to find and fix common leaks. Water conservation information is also made available on TUD's web site at http://www.tudwater.com/.

Since 2006, TUD has contracted annually with the University of California Agriculture and Natural Resources Cooperative Extension (UCCE) Program to provide public information regarding water conservation gardening and landscaping. Information from this program is distributed at the main TUD office at 18885 Nugget Blvd. Sonora CA 95370, and at home and garden shows and upon request. Handout titles provided by this program and other sources in the past have consisted of:

- Water Conservation Tips for the Home and Garden
- Taming Motherlode Watering Woes
- Save Water in Your Garden and Landscape
- Foothill Friendly Gardening
- The ABC's of Water Conservation
- Reduce Your Lawn to Cut Water Bills
- Demonstration Garden Flyer
- Summer Lawn Conservation Tips
- Indoor Conservation Tips
- Information about Public Demonstration Gardens

TUD contracts with a public education consultant to administer ongoing outreach programs. A summary of the programs TUD offers includes:

- Presentations to local service clubs and organizations focusing on water efficient gardening techniques and foothill-friendly gardening practices.

- UCCE Tuolumne County Master Gardener Open Garden Day demonstrations for members of the public:
  - Water efficient gardening techniques
  - Winterizing your irrigation system
  - Drip irrigation systems
  - Fire safe landscaping

- Publications recommending buffalo grass as a water-efficient turf alternative and growth trials at demonstration garden

- Continued publishing of water efficiency columns in local newspapers, on-line news services, and UCCE/TUD website.

A summary of the number of outreach activities implemented and associated costs as part of the public information program is included in Table 7-4.

Table 7-4: Outreach Activities Summary

Item	2006	2007	2008	2009	2010
Paid Advertising	3	4	3	3	2
Public Service Announcement	3	3	3	3	3
Bill Inserts / Newsletters / Brochures(1)	6	10	8	7	7
Demonstration Gardens	2	2	2	2	2
Special Events, Media Events	2	2	2	2	2
Program to coordinate with other government agencies, industry, public interest groups and media	3	3	3	3	3

Note:
1. Bill insert, newsletter, and brochure use has declined with increased website use.

Implementation Steps and Schedule

TUD is planning to continue the partnership with the UCCE Tuolumne County Master Gardener program to provide information about water conservation focusing on outdoor watering activities. Listed below is a brief outline of those planned activities as well as other public information programs to be undertaken by TUD:

Planned Public Education Materials:

- Copies of “Save Water” and “Foothill-Friendly Gardening” brochures for the Tuolumne County Home and Garden Show.
- Water-wise landscaping articles, written by UCCE Tuolumne County Master Gardener program, to distribute at the Tuolumne County Home and Garden Show and to TUD clients.
- Landscape information, vendor sources, and water-efficient landscape plants for display at the Home and Garden Show booth.
- UCCE Tuolumne County Master Gardener book “Sharing the Knowledge: Gardening in the Mother Lode.” One book is given away each day of the Tuolumne County Home and Garden Show.
- Educational materials to be mailed to TUD customers who call to protest high water bills.
- Inclusion of an “Is Your Water Bill Too High?” insert in bills to the highest residential water users. The insert refers water users to TUD staff and then to UCCE for educational materials regarding using water more efficiently.

Planned Workshops:

- **Water Forum, July 2011:** TUD is developing a water forum/water fair to be held at TUD during July, "Smart Irrigation Month." The event will be open to the general public, with a special invitation extended to TUD's highest- water-using residential customers. The event will include outdoor activities to demonstrate water-efficient landscaping, along with vendor booths, water use presentations, and rebate coupons for landscaping products at local vendors. Backyard food gardens and orchards will be highlighted as a demonstration of beneficial use. Cal Fire speakers will also be invited to provide examples of the beneficial use to public safety in creating fire-resistant, water use efficient green belts around homes and buildings.

- **Growing with Natives Seminar, September, 2011:** This event will include water-wise educational materials, a TUD information booth, and smart landscaping topics in the "Growing with Natives" Seminar in September. The workshop will highlight beneficial use - decorative, recreational, fire safety, and edible landscaping. TUD plans to arrange for a keynote speaker dedicated to water-wise or beneficial use landscaping.

- **Water Policy Workshop:** TUD plans to offer a half-day water workshop to provide enhanced training on water issues in California and the Mother Lode. The targeted audience is certified Master Gardeners and members of the public.

Commitment to Increase Outreach:

TUD began significant outreach activities starting in 1991 under directive of the TUD Board. TUD has been active each year since then and will continue to implement the Public Information Programs using outreach activities. In addition to the items listed above, TUD is pursuing the opportunity of offering additional public workshops in order to provide information to the general public on a variety of water efficiency related issues including:

- Water meter and smart meter operations and how to go about finding a leak on private property.

