4 PLANNING DATA AND WATER DEMAND FORECASTING

This chapter discusses the planning data and water demand forecast information used to assess the current and future capabilities of the District's water system. It summarizes historical and projected population trends in the District's water service area as well as water use characteristics, including production, consumption, and related factors used to develop the District's demand forecast for the 20-year planning period.

4.1 Population Data

Population data were used to understand the historical growth patterns of Skagit County, and as an indicator of the growth potential during this 20-year planning period. Population data from the U.S. Census Bureau and from the Washington State Office of Financial Management (OFM) were used to develop population growth projections for the customers within the Judy System. These growth projections were used as a reference, along with historical water consumption data and potential meter growth, in the development of the water demand forecasts. Other growth projection sources, such as the Skagit County Comprehensive Plan, were not used for this analysis due to the relatively outdated information compared to the newer information provided by the U.S. Census Bureau and OFM.

4.1.1 Historic

U.S. Census Bureau population data collected for 1990, 2000, and 2010 for Skagit County, incorporated cities and towns, as well as the unincorporated areas of the county are displayed in Table 4-1 below. For the county as a whole, and for each individual city and town, the rate of population growth slowed between 2000 and 2010 compared to the rate between 1990 and 2000. However, while the growth rate slowed, the percentage of new population that became District customers increased over the same period. During the 20-year period from 1990 to 2010, just over 37,000 people were added to the county's population. Of this total number, over 22,000, or nearly 60%, were added in the three cities of Burlington, Mount Vernon, and Sedro-Woolley. During the 10-year period from 2000 to 2010, of the approximately 14,000 residents added to the county's population, approximately 9,000, or nearly 65%, were residents of Burlington, Mount Vernon, and Sedro-Woolley.

Table 4-1. Census Data for Historic Population Growth in Skagit County

Locality	1990	2000	10-Year Growth Rate (1990–2000)	2010	10-Year Growth Rate (2000-2010)
Skagit County	79,545	102,979	29.5%	116,901	13.5%
Anacortes	11,451	14,707	28.4%	15,778	7.3%
Burlington	4,349	6,623	52.3%	8,388	26.6%
Concrete	735	832	13.2%	710	-14.7%
Hamilton	228	330	44.7%	301	-8.8%
La Conner	656	782	19.2%	891	13.9%
Lyman	275	384	39.6%	438	14.1%
Mount Vernon	17,647	26,297	49.0%	31,743	20.7%
Sedro-Woolley	6,333	8,698	37.3%	10,540	21.2%
Unincorporated Areas	37,871	44,326	17.0%	48,112	8.5%

Source: Adapted from Washington State Office of Financial Management (OFM 2012)

4.1.2 Future

As directed by state statute RCW 43.62.035, every 5 years OFM prepares a reasonable range of population growth forecasts for Washington counties required to comply with the Growth Management Act. The population forecasts are projected for a 20-year period and include a low, medium, and high estimate. The medium-level projection represents OFM's estimate of the most likely population projection for the county. Skagit County is required to plan under the Growth Management Act. The OFM low, medium, and high forecasts for Skagit County for 2020, 2030, and 2040 are presented in Table 4-2.

Table 4-2. OFM Population Projections for Skagit County Based on the 2010 Census

Census 2010	OFM Projection	2020	10-year Growth Rate (2010–2020)	2030	10-year Growth Rate (2020–2030)	2040	10-year Growth Rate (2030–2040)
116,901	Low	112,269	-4.0%	121,917	8.6%	132,559	8.7%
	Medium	128,249	9.7%	144,953	13.0%	162,738	12.3%
	High	150,199	28.5%	179,929	19.8%	210,827	17.2%

As a comparison, the District's 2007 Water System Plan provided population forecasts from OFM using the 2000 census data, and from the 2000 Coordinated Water System Plan. Table 4-3 shows the projections made by OFM and the CWSP for 2010.

Table 4-3. Previous OFM and CWSP Population Projections for Skagit County

Census 2000	Projection Rates	OFM 2010 Projection	2000 CWSP Projection	Census 2010
102,979	Low	113,902	118,853	116,901
	Medium	123,807	125,510	
	High	137,054	136,644	

As evidenced by Table 4-3, the actual census population for 2010 was between the low and medium growth rates for the OFM projections and below the low growth rate for the CWSP. As mentioned earlier, the actual population growth rates are considered, along with historical growth information of the District's customers, to determine the future meter growth rate and the water demand forecast.

4.2 Water Usage Characteristics

4.2.1 Production

Figure 4-1 shows a history of the District's water production including production from the District's water treatment plant and the water purchased from the City of Anacortes through interties. Total water production into the District's system has ranged from a low of 2,832 million gallons in 2005 to a high of 2,945 million gallons in 2007. The average annual production over the past 9 years has been 2,908 million gallons. The overall production is not expected to change, but it is expected that the amount of water purchased from Anacortes through the interties will decrease considerably because of the completion of the Josh Wilson Road pipeline, which brings the District's water to customers in Bay View.