- Directly notifying high bill customers through a bill insert entitled "Is Your Water Bill Too High?" referring the customer initially to TUD staff and then to the Tuolumne County University of California Cooperative Extension for education materials regarding how to more efficiently use water.

- Offering specific information related to reducing landscape water use and advertising access to demonstration landscape surrounding the TUD main office.

- Providing a water bill showing water usage in comparison to previous year's usage.

7.3.2.2 School Education Programs (DMM H)

TUD contracts with a local coordinator from the Tuolumne County Master Gardener program to provide classroom presentations to all third grade classes in Tuolumne County – even the schools outside the District's service area and boundary. The program, which began in 1986, has an annual budget of $2,000 and meets the state education framework requirements. Instruction material has been provided by the DWR, Office of Education in the past. DWR just

recently provided TUD with 500 copies of "The California Water Works" which will be made available for the School Education Program in 2012.

Students learn about water conservation practices, respecting the water cycle, and the hazards of TUD's open ditch system. The program includes a short video provided by DWR on "Water Who Needs It?" and a demonstration with student participation, charts, and a worksheet. Materials are also provided for students to take home and share with their parents as a reinforcement tool.

Results from the program are tracked, and a comprehensive Program Summary Report is generated at the end of each school year. This report documents the estimated reduction in water usage that was achieved through the retrofits and provides data on the percentage of students who participated in the program. Table 7-5 provides a summary of program participation results between 2006 and 2010.

Table 7-5: School Education Activities

	2006	2007	2008	2009	2010
Number of Presentations	22	23	23	20	17
Grade	3rd	3rd	3rd	3rd	3rd
Number of Students	560	632	562	545	363

Implementation Steps and Schedule

TUD will continue to provide their successful student outreach program to all the third grade students in Tuolumne County. This program will continue to teach the students the three basic methods to conserve water: economize, repair leaks, and install water saving devices. The program will not be expanded to other grades as this particular lesson is geared towards third grade students. However, more presentations will occur as additional students and classrooms are added to schools within the service area.

7.3.3 Foundational BMPs - Methods Used to Evaluate Effectiveness and Water Savings

Implementation of the Utility Operations BMPs is fundamental to ensuring the long-term success of TUD's conservation program. TUD will utilize measurable methods to the effectiveness of each BMP to the extent practicable. For example, the effectiveness of the Water Waste Prevention and Water Loss Control BMPs can be measured, in part, from completing the annual water loss audits and documenting a year over year reduction in unaccounted-for water. Reduction in unaccounted-for water has a direct conservation savings. The District will use its existing billing system to carefully monitor metered consumption across a broad range of customer categories, providing a means to quantify savings realized from this pricing structure.

Likewise, the effectiveness of implementation of the Public Education BMPs will be measured by tracking customer participation in the various incentive programs offered by TUD such as

rebates and audits offered. A successful public information program should encourage customers to take advantage of conservation incentives being offered by TUD.

There are no quantifiable estimates of water savings applicable to the Foundational BMPs.

7.4 Programmatic DMMs

As described above, the District intends to continue to comply with the MOU using the BMP compliance approach. TUD is responsible for administering the Residential, Landscape, and CII BMPs currently being offered to the retailers' customers.

The District has completed a cost-effectiveness analysis using an avoided cost of water of $168 per ac-ft. At this time, the only cost effective programmatic BMP is residential BMP 3.4: WaterSense Specification (WSS) toilets. The following section describes how this DMM is being implemented, and provides an evaluation of the remaining DMMs that were determined to be either not cost effective at this time or there is not enough participation from customers to meet water savings goals. This section provides a cost benefit analysis summary for each DMM not being implemented. Further detail on how this cost benefit analysis was performed is included in Appendix L.

7.4.1 Residential DMMs

7.4.1.1 Residential Assistance Programs (DMM A and B)

TUD is not formally implementing residential assistance programs because residential water audits and plumbing retrofit kits are not locally cost effective. However, TUD does closely monitor residential water use patterns and has a program to assist customers with unusually high water use. A high reading or percentage will prompt a water meter technician to perform an on-site visit and check the meter reading and functionality of the meter. If it is determined that the water meter is reading correctly, a notice is then provided to the customer that high water use is detected.

TUD tracks and responds to all residential calls regarding water distribution issues including leaks, high bill complaints, or suspicions of high water use. During a response, a water distribution technician visits with the customer to discuss the problem. If there is a leak in the TUD system, it is scheduled for repair. If a leak is part of a private water system, the technician specifically explains the functions of the water meter to assist the owner in tracking their leak. In some cases, a smart meter may be installed to assist the owner in tracking their water use. These meters are capable of logging data every fifteen minutes for up to 90 days. Analysis of data can help determine when and how frequently the abnormal water usage is occurring, which often leads to a solution. TUD has installed approximately 810-820 smart meters annually over the last 5 years. The annual number of residential calls resulting in on-site visits is summarized in Table 7-6.

Table 7-6: On-site Visits in Response to Customer Calls

Item	2006	2007	2008	2009	2010
On-site visits	Not noted	421	358	576	562

In addition, TUD staff is responsible for exploring opportunities to convert residential customers with irrigation systems located near TUD's raw water ditches from treated water irrigation supply to raw water irrigation supply. The benefits of such a conversion are two-fold in that customers can use this less expensive water for gardening and landscape while at the same time TUD realizes a reduction in treated water demand.

Implementation Exemption

TUD is filing a cost-effectiveness exemption from the residential survey programs. The cost effectiveness worksheet is provided in Appendix L. The Residential Assistance and Landscape Water Survey programs are combined into a single analysis because audits are generally implemented as a single program with indoor and landscape elements. The analysis was performed using CUWCC assumptions for water savings, decay and program costs for performing 178 surveys per year, which represents 1.5 percent of residential accounts. The assumptions are based on CUWCC estimates from Research and Evaluation Committee Report (8/13/09) which identify a savings per unit of 0.045 ac-ft/yr and a decay rate of 10 percent. Administrative costs of 25 percent are assumed and include customer contact, inspection scheduling, marketing materials and follow up.

After performing a cost-benefit analysis for residential assistance surveys and residential plumbing retrofit kits, it was concluded that this DMM would not be locally cost effective to implement by the District. The results shown in Table 7-7 and Table 7-8, demonstrate that residential assistance programs are not a locally cost effective management tool for water conservation at this time.

Table 7-7: Cost Effectiveness of Residential Assistance Surveys

Total Costs	$69,678
Total Benefits	$10,324
Discount Rate	2.9%
Time Horizon	25 years
Cost of Water	$940
Annual Water Savings (ac-ft)	74
Benefit Cost	0.15

Table 7-8: Cost Effectiveness of Residential Plumbing Retrofit Kits	
Total Costs	$2,673
Total Benefits	$1,122
Discount Rate	2.9%
Time Horizon	25 years
Cost of Water	$375
Annual Water Savings (ac-ft)	7
Benefit Cost	0.42

Many factors were taken into account when determining the effectiveness of implementing this DMM including social, health, customer impact, and technological factors. There are no planned water supply projects that would produce water at a higher cost than implementing this BMP.

7.4.1.2 Landscape Water Surveys (DMM A)

The implementation of residential assistance surveys would include a landscape component including water meter instruction, assistance in tracking a high water bill through a smart meter, and notification of unusually high meter readings. As discussed above, a number of factors have established that implementing the residential assistance DMM is not locally cost effective and would not be successful due to social and customer impact factors. Please see the description in Section 7.4.1.1 Residential Assistance Programs for further detail.

Implementation Exemption

Please see the Residential Assistance Programs implementation exemption in Section 7.4.1.1. The cost effective summary would also be the same as analyzed for the residential assistance surveys summarized previously in Table 7-7.

7.4.1.3 High-Efficiency Washing Machine Rebate Program (DMM F)

The District is not currently implementing this DMM and is filing an exemption because it has been determined this DMM is not locally cost effective. It has been considered that this DMM may offer lower incremental costs than expanded or additional water supplies. At this time, TUD does not have any water supply projects planned.

Many factors were taken into account when determining the effectiveness of implementing this DMM including economic, environmental, social, health, customer impact, legal authority, and technological factors. When analyzing these factors, it was found that the economic factors lead to an implementation of this DMM that is not cost effective for TUD at this time.

Implementation Exemption

Table 7-9 depicts the expected; administrative costs, cost to implement, water savings and decay, avoided costs and lost revenues due to implementing a High-Efficiency Washing Machine Rebate Program. The unit cost to TUD to conserve water by this DMM is over $500 per acre-feet, which is not locally cost effective. The calculation used to determine the cost effectiveness of this DMM is included in Appendix L.

Table 7-9: Cost Effectiveness of High-Efficiency Washing Machine Rebate Program

Total Costs	$21,551
Total Benefits	$5,370
Discount Rate	2.9%
Time Horizon	25 years
Cost of Water Saved	$546
Annual Water Savings in ac-ft	39
Benefit: Cost	0.25

7.4.1.4 WaterSense Specification (WSS) Toilets (DMM N)

TUD provides an Ultra Low Flow Toilet (ULFT) Rebate program and reimburses consumers when they install a ULFT (1.6 gallons per flush or less) in their household that replaces a non-low flow toilet (3.0 gallons per flush or more). The ULFT rebate program started in 1991. Currently customers choosing to use this program receive a $45 per toilet rebate with a maximum of three toilets per residential customer account. There is no maximum for commercial businesses. The number of ULFT rebates issued in the last 5 years is listed in Table 7-10.