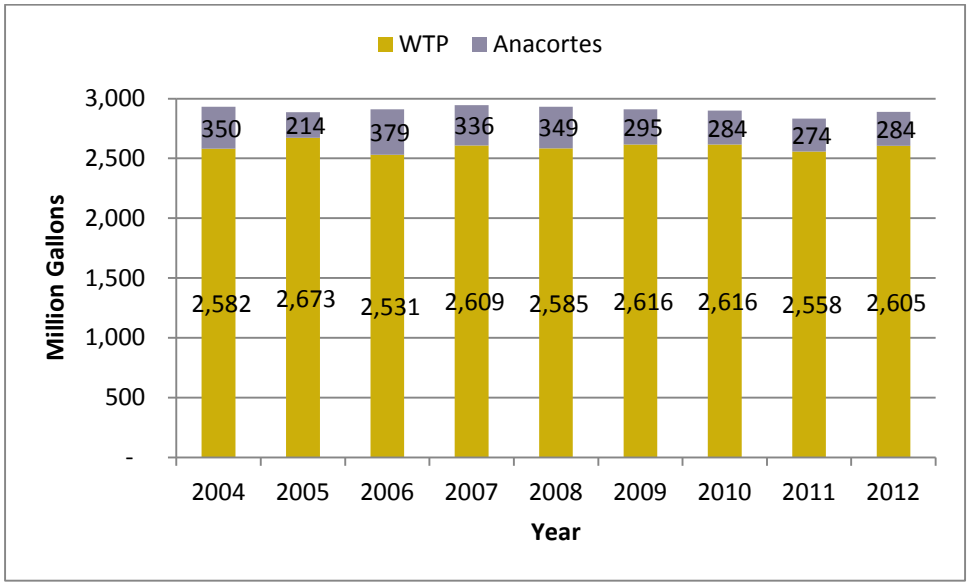

Figure 4-1. Annual Water Production (2004–2012)

Production typically increases in the summer months due to irrigation use. Figure 4-2 shows the average monthly distribution of water production from the District's water treatment plant for 2010-2012.

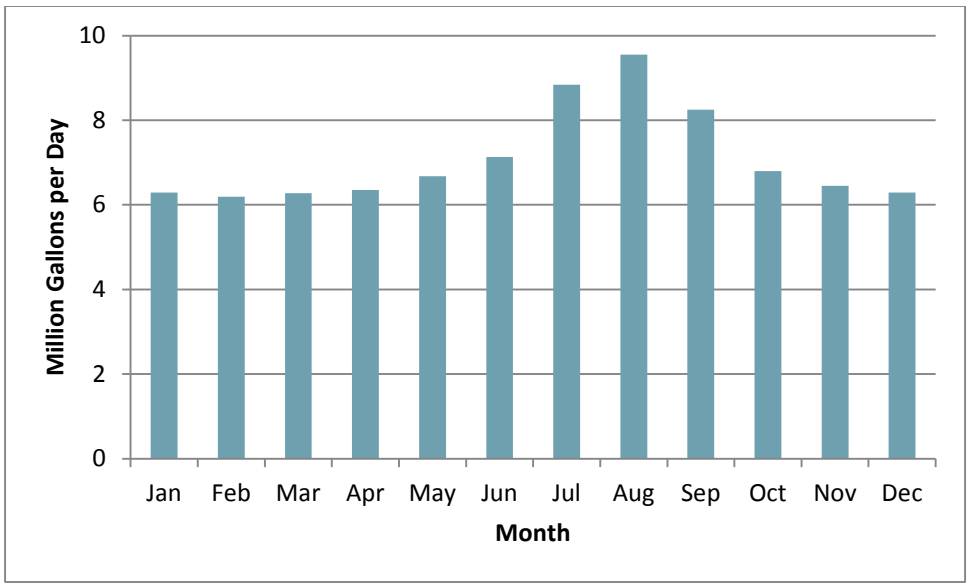

Figure 4-2. Monthly Distribution of Water Production (2010–2012 Average)

For 2012, the average day production for the system, including production from the water treatment plant and the water purchased from Anacortes, was 7.98 MGD. The peak production day for 2012 occurred on August 16 and was 12.68 MGD, resulting in a peaking factor of 1.59. Table 4-4 lists the average day and peak day production and the peaking factor for 2004–2012.

Table 4-4. Peaking Factor

Year	Average Day Production from WTP And Anacortes (MGD)	Peak Day Production from WTP and Anacortes		Peaking Factor
		(MGD)	Date	
2004	8.01	12.78	7/23	1.59
2005	7.89	13.75	7/26	1.74
2006	7.95	13.79	7/3	1.73
2007	8.05	16.88	7/12	2.10
2008	8.01	12.93	8/16	1.61
2009	7.95	14.16	7/28	1.78
2010	7.92	13.37	8/17	1.69

Year	Average Day Production from WTP And Anacortes (MGD)	Peak Day Production from WTP and Anacortes		Peaking Factor
		(MGD)	Date	
2011	7.74	12.79	9/22	1.65
2012	7.98	12.68	8/16	1.59

4.2.2 Consumption

The District's primary water customer category is residential; however, a variety of other customer types are served. The District's customer categories are grouped as follows:

Residential: The residential customers include single-family residences.

Multi-Family: Multi-family customers are defined as apartments, condominiums, and other structures where multiple dwellings are served from a single water meter.

Commercial and Industrial: This category includes retail consumers, churches, as well as manufacturing and processing consumers.

Government: Buildings or facilities that are owned by local government agencies, including schools.

Farms: Customers that own and operate farms.

Irrigation: Customers that provide irrigation water to their property, including golf courses.

Fire Protection: Water that is used by Fire Departments and Fire Districts throughout Skagit County for use in training staff in how to fight fires, and for actually fighting the fires.

Resale: Resale customers have a wholesale meter that provides water to a specific area. The District currently has two resale customers: North Fir Island Water Association and Samish Farms Water Association.