Table 7-10: ULFT Rebates and Replacements Received by TUD Customers

Actual	2006	2007	2008	2009	2010
Number of ULFT Rebate	10	35	24	8	32
Estimated Water Savings (ac-ft/yr)	0.3	1.2	0.8	0.3	1.1

Implementation Steps and Schedule

As outlined in Chapter 3, TUD's current water usage is projected to be in compliance with SBX7-7 target gpcd. Therefore, TUD's existing rebate program is expected to produce sufficient savings in the future. The planned number of rebates to be disbursed is based on the average number of rebates processed over the last 5 years and is summarized in Table 7-11.

Table 7-11: Anticipated ULFT Rebates to be Disbursed					
Type	**2011**	**2012**	**2013**	**2014**	**2015**
Number of ULFT Rebate	22	22	22	22	22
Estimated Water Savings (ac-ft/yr)	0.7	0.7	0.7	0.7	0.7

Note:
Anticipated number of ULFT rebates is based on the average number of rebates processed from 2006 through 2010.

TUD is considering ways to increase both customer and vendor awareness of the ULFT Rebate Program in order to have an even more effective program.

Methods Used to Evaluate Effectiveness and Water Savings

Toilet rebate data is tracked and summarized each year. TUD uses published water use savings data measured in savings of 0.033 ac-ft/yr per toilet. This data combined with the number of new low flow toilets installed over the last 5 years accounts for roughly 4 ac-ft/yr of water that would otherwise be consumed on an annual basis. This measure is assumed effective in part due to the longevity of toilets in general.

7.4.2 Commercial, Industrial, and Institutional DMMs (DMM I)

TUD serves roughly 850 commercial and 400 Institutional/industrial accounts, and CII customers make up roughly 17% of total water use in the District. TUD is currently in the process of evaluating the highest water users amongst these sectors and more accurately defining and sorting these customer sector groups from TUD's complete customer database. This new information will be the basis for future evaluation of conservation water savings to the CII accounts. TUD currently does not regularly perform water audits to this sector of its customer base. Other CII conservation measures such as rebates for high efficiency washing machines and urinals are not currently offered. The ULFT Rebate Program is the only conservation measure offered to commercial connections.

Many factors were taken into account when determining the effectiveness of implementing this DMM including economic, environmental, social, health, customer impact, legal authority, and technological factors. Analysis has found that the economic factor overwhelmingly leads to an unsuccessful implementation of this DMM.

Implementation Exemption

The District has determined that it would not be cost effective to fully implement this DMM. Table 7-12 provides a cost effectiveness summary for CII indoor surveys. The calculation used to determine the cost effectiveness of CII indoor surveys and the cost effectiveness for other CII conservation measures are included in Appendix L.

Table 7-12: Cost Effectiveness of Commercial, Industrial, and Institutional Indoor Surveys	
Total Costs	$2,331,250
Total Benefits	$9,087
Discount Rate	2.9%
Time Horizon	25 years
Cost of Saved Water	$35,738
Water Savings	65
Benefit: Cost	0.004

7.4.3 Large Landscape (DMM E)

The same landscape water use services available to residential customers are provided to CII and Large Landscape customers. Program offerings include water meter reading instruction, assistance in tracking a high water bill through a smart meter, and notification of unusually high meter readings. Since Large Landscape usage makes up less than 10 percent of the total water production, no devices or programs are offered specifically to Large Landscape customers. TUD plans to implement a proactive program to contact customers from all sectors that have unusually high water usage, which is further described in Section 7.5.

Many factors were taken into account when determining the effectiveness of implementing this DMM including economic, environmental, social, health, customer impact, legal authority, and technological factors. When analyzing these factors, it was found that the economic factor overwhelmingly leads to an unsuccessful implementation of this DMM.

TUD has considered that implementing this DMM may offer lower incremental costs than expanded or additional water supplies. However, TUD does not have any water supply projects planned at this time.

<u>Implementation Exemption</u>

The cost effective summary of large landscape surveys demonstrates that this DMM is not locally cost effective for implementation by the District. That is, the measured variable costs to carry out this DMM on behalf of the District and its customers, using prudent professional estimates, is higher than the benefits to the District and its customers. The cost analysis presented in Appendix L explores the total variable costs to implement large landscape surveys, monitor use and encourage large landscape owners to continue recommendations by the landscape auditor. The cost effective summary is provided in Table 7-13.

Table 7-13: Cost Effectiveness of Large Landscape Conservation Programs	
Total Costs	$27,819
Total Benefits	$745
Discount Rate	2.9%
Time Horizon	25 years
Cost of Saved Water	$5,531
Water Savings	5
Benefit: Cost	0.03

7.5 SBX7-7 Compliance Approach

The SBX7-7 water use baseline for TUD is 187 gpcd and the 2020 compliance target goal is 165 gpcd as documented in Chapter 3.

TUD plans to continue to implement water conservation programs which combine financial incentives, rules and regulations, and information elements to build on existing activities. Based on the projected demand discussed in Chapter 3, TUD's water use in 2010 was 158 gpcd but is projected to require additional conservation to be in compliance with SBX7-7 targets through 2020 and beyond. Starting in July 2011, TUD plans to focus on maintaining current water savings and increasing savings through the additional initiatives summarized below.

Operations Practices to be Implemented

1. Water Loss Control: TUD will continue to implement all Foundational BMPs, with specific focus on increasing conservation through Water Loss Control. It is anticipated that a majority of the required gpcd reduction can be achieved through water system infrastructure renovations by reducing the current unaccounted-for water loss volumes.

   As discussed in Section 7.3.1.4, TUD currently monitors individual water system loss by comparing WTP production and total customer water usage in each distribution system. The District has employed this method for years and uses local and historic knowledge of the individual water systems to interpret water loss and direct resources to control these losses. This has been a sensible method for the District and has been used for many years. However, it is understood that the unaccounted-for water loss information compiled in this format is subject to many potential flaws. This method is reaching a point where modern techniques will make more economic sense to implement as noted below in an excerpt from the AWWA M36 manual.

   According to the AWWA "Water Audits and Loss Control Programs" M36 manual, third edition, page 52, this water audit method, though employed world-wide, is imprecise and contains a number of flaws. Some of the problems with a water loss percentage calculation are listed below:

- This indicator is highly sensitive to the level of customer consumption in the water utility. If consumption increases or decreases noticeably, the percentage can change, despite the fact that no change in loss levels may have occurred.

- This indicator does not segregate apparent and real losses. Also, it includes no information on water volumes and costs, the two most important parameters in assessing water loss.

TUD plans to begin implementing procedures as outlined in the AWWA M36 manual starting with the systems with the most suspected water losses. This AWWA M36 approach guides the auditor through a series of financial, leak, and operational performance indicators. Data is normalized and indices are calculated through an intensive compilation of data from trusted and accurate water and financial measurements and indicators. It is anticipated that this will require the installation of several new measurement and logging devices throughout the TUD distribution systems.

2. TUD also plans to implement a proactive program to contact customers from all sectors that have unusually high water usage in general. The current program makes note of high usage which stands out at the time of the meter reading. The new proactive program will analyze water usage from all customers and sort data by high water users. TUD will contact these accounts through a bill insert; “Is Your Water Bill Too high?” referring them initially to TUD staff and then to Tuolumne County University of California Cooperative Extension for educational materials regarding how to more efficiently use water. This program will target all water users, regardless of account category, and will address the largest water users first. The details and schedule for this program are still in the development phase but is expected to help maintain SBX7-7 compliance.

Information/Tracking

Information and tracking represents a new element to the existing TUD conservation program focusing on collecting and processing information and ensuring that the programs are on track to meet the goals. These activities will also help in program design by providing more robust information about customers and their water use patterns. The immediate priorities include:

1. Proximity Read Meters: TUD will continue to implement and utilize proximity read meters as a priority to obtain real time data for water usage and identify customer-side leaks. This information can also help TUD monitor the impacts of existing programs, make adjustments where necessary and develop new programs. TUD is currently in the process of replacing all manual read meters with proximity read meters.

2. Water Use Tracking Tools: TUD will consider plans to design and develop database tracking tools for water savings associated with its conservation plans and increase flexibility in adding or changing program elements.

3. Water use history bill format: TUD is implementing a new water bill format that will show water usage in comparison to previous year’s usage. This format is expected to start before the end of 2011.

7.5.1 Consideration of Economic Impacts

Since funding for all conservation activities is subject to approval by the TUD Board of Directors before programs can be implemented, the economic impacts of complying with SBX7-7 have not yet been fully determined. However, an economic analysis to help develop programs that avoid placing disproportionate burdens on any single customer sector will be prepared during development of the SBX7-7 water use efficiency program. The cost associated with implementing the selected programmatic BMPs is estimated at approximately $77,000 a year. The estimated annual cost associated with implementing the foundational BMPs based on the existing conservation program is approximately $228,000. The associated cost of incorporating AWWA M36 Standard Water Audit Methodology to the existing conservation program is estimated to cost an additional $50,000 per year.