Other: This includes two small customer categories: Manifold (non-irrigation), which includes the residential meter on a manifold meter set up for both irrigation and consumption; and Statement No-Bill, which includes the water consumption by the District's facilities that is not billed. This includes things like the backwash water at the water treatment plant and the water used by the District office.

Table 4-5 shows the number of active service connections by customer category for 2012, along with the total water consumption for that category and the overall percentage of consumption compared to the yearly total.

Table 4-5. 2012 Service Connections by Category

Category	Number of Meters	Water Consumption (MG)	% of Total
Residential	19,469	1,084.05	42.8
Multi-Family	1,209	387.49	15.3
Commercial/Industrial	1,776	759.55	30.0
Government	186	65.45	2.6
Farms	124	115.46	4.6
Irrigation	182	81.24	3.2
Fire Protection	103	0.28	0.01
Resale	2	32.79	1.3
Other	12	7.90	0.3
TOTAL	23,063	2,534.21	100

Since 2007, there has been an increase in the number of new water meters within the District's system. However, the growth in the meter count does not correspond with the annual water production, as provided in Figure 4-1. Table 4-6 shows the growth in the number of meters compared to the overall water production.

Table 4-6. Service Connection Growth by Year

Year	Number of Meters	% Growth	Water Production (MG)	% Growth
2007	22,402		2,945	
2008	22,634	1.0%	2,940	-0.2%
2009	22,856	1.0%	3,020	2.7%
2010	22,895	0.2%	2,898	-4.0%
2011	22,938	0.2%	2,832	-2.3%
2012	23,063	0.5%	2,921	3.1%

The overall quantity of water produced, including the production at the WTP and the water purchased from Anacortes, decreased from 2007 to 2012. With the number of meters increasing during this same period, the average consumption per equivalent residential unit (ERU) has decreased. This is discussed in greater detail below.

Customers with large water demands are of interest because their demand can have a significant impact on the overall water demand for the District's system. The 10 largest District customers on the Judy System are listed in Table 4-7.

Table 4-7. District's Largest Customers in 2012

Customer	Service Type	2012 Volume Used (MG)
Draper Valley Farms	Commercial	121.1
Sierra Pacific	Industrial	117.4
Advanced Refreshment LLC	Commercial	82.2
Samish Farms Water Association	Re-Sale	30.0
Sakuma Bros.	Commercial	26.0
Skagit Gardens Nursery	Irrigation	23.2
Skagit Valley Mobile Manor	Multi-Family	16.1
Eaglemont Golf Course	Irrigation	12.2
Washington Bulb Company	Commercial	11.7
Cascade Ag Services	Commercial	11.2

4.2.3 Water Use Factors – Equivalent Residential Units

The residential water use factor for 2012 was found to be 152 gallons per day per residential account. This number was determined by taking the average daily water consumption for the entire Residential meter category and dividing it by the total number of meters.

Water Use Factor = 1,084,051,716 gallons per year / 366 days per year / 19,469 meters

Water Use Factor = 152.1 gallons per day per meter

This number was used to determine the ERU for each of the remaining customer categories to determine the overall number of ERUs in the system. Table 4-8 shows the results of those calculations.

Table 4-8. Water Use Factor and 2012 ERUs

Category	Number of Meters	2012 Water Consumption (MG)	ERUs
Residential	19,469	1,084.0	19,469
Multi-Family	1,209	387.5	6,959
Commercial/Industrial	1,776	759.6	13,641
Government	186	65.5	1,175
Farms	124	115.5	2,074
Irrigation	182	81.2	1,459
Fire Protection	103	0.3	5
Resale	2	32.8	589
Other	12	7.9	142
TOTAL	23,063	2,534.2	45,513

Note: ERUs calculated by dividing the 2012 water consumption by residential water use factor of 152.1.

ERUs are a method of representing water use by non-residential customers as an equivalent number of residential customers. An ERU is the amount of water used by a single-family household, and is used in the analysis of the system to determine the availability of source or reservoir storage adequacy. The District's water use factors numbers from 2007–2012 are presented in Table 4-9.

Table 4-9. Water Use Factors from 2007 through 2012

Year	Number of Residential Meters	Water Use Factor
2007	22,393	167.5
2008	22,625	159.6
2009	22,843	172.1
2010	22,889	160.5
2011	22,927	149.9
2012	23,050	152.1
	Average	160.3

As shown in Table 4-9, the ERU has been on a downward trend since 2007, indicating water conservation throughout the District. The average water use factor of 160.3 is what is used to determine the water use forecast.

4.2.4 Water Balance, Non-Revenue, and Leakage

The District embarked on a water meter replacement program in 2007 and 2008 that replaced all of the existing small-diameter water meters with new radio-read Badger meters. Other larger-diameter water meters are also systematically being replaced as budget allows. The new water meters have given staff more confidence in the readings, as well as being able to detect faulty meter reads based on historical usage and possible leaks on the customer side of the meter. In 2014 the District plans to replace two additional meters located at the WTP on each of the District's transmission lines. The replacement of these source meters will be a tremendous help in the tracking the revenue vs. non-revenue water.

A water balance is an accounting for all water that is produced and purchased. Table 4-10 shows the water balance for the District's Judy System for 2012. It is a slightly modified version of the format recommended for use by the American Water Works Association's Water Loss Committee.

Table 4-10. Water Balance (2012)

	Level 1	Level 2	Level 3	Million Gallons	% of Water Produced
Water Produced	Revenue Water	Billed Authorized Consumption	Billed Water Exported (1)	32.8	1.1%
			Billed Metered Consumption (2)	2,493.5	85.4%
			Billed Unmetered Consumption	0	0
	Non-Revenue Water	Unbilled Authorized Consumption	Unbilled Metered Consumption (3)	7.9	0.3%
			Unbilled Unmetered Consumption	0	0
		Apparent Losses	Unauthorized Consumption	0	0
			Customer Metering Inaccuracies	0	0
		Real Losses	Known Leakage	0	0
			Assumed Leakage (4)	387.1	13.3%
			Total	2,921.3	100%

1. Water sold to resale customers North Fir Island Water Association and Samish Farms Water Association.
2. Water sold to retail customers.
3. This represents consumption by District facilities that is metered but not billed, as well as a manifold non-irrigation meter.
4. This is the overall water production (District WTP production plus purchased water from Anacortes) minus all other categories. As mentioned in this chapter, the District will be replacing two of the large source meters at the WTP, which is expected to increase the reliability and accuracy of the overall system reads.

The water balance allocates the water production to different categories at three different levels:

Level 1 – allocates the water to either Revenue or Non-Revenue Water. As implied by the names, Revenue Water generates income while Non-Revenue Water does not. This is helpful in understanding what percent of water production generates income for the District. Additionally, Non-Revenue Water needs to be factored into the demand forecast.

Level 2 – splits Non-Revenue Water into the following three sub-categories, which are useful in identifying potential additional revenue sources and identifying the magnitude of leaks that could be fixed.

Unbilled Authorized Consumption: Includes uses such as water system flushing, firefighting, and water used for District facilities.

Apparent Losses: Includes unauthorized uses and customer meter inaccuracies, both of which are lost revenue opportunities.

Real Losses: Includes various types of system leaks and also includes inaccuracies in the meters themselves. A certain level of leakage is unavoidable; however, leakage beyond that level should be repaired as soon as practically possible to avoid damage to the natural resource and physical infrastructure. Any amount that cannot be assigned to another category is considered a Real Loss under the American Water Works Association's protocol, as well as per the formula for calculating distribution system leakage under Washington State's Water Use Efficiency Rule.

Level 3 – simply further splits the water into additional sub-categories.

Table 4-11 shows a history of the District's water balance elements, namely distribution system leakage and Non-Revenue Water.

Table 4-11. Distribution System Leakage and Non-Revenue Water

Year	Water Produced (MG) [1]	Authorized Consumption		Distribution System Leakage [4]		Non-Revenue Water [5]	
		Billed (MG) [2]	Unbilled [3]	Qty (MG)	% of Production	Qty (MG)	% of Billed Consumption
2007	2,945	2,643	8.4	294	10.0%	302	11.4%
2008	2,933	2,686	7.0	240	8.1%	247	9.2%
2009	2,911	2,729	7.7	174	6.0%	182	6.7%
2010	2,900	2,598	5.7	296	10.2%	302	11.6%
2011	2,832	2,470	82.4	280	9.9%	362	14.7%
2012	2,921	2,527	7.9	387	13.3%	394	15.6%
AVG	2,907	2,609	19.8	278	9.6%	298	11.4%

1. This is the overall water production for the year, including the production from the District's WTP and water purchased from the City of Anacortes.
2. Water sold to District customers.
3. This represents consumption by District facilities that is metered but not billed, as well as a manifold non-irrigation meter.
4. As defined by the Water Efficiency Rule, Distribution System Leakage is the water production minus authorized consumption.
5. Calculated as water production minus billed consumption.

4.3 Water Demand Forecast

4.3.1 Customer Demand Forecast

The development of the District's water demand forecast is based on an estimation of the meter growth rate, using OFM population data and historical District customer growth information as a reference, and then calculating the total Maximum Day Demand of the system for each year in the reporting period using the average water use factor from 2007 through 2012 of 160.3 gpd/ERU.

Based on the historical customer growth rate at the District over the past 4 to 5 years, which was affected by a recessionary economy and poor job growth, the customer growth rate was estimated for each of the District's meter categories. Table 4-12 shows the estimated meter growth for each of the different customer categories and the total anticipated growth for the Judy System.

Starting in 2014, the three main customer categories (residential, multi-family, and commercial/industrial) are forecasted to increase approximately 0.8% per year until 2019, and then at 1.0% per year until 2033. This coincides with the recent meter growth that the District has experienced. The other customer categories are forecasted to increase at different rates, with the Resale and Other categories forecasted to have zero growth. The overall meter growth rate calculates as 0.8% per year from 2014 to 2019, and as 1.0% per year from 2020 to 2033.

Each of the customer categories also has its own consumption pattern and specific water use per meter. As a result, the historical annual water usage from 2007 through 2012 was used to determine a water use per meter for each different customer category. The average annual water use per meter for each category from 2007 through 2012 was used as the projected annual water use per meter going forward from 2014 to 2033 for each customer category. Therefore, the projected meter growth per year for each customer category can be translated into the annual water usage per year for each category. Adding up the annual water usage for each customer category provides the total yearly water demand of the customers for each year.

Table 4-13 shows a summary of the meter growth and annual water demand for each customer category for this planning period, including the years 2007 through 2012 to provide a reference point. Table 4-13 also uses the water use factor of 160.3 gpd/ERU to determine the ERU growth for each year for each customer category from 2014 to 2033. The summary total of the meter growth, the annual usage, and the ERU growth is shown totaled on the right side of the table.