Chapter 8: Water Shortage Contingency Plan

Section 10632 of the Act details the requirements of the water-shortage contingency analysis. The Act states the following:

Section 10632. The plan shall provide an urban water-shortage contingency analysis that includes each of the following elements that are within the authority of the urban water supplier:

(a) Stages of action to be undertaken by the urban water supplier in response to water supply shortages, including up to a 50 percent reduction in water supply, and an outline of specific water supply conditions, which are applicable to each stage.

(b) An estimate of the minimum water supply available during each of the next three water years based on the driest three-year historic sequence for the agency's water supply.

(c) Actions to be undertaken by the urban water supplier to prepare for, and implement during, a catastrophic interruption of water supplies including, but not limited to, a regional power outage, an earthquake, or other disaster.

(d) Additional, mandatory prohibitions against specific water-use practices during water shortages, including, but not limited to, prohibiting the use of potable water for street cleaning.

(e) Consumption reduction methods in the most restrictive stages. Each urban water supplier may use any type of consumption reduction methods in its water shortage contingency analysis that would reduce water use, are appropriate for its area, and have the ability to achieve a water-use reduction consistent with up to a 50 percent reduction in water supply.

(f) Penalties or charges for excessive use, where applicable.

(g) An analysis of the impacts of each of the actions and conditions described in subdivisions (a) to (f), inclusive, on the revenues and expenditures of the urban water supplier, and proposed measures to overcome those impacts, such as the development of reserves and rate adjustments.

(h) A draft water shortage contingency resolution or ordinance.

(i) A mechanism for determining actual reductions in water use pursuant to the urban water shortage contingency analysis.

This chapter documents TUD's Water Shortage Contingency Plan for the Treated Water System per requirements of Section 10632 of the Act. The Water Shortage Contingency Plan is based on Regulation No. 12. Appendix J contains the full text of this regulation.

The purpose of the Water Shortage Contingency Plan is to provide a plan of action to be followed during the various stages of a water shortage. The plan includes the following elements: action stages, estimate of minimum supply available, actions to be implemented during a catastrophic interruption of water supplies, prohibitions, penalties and consumption reduction methods, revenue impacts of reduced sales, and water use monitoring procedures.

8.1 Action Stages

TUD has grouped the actions to be taken during a water shortage into three phases that are based on the water supply conditions. This three-phase rationing plan includes both voluntary and mandatory rationing, depending on the causes, severity, and anticipated durations of the water supply shortage. Table 8-1 describes the water supply shortage phases and conditions. The phases will be implemented during water supply shortages according to shortage level,

ranging from normal conditions in Phase I to critical conditions in Phase III. The specific actions to be undertaken during each water shortage supply phase are listed in Regulation No. 12 included in Appendix J.

Table 8-1: Water Supply Shortage Stages and Conditions

Phase No.	Water Shortage Supply Conditions	Shortage Percent
I	Minimum – Ongoing Water Management	0
II	Moderate to Critical – Conservation Measures During Low Water Years	0-50
III	Critical – Restricting Use of Potable Water[(2)]	50+

Notes:

1. This table is based on the DWR Guidebook Table 35.
2. Per Regulation 12, TUD may implement Phase III "whenever it determines that the amount of available water supply may be less than the projected water system demand."

The phase determination and declaration during a water supply shortage will be made by the District Board of Directors in accordance with Regulation No. 12.

8.2 Minimum Supply Estimate

The Act requires an estimate of the minimum water supply available during each of the next three water years based on the driest 3-year historic sequence for TUD's existing water supply sources.

Table 8-2 summarizes the minimum volume of water available from each source during the next 3 years based on multiple-dry water years and normal water year. The driest 3-year historic sequence is provided in Chapter 6. The water supply quantities for 2011 to 2013 are calculated by linearly interpolating between the projected water supplies of 2010 and 2015 for normal years. The water supplies for 2010 and 2015 are presented in Chapter 4. The third year of the multiple-dry year water supply projection represents the end of each 3-year multiple-dry year period as required for the multiple-dry year analysis.

It is assumed that the multiple-dry year supplies will be the same as those for the normal years for surface water based on historical supply to TUD during extended drought periods. However, groundwater supplies are assumed to decrease in average annual yield by approximately 50 percent and recycled water is assumed to decrease by approximately 20 percent from normal during a dry year. Therefore, the minimum water supply will meet projected normal year water demands under all anticipated hydrologic conditions and is expected to be at least 96 percent reliable from 2011 to 2013.

Table 8-2: 3-Year Estimated Minimum Water Supply (ac-ft/yr)			
Source	**2011**	**2012**	**2013**
Water from PG&E	24,500	24,500	24,500
Groundwater	656	656	656
Recycled water	1,768	1,785	1,802
Total	26,924	26,941	26,958

8.3 Catastrophic Supply Interruption Plan

The Act requires documentation of actions to be undertaken by the water supplier to prepare for, and implement during a catastrophic interruption of water supplies. A catastrophic interruption constitutes a proclamation of a water shortage and could result from an event (either natural or man-made) that causes a water shortage severe enough to classify as a Phase III water supply shortage condition.

8.3.1 Emergency Response Plan

TUD is authorized under the California Emergency Services Act (Chapter 7, Article 9.5. California Government Code) to conduct emergency operations. In December 2004 the District adopted an Emergency Response Plan (ERP) which includes standardized responses to a variety of natural and human caused incidents. The District's ERP exclusive of sensitive system information is included as Appendix M for reference. The District's ERP is consistent with the standardized emergency management system (SEMS) adopted by the State and was developed pursuant to an agreement entitled "Tuolumne County Operational Area Agreement" dated 16 January 1996 between the County, City of Sonora, TUD and seven (7) other special districts within the County which established standards for emergency response plans. The statewide SEMS substantially meets the objectives of the Federal National Incident Management System.

TUD maintains the District's ERP that documents actions to be undertaken to prepare for and implement during a catastrophic interruption of water supply including those caused by power outages and natural disasters. The ERP is discussed below in terms of the details required for UWMPs.

Reduced Water Supply

In the event of a water shortage catastrophe, the TUD Board of Directors would call for a State of Emergency which would implement actions as outlined in the ERP and Regulation No. 12.

Regional Power Outage

In the event of a power-outage, the District implements those sections of the ERP according to what level of outage the area is experiencing. In particular, critical water and wastewater infrastructure can be served by stand-by power. The District maintains automatic backup generators at their headquarters (which is also designated as an official Emergency Command

Center) at all wastewater pump stations, the RWWTP, most WTPs, and other selected operational facilities. In addition to the static standby generators, mobile generators are available and can be dispatched to facilities to provide stand-by electric power where required. During power outages, the TUD generates power from these sources to maintain system operations. The District's main supply of water is delivered from a higher elevation which is gravity fed to areas of consumption. Thus, power outages do not interrupt the source of raw water to the District's surface WTPs.

Raw Water Conveyance System Damage

The open ditch/flume raw water conveyance system from Lyons Reservoir to distributions points within the TUD Treated Water System could be subject to vulnerability due to wild fires, and storm conditions including heavy rain, heavy snow, flood, erosion, landslide, as well as other natural disasters. Flume structures are especially vulnerable due to boulders and other debris that could potentially dislodge upslope of the conveyance facilities and damage one of more of these flume structures below it. Footings supporting these flumes could fail in any of these natural disasters, and wooden flume structures are highly subject to vulnerability due to wild fires. Damage to the flume structure that would then implement the emergency measures as documented in the ERP included in Appendix M.

8.3.2 Main Tuolumne Canal Interrupt

In addition to the Emergency Response Plan, TUD consultants are in the final stages of preparing the South Fork Stanislaus Water Supply Project to evaluate and provide alternatives to a potential interrupt of the Main Tuolumne Canal functions that supply water to TUD. The project is intended to:

- Develop a hazard evaluation and reduction plan,
- Develop cooperative agreements with PG&E for emergency response plans to address a Main Tuolumne Canal failure,
- Review and develop alternatives to prepare or safeguard against such failures, and
- Review security and operations of other agencies with similar water conveyance infrastructure issues.

The evaluation and report is due later this year.

8.4 Prohibitions, Penalties, and Consumption Reduction Methods

The Act requires an analysis of mandatory prohibitions, penalties, and consumption reduction methods against specific water use practices which may be considered excessive during water shortages. Regulation No. 12 details the various prohibitions and sets forth water use violation fines, charges for removal of flow restrictors, as well as establishes the period during which mandatory conservation and rationing measures will be in effect. The prohibitions on various wasteful water uses, include, but are not limited to, the hose washing of sidewalks and driveways using potable water, and cleaning for filling decorative fountains.

During a Phase III water shortage condition, metered domestic customers will be serviced water under a life line rate structure. Water use would be restricted to eliminate such uses as washing vehicles. Landscape irrigation resulting in water runoff and the filling swimming pools would be prohibited. Industrial, commercial, and raw water users would be restricted to minimal sustainable operations as the flow in the open conveyance ditch system will be strictly reduced to minimize the open ditch and flume system losses. Second time (and above) violators face imposition of flow restriction devices and penalties as listed in the Enforcement section of Regulation No. 12 (paragraph 12.04). Table 8-3 summarizes the various prohibitions and the phases during which the prohibition becomes mandatory.