4.3.2 System Demand Forecast

The calculation of the overall water demand for the Judy System is more a calculation of the demand of the system, instead of the demand of the customers. The difference between the system demand and the customer demand is the amount of water produced by the WTP and purchased from the City of Anacortes that cannot be accounted for. That water can be allocated to system leakage, inaccurate meter readings, etc. But regardless of where the water eventually goes, the District is required to produce that water at the WTP or purchase it from the City of Anacortes in order to serve the system demand. Therefore, the water demand for the Judy System is calculated based on the system demand and not the customer demand.

The distribution system leakage calculated for 2012 was found to be 13.3%. It is the District's goal to reduce that number to at least 10% in 2014 and to at least 9% for each year after that. The volume of water calculated in the distribution system leakage is added to the customer demand to determine the overall system demand.

Table 4-13 shows the metered demand (customer demand) of the Judy System for each year, as well as the production requirements, which is the overall water demand. For 2012, the overall metered customer demand was 6.92 MGD, whereas the actual water demand and production requirement was determined to be 7.98 MGD. Going forward from 2014, the process of calculating the water demand for a given year was based on the following steps:

1. Add up the annual demand from each customer category to determine the total metered demand for each year. Divide that number by 366 to determine the average daily customer demand.

2. Take the total annual metered demand from the customer categories and add the percentage of distribution system leakage to get the production requirements from the District WTP for each year. Divide that number by 366 to determine the average daily water demand of the District WTP.

Adding the values from steps 1 and 2 above gives the overall production requirements of the Judy System for any given year.

The average yearly peaking factor for the Judy System from 2007 through 2012 was found to be 1.73. This peaking factor is applied to steps 1 and 2 above to determine the peak day customer demand and the overall Maximum Day Demand of the Judy System.

4.3.3 System Demand with Conservation

The total Maximum Day Demand and the residential water use factor of the system are affected by the extent of the water efficiency measures that are adopted (see Chapter 5). After considering the water efficiency measures that are proposed as a part of this plan, and adjusting the residential water use factor as a result of those savings, it is projected that these measures will not significantly reduce the residential water use factor. The District plans to continue the water efficiency measures beyond 2019, but the average water use factor of 160.3 gpd calculated from 2007 through 2012 was used for the water demand forecast.

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Table 4-12 Meter Growth Forecast

	Year	Residential		Multi-Family		Commercial and Industrial		Government		Farms		Irrigation		Fire Protection		Resale		Other		Total	
		Quantity	Change (%)	Quantity	Change (%)	Quantity	Change (%)	Quantity	Change (%)	Quantity	Change (%)	Quantity	Change (%)	Quantity	Change (%)	Quantity	Change (%)	Quantity	Change (%)	Quantity	Change (%)
Actual	2007	18,792	2.6%	1,223	1.2%	1,752	1.4%	175	0.0%	124	2.5%	174	5.5%	150	20.0%	2	0.0%	10		22,402	2.6%
	2008	19,048	1.4%	1,220	-0.2%	1,764	0.7%	182	4.0%	123	-0.8%	179	2.9%	106	-29.3%	2	0.0%	10		22,634	1.0%
	2009	19,232	1.0%	1,222	0.2%	1,770	0.3%	182	0.0%	125	1.6%	183	2.2%	130	22.6%	2	0.0%	10		22,856	1.0%
	2010	19,324	0.5%	1,222	0.0%	1,763	-0.4%	187	2.7%	124	-0.8%	184	0.5%	80	-38.5%	2	0.0%	9		22,895	0.2%
	2011	19,363	0.2%	1,217	-0.4%	1,760	-0.2%	186	-0.5%	126	1.6%	181	-1.6%	93	16.3%	2	0.0%	10		22,938	0.2%
	2012	19,469	0.5%	1,209	-0.7%	1,776	0.9%	186	0.0%	124	-1.6%	182	0.6%	103	10.8%	2	0.0%	12		23,063	0.5%
Current	2013	19,566	0.5%	1,215	0.5%	1,785	0.5%	188	1.0%	124	0.3%	183	0.5%	104	0.5%	2	0.0%	12	0.0%	23,179	0.5%
Forecast	2014	19,723	0.8%	1,225	0.8%	1,799	0.8%	190	1.0%	125	0.3%	186	1.5%	105	1.5%	2	0.0%	12	0.0%	23,366	0.8%
	2015	19,881	0.8%	1,235	0.8%	1,814	0.8%	192	1.0%	125	0.3%	188	1.5%	107	1.5%	2	0.0%	12	0.0%	23,554	0.8%
	2016	20,040	0.8%	1,244	0.8%	1,828	0.8%	194	1.0%	125	0.3%	191	1.5%	108	1.5%	2	0.0%	12	0.0%	23,745	0.8%
	2017	20,200	0.8%	1,254	0.8%	1,843	0.8%	195	1.0%	126	0.3%	194	1.5%	110	1.5%	2	0.0%	12	0.0%	23,936	0.8%
	2018	20,362	0.8%	1,264	0.8%	1,857	0.8%	197	1.0%	126	0.3%	197	1.5%	112	1.5%	2	0.0%	12	0.0%	24,129	0.8%
	2019	20,525	0.8%	1,275	0.8%	1,872	0.8%	199	1.0%	126	0.3%	200	1.5%	113	1.5%	2	0.0%	12	0.0%	24,324	0.8%
	2020	20,730	1.0%	1,287	1.0%	1,891	1.0%	201	1.0%	127	0.3%	203	1.5%	115	1.5%	2	0.0%	12	0.0%	24,568	1.0%
	2021	20,937	1.0%	1,300	1.0%	1,910	1.0%	203	1.0%	127	0.3%	206	1.5%	117	1.5%	2	0.0%	12	0.0%	24,814	1.0%
	2022	21,146	1.0%	1,313	1.0%	1,929	1.0%	205	1.0%	127	0.3%	209	1.5%	118	1.5%	2	0.0%	12	0.0%	25,063	1.0%
	2023	21,358	1.0%	1,326	1.0%	1,948	1.0%	208	1.0%	127	0.3%	212	1.5%	120	1.5%	2	0.0%	12	0.0%	25,314	1.0%
	2024	21,571	1.0%	1,340	1.0%	1,968	1.0%	210	1.0%	128	0.3%	215	1.5%	122	1.5%	2	0.0%	12	0.0%	25,568	1.0%
	2025	21,787	1.0%	1,353	1.0%	1,987	1.0%	212	1.0%	128	0.3%	219	1.5%	124	1.5%	2	0.0%	12	0.0%	25,824	1.0%
	2026	22,005	1.0%	1,366	1.0%	2,007	1.0%	214	1.0%	128	0.3%	222	1.5%	126	1.5%	2	0.0%	12	0.0%	26,083	1.0%
	2027	22,225	1.0%	1,380	1.0%	2,027	1.0%	216	1.0%	129	0.3%	225	1.5%	128	1.5%	2	0.0%	12	0.0%	26,344	1.0%
	2028	22,447	1.0%	1,394	1.0%	2,048	1.0%	218	1.0%	129	0.3%	229	1.5%	129	1.5%	2	0.0%	12	0.0%	26,608	1.0%
	2029	22,672	1.0%	1,408	1.0%	2,068	1.0%	220	1.0%	129	0.3%	232	1.5%	131	1.5%	2	0.0%	12	0.0%	26,875	1.0%
	2030	22,899	1.0%	1,422	1.0%	2,089	1.0%	222	1.0%	130	0.3%	236	1.5%	133	1.5%	2	0.0%	12	0.0%	27,144	1.0%
	2031	23,128	1.0%	1,436	1.0%	2,110	1.0%	225	1.0%	130	0.3%	239	1.5%	135	1.5%	2	0.0%	12	0.0%	27,417	1.0%
	2032	23,359	1.0%	1,451	1.0%	2,131	1.0%	227	1.0%	130	0.3%	243	1.5%	137	1.5%	2	0.0%	12	0.0%	27,692	1.0%
	2033	23,592	1.0%	1,465	1.0%	2,152	1.0%	229	1.0%	131	0.3%	246	1.5%	139	1.5%	2	0.0%	12	0.0%	27,969	1.0%