Table 8-3: Summary of Mandatory Prohibitions

Examples of Prohibitions	Stage When Prohibition Becomes Mandatory
Watering which results in flooding or run-off in gutters, waterways, patios, driveway, or streets	III
Washing aircraft, cars, buses, boats, trailers, or other vehicles by hose or by use of water directly from public water supply	III
Washing buildings, structures, sidewalks, walkways, driveways, patios, parking lots, tennis courts, or other hard-surfaced areas	III
Irrigation season postponed	II, III
New construction service applications must delay landscaping until repeal of Phase III restrictions	III
Use of water for decorative fountains or the filling or topping off of decorative lakes or ponds	III
Sewer flushing, dust control, earth compaction, and other construction use of potable water	III
Filling or refilling of swimming pools	III
Fire hydrant flow testing	II
Uncorrected plumbing leaks	III

Note:
This table is based on the DWR Guidebook Table 36.

In addition to prohibitions during water supply shortage events requiring a voluntary or mandatory program, TUD will make available to its customers water conservation kits as required by Regulation No. 12. TUD will notify all customers of the availability of conservation kits.

In addition to prohibitions, Regulation No. 12 provides penalties and charges for excessive water use. Violators receive one written warning after which a flow-restricting device may be installed in the violator's water service to be removed upon payment of a $200.00 penalty. Upon a third violation or under a Phase III water shortage condition, domestic customers will be serviced water under a life line or life sustaining rate structure. The life line rate is the lowest bracket of the then current rate schedule:

- Customers are billed 1.00 times the life line rate for the first 500 cubic feet (cf) of water used on a monthly basis.
- Customers are billed 1.25 times the life line rate for the next 500 cf
- Customers are billed 1.5 times the life line rate for the next 500 cf
- Customers are billed 1.75 times the life line rate for the next 3000 cf
- Customers are billed 2.00 times the life line rate for the next 4500 cf

Table 8-4 summarizes the penalties and charges and the stage during which they take effect.

Table 8-4: Summary of Penalties and Charges for Excessive Use

Penalties or Charges	Stage When Penalty Takes Effect
Penalties for not reducing consumption	III
Charges for excess use	III
Violation penalties	II, III
Installation of new construction landscaping	III
Flow restriction	III

Note:
This table is based on the DWR Guidebook Table 38.

In addition to prohibitions and penalties, TUD can use other consumption reduction methods to reduce water use. Table 8-5 summarizes the methods that can be used by TUD in order to enforce a reduction in consumption, where necessary.

Table 8-5: Summary of Consumption Reduction Methods		
Consumption Reduction Method	**Stage When Method Takes Effect**	**Projected Reduction Percentage**
Demand reduction program	All Phases	N/A
Reduce pressure in water lines; flow restriction	III	N/A
Restrict building permits; restrict for only priority uses	II, III	N/A
Use prohibitions	All Phases	N/A
Water shortage pricing; per capita allotment by customer type	III	N/A
Plumbing fixture replacement	All Phases	N/A
Voluntary rationing	I, II	N/A
Mandatory rationing	II, III	N/A
Incentives to reduce water consumption; excess use penalty	III	N/A
Water conservation kits	All Phases	N/A
Education programs	All Phases	N/A

Note:
This table is based on the DWR Guidebook Table 37.

8.5 Revenue Impacts of Reduced Sales

Section 10632(g) of the Act requires an analysis of the impacts of each of the actions taken for conservation and water restriction on the revenues and expenditures of the water supplier. During a water shortage as determined by Regulation No. 12, under a Phase III water shortage condition, it is expected that there will be a reduction of revenues due to a significant drop in water sales and that there will be an increase in expenditures due to the need to provide additional staff to monitor water waste. TUD expects that, to overcome the revenue loss and increase in expenditures, the District will have to utilize fiscal reserves, defer existing non-essential operations and projects, obtain loans, and/or develop rate increases.

8.6 Water-Use Monitoring Procedures

This section addresses the Act's requirement for an analysis of mechanisms for determining actual reduction in water use when the Water Shortage Contingency Plan is in effect.

TUD would utilize available water meters to analyze actual reduction. TUD can use customer meters to determine customer consumption data for a specific user based on hourly, daily and/or monthly water consumption depending on the type of meter installed. TUD can monitor long-term water use through regular bi-monthly meter readings, which provide TUD the ability to identify exceptionally high usage for verification of water loss or abuse. In addition, TUD can use

production meters to determine water losses within a distribution based on hourly, daily and/or monthly readings.

During a water shortage, the procedure that TUD would use to determine actual reductions of water is as follows:

1. Comparison of treated water supply production for each distribution system on a daily basis to determine if the usage is reduced accordingly.

2. If conservation reductions are not met based on the supply production analysis, then a reading of water meters on that distribution system would be initiated to find the violators and to begin notifications, restrictions, penalties, etc.

3. Field employees will be deployed in order to provide reports of any observed water use that is restricted by Regulation No. 12.

4. Distribution systems will be field inspected for theft or other uncontrolled system losses if the production flow meters that serve them do not show the expected reduction of water use.

Chapter 9: References

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