Table 4-13 Water Demand Growth Forecast with Conservation

	Year	Residential			Multi-Family			Commercial and Industrial			Government			Farms			Irrigation			Fire Protection			Resale			Other			Total			Metered Demand		Production Requirements	
		Meter Quantity	Annual Usage (MG)	GPD/M (ERU value)	Meter Quantity	Annual Usage (MG)	ERU Quantity	Meter Quantity	Annual Usage (MG)	ERU Quantity	Meter Quantity	Annual Usage (MG)	ERU Quantity	Meter Quantity	Annual Usage (MG)	ERU Quantity	Meter Quantity	Annual Usage (MG)	ERU Quantity	Meter Quantity	Annual Usage (MG)	ERU Quantity	Meter Quantity	Annual Usage (MG)	ERU Quantity	Meter Quantity	Annual Usage (MG)	ERU Quantity	Meter Quantity	Annual Usage (MG)	ERU Quantity	Average Day Demand (ADD)	Maximum Day Demand (MDD)	Average Day Demand (ADD)	Maximum Day Demand (MDD)
Actual	2007	18,792	1152.01	167	1,223	415.30	6,774	1,752	702.03	11,452	175	72.56	1,184	124	119.37	1,947	174	141.84	2,314	150	0.78	13	2	38.50	628	10	8.38	137	22,402	2,650.77	43,240	7.24	15.19	8.05	16.88
	2008	19,048	1112.84	160	1,220	408.38	6,990	1,764	733.55	12,556	182	68.65	1,175	123	127.85	2,188	179	107.10	1,833	106	97.59	1,670	2	32.00	548	10	6.99	120	22,634	2,694.95	46,128	7.36	11.88	8.01	12.93
	2009	19,232	1211.59	172	1,222	421.17	6,685	1,770	736.79	11,695	182	74.36	1,180	125	125.58	1,993	183	118.12	1,875	130	0.41	7	2	40.76	647	10	7.68	122	22,856	2,736.47	43,437	7.48	13.31	7.95	14.16
	2010	19,324	1135.45	161	1,222	403.20	6,862	1,763	746.47	12,704	187	74.98	1,276	124	119.78	2,039	184	81.16	1,381	80	0.49	8	2	35.76	609	9	5.70	97	22,895	2,602.98	44,300	7.11	12.01	7.92	13.37
	2011	19,363	1062.23	150	1,217	388.35	7,079	1,760	731.97	13,343	186	60.07	1,095	126	118.18	2,154	181	74.45	1,357	93	0.47	9	2	33.43	609	10	82.42	1,502	22,938	2,551.55	46,511	6.97	11.52	7.74	12.79
	2012	19,469	1084.05	152	1,209	387.49	6,959	1,776	759.55	13,641	186	65.45	1,175	124	115.46	2,074	182	81.24	1,459	103	0.28	5	2	32.79	589	12	7.90	142	23,063	2,534.21	45,513	6.92	11.00	7.98	12.68
		2007-2012 Average:		160.302																															
Current	2013	19,566	1147.58	160.3	1,215	402.73	6,864	1,785	743.69	12,676	188	71.18	1,213	124	121.01	2,063	183	101.99	1,738	104	0.46	8	2	35.54	606	12	7.43	127	23,179	2,631.61	44,861	7.19	12.44	8.08	13.98
Forecast	2014	19,723	1156.76	160.3	1,225	405.95	6,919	1,799	749.64	12,777	190	71.90	1,225	125	121.32	2,068	186	103.52	1,765	105	0.46	8	2	35.54	606	12	7.43	127	23,366	2,652.51	45,217	7.25	12.54	8.05	13.93
	2015	19,881	1166.01	160.3	1,235	409.19	6,974	1,814	755.64	12,879	192	72.62	1,238	125	121.62	2,073	188	105.08	1,791	107	0.47	8	2	35.54	606	12	7.43	127	23,554	2,673.59	45,576	7.30	12.64	8.03	13.89
	2016	20,040	1175.34	160.3	1,244	412.47	7,030	1,828	761.68	12,982	194	73.34	1,250	125	121.92	2,078	191	106.65	1,818	108	0.48	8	2	35.54	606	12	7.43	127	23,745	2,694.85	45,939	7.36	12.74	8.09	14.00
	2017	20,200	1184.74	160.3	1,254	415.77	7,086	1,843	767.78	13,086	195	74.07	1,263	126	122.23	2,083	194	108.25	1,845	110	0.49	8	2	35.54	606	12	7.43	127	23,936	2,716.29	46,304	7.42	12.84	8.16	14.11
	2018	20,362	1194.22	160.3	1,264	419.09	7,143	1,857	773.92	13,191	197	74.82	1,275	126	122.54	2,089	197	109.88	1,873	112	0.49	8	2	35.54	606	12	7.43	127	24,129	2,737.92	46,673	7.48	12.94	8.22	14.22
	2019	20,525	1203.77	160.3	1,275	422.45	7,200	1,872	780.11	13,296	199	75.56	1,288	126	122.84	2,094	200	111.53	1,901	113	0.50	9	2	35.54	606	12	7.43	127	24,324	2,759.72	47,045	7.54	13.04	8.29	14.33
	2020	20,730	1215.81	160.3	1,287	426.67	7,272	1,891	787.91	13,429	201	76.32	1,301	127	123.15	2,099	203	113.20	1,929	115	0.51	9	2	35.54	606	12	7.43	127	24,568	2,786.53	47,502	7.61	13.17	8.37	14.47
	2021	20,937	1227.97	160.3	1,300	430.94	7,345	1,910	795.79	13,564	203	77.08	1,314	127	123.46	2,104	206	114.90	1,958	117	0.52	9	2	35.54	606	12	7.43	127	24,814	2,813.61	47,963	7.69	13.30	8.45	14.61
	2022	21,146	1240.25	160.3	1,313	435.25	7,419	1,929	803.75	13,699	205	77.85	1,327	127	123.77	2,109	209	116.62	1,988	118	0.52	9	2	35.54	606	12	7.43	127	25,063	2,840.97	48,430	7.76	13.43	8.53	14.76
	2023	21,358	1252.65	160.3	1,326	439.60	7,493	1,948	811.79	13,836	208	78.63	1,340	127	124.07	2,115	212	118.37	2,018	120	0.53	9	2	35.54	606	12	7.43	127	25,314	2,868.61	48,901	7.84	13.56	8.61	14.90
	2024	21,571	1265.18	160.3	1,340	444.00	7,568	1,968	819.90	13,975	210	79.42	1,354	128	124.38	2,120	215	120.14	2,048	122	0.54	9	2	35.54	606	12	7.43	127	25,568	2,896.53	49,377	7.91	13.69	8.70	15.05
	2025	21,787	1277.83	160.3	1,353	448.44	7,643	1,987	828.10	14,114	212	80.21	1,367	128	124.70	2,125	219	121.95	2,079	124	0.55	9	2	35.54	606	12	7.43	127	25,824	2,924.73	49,858	7.99	13.82	8.78	15.19
	2026	22,005	1290.61	160.3	1,366	452.92	7,720	2,007	836.38	14,256	214	81.01	1,381	128	125.01	2,131	222	123.78	2,110	126	0.55	9	2	35.54	606	12	7.43	127	26,083	2,953.23	50,343	8.07	13.96	8.87	15.34
	2027	22,225	1303.51	160.3	1,380	457.45	7,797	2,027	844.75	14,398	216	81.82	1,395	129	125.32	2,136	225	125.63	2,141	128	0.56	10	2	35.54	606	12	7.43	127	26,344	2,982.01	50,834	8.15	14.10	8.95	15.49
	2028	22,447	1316.55	160.3	1,394	462.02	7,875	2,048	853.19	14,542	218	82.64	1,409	129	125.63	2,141	229	127.52	2,173	129	0.57	10	2	35.54	606	12	7.43	127	26,608	3,011.10	51,330	8.23	14.23	9.04	15.64
	2029	22,672	1329.71	160.3	1,408	466.64	7,954	2,068	861.73	14,688	220	83.47	1,423	129	125.95	2,147	232	129.43	2,206	131	0.58	10	2	35.54	606	12	7.43	127	26,875	3,040.48	51,831	8.31	14.37	9.13	15.79
	2030	22,899	1343.01	160.3	1,422	471.31	8,033	2,089	870.34	14,834	222	84.30	1,437	130	126.26	2,152	236	131.37	2,239	133	0.59	10	2	35.54	606	12	7.43	127	27,144	3,070.16	52,337	8.39	14.51	9.22	15.95
	2031	23,128	1356.44	160.3	1,436	476.02	8,114	2,110	879.05	14,983	225	85.15	1,451	130	126.58	2,157	239	133.34	2,273	135	0.60	10	2	35.54	606	12	7.43	127	27,417	3,100.14	52,848	8.47	14.65	9.31	16.10
	2032	23,359	1370.01	160.3	1,451	480.78	8,195	2,131	887.84	15,133	227	86.00	1,466	130	126.89	2,163	243	135.34	2,307	137	0.61	10	2	35.54	606	12	7.43	127	27,692	3,130.43	53,364	8.55	14.80	9.40	16.26
	2033	23,592	1383.71	160.3	1,465	485.59	8,277	2,152	896.72	15,284	229	86.86	1,480	131	127.21	2,168	246	137.37	2,341	139	0.62	10	2	35.54	606	12	7.43	127	27,969	3,161.04	53,886	8.64	14.94	9.49	16.42

4.3.4 System Demand Summary

Table 4-14 shows the water demand forecast based on the data discussed in this chapter and accounting for water use efficiency measures. Results from Tables 4-12 and 4-13 for the first year and last year during this Water Use Efficiency Plan period are as follows:

Table 4-14. Water Demand Summary

Year	Period	Demand without Conservation (MGD)	Demand with Conservation (MGD)
2014	Avg Day Demand	8.05	8.05
2019	Avg Day Demand	8.29	8.28

The efficiency measures that can be quantified do not make a significant impact on the overall Average Day Demand. However, there are a number of other measures that will be implemented that are not quantifiable that will help reduce the overall Average Day Demand; because those efficiency measures cannot be quantified, they are not included in the calculations for the water demand summary.

Figure 4-3 shows the projected Average Day Demand and Maximum Day Demand of the Judy System during the next 20-year reporting period.

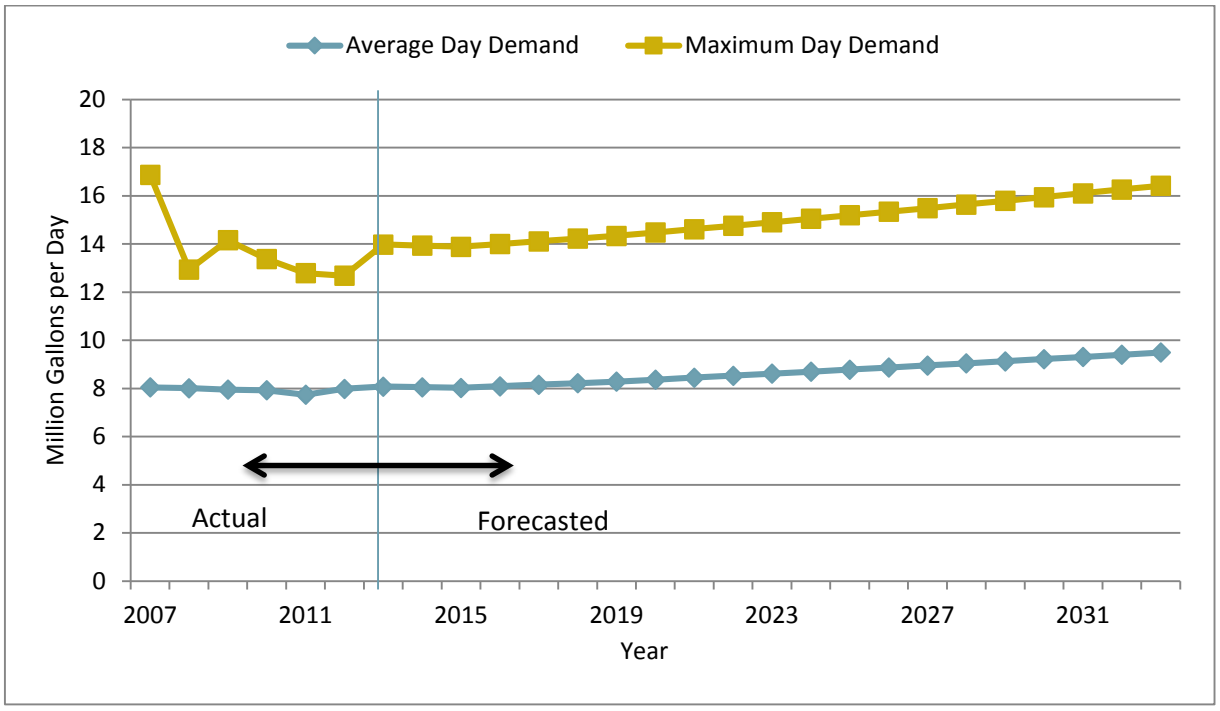

Figure 4-3. Demand Forecast Summary (With Conservation)

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