Section 7
Water Service Reliability

7.1 Introduction

The implementation of the water projects included in this UWMP, namely the Recycled Water Plan will help ensure that the DWP will be able to meet projected water demands.

As discussed earlier, almost 100% of the DWP's water supplies are groundwater, with a very small percentage being imported water to supply a distant portion of the service area.

7.2 Projected Normal Year Supply and Demand Comparison

The tables below (Tables 7-1 and 7-2) project the total supplies and total demands for the DWP under average conditions, in five year intervals through 2025. Under normal conditions, it is expected that the present groundwater supply is adequate to meet demands through 2011, when the Recycled Water project is anticipated to come online. Stage 1 of the Recycled Water Project is projected to come online in 2011, and projected to provide 500 acre-feet of supply, as groundwater recharge. Stage 2 is projected to come online in 2014, providing an additional 500 acre-feet of supply starting in 2015, for a total of 1,000 acre-feet.

In January 2005, the DWP prepared an update of the perennial yield of the groundwater basins, and determined the maximum perennial yield to be 3,400 to 3,475 acre-feet per year under normal conditions. Under normal conditions, the maximum perennial yield as well as recycled water, should meet the demand out to 2025.

Table 7-1
Projected Normal Water Year Supply – AF/Y

Supply	2010	2015	2020	2025
Groundwater	2,895	2,318	2,541	2,863
Recycled Water	0	1000	1000	1000
% of Normal	100%	100%	100%	100%

Table 7-2
Projected Normal Water Year Demand – AF/Y

	2010	2015	2020	2025
Demand	2,757	3,065	3,372	3,679
Unaccounted for water (5%)	138	153	169	184
Total	2,895	3,318	3,541	3,863
% of 2005	113%	129%	138%	150%

Table 7-3 Projected Normal Year Supply and Demand Comparison – AF/Y				
	2010	**2015**	**2020**	**2025**
Supply total	2,895	3,318	3,541	3,863
Demand total	2,895	3,318	3,541	3,863
Difference (S-D)	0	0	0	0
Diff. as % Supply	0%	0%	0%	0%
Diff. as % of Demand	0%	0%	0%	0%

7.3 Projected Single Dry Year Supply and Demand Comparison

Using 2002 to represent the single-dry year, projections of water demand were compared to projected supplies for the period 2010 to 2025 in the tables below. This information is based on continued commitment to conservation programs and the use of recycled water as groundwater recharge beginning in 2011.

The vast majority (98%) of the present water supply from the DWP consists of groundwater pumped from several hydrologic subunits within the Big Bear Valley. In the event of single and multiple dry years, the lower rainfall results in lower recharge in the subunits. Since the subunits contain more water in storage than the perennial yield, there is water available despite lower recharge. The lower recharge simply results in lower water levels in the wells. This causes decreases in the production capacity of each well; the pumps will have to pump against a larger total dynamic head due to the increased distance from the water level to the surface. When pumps operate against a larger total dynamic head than they were designed for, the total flow from the pump and the efficiency of the pump decreases from the design values. The decreased total flow from the well can be recovered by pumping for a longer time to achieve the same volume of water. In the case of a well that pumps constantly, the total volume from the well will be reduced. When considering the entire system, an overall lowering of capacity can be expected.

During the drought from 2001 to 2003, the DWP experienced a decrease in the well production capacity throughout their system. This reduction ranged from 97% of the perennial yield in 2001, 93% in 2002, 84% in 2003, to 85% in 2004. There were a few years of lower than average rainfall prior to 2001, and 2004 was a lower than average year as well. A total production rate in gallons per minute (gpm) was also measured in the Big Four portion of the service area in the first week in April each year during this drought. The reduction in total capacity of the wells ranged as low as 65% of the production at the same time of the year in 2005 (above average rainfall).

For purposes of the UWMP, 2002 was considered the single dry year based on the low rainfall that year. But, since 2002 was near the start of the drought, the largest impacts of the drought on the water levels were not seen until 2003. The 84% reduction in well production capacity from perennial yield was used to estimate the projected single dry year water supply in five year increments through 2025 (Table 7-4).

Table 7-4
Projected Single Dry Year Water Supply – AF/Y

Supply	2010	2015	2020	2025
Groundwater	2,460	2,460	2,460	2,460
Imported water	66	66	66	66
Recycled Water	0	1000	1000	1000
Totals	2,526	3,526	3,526	3,526
% of Normal	87%	106%	99%	91%

Table 7-5
Projected Single Dry Year Water Demand – AF/Y

	2010	2015	2020	2025
Demand	3,062	3,318	3,541	3,863
% of 2005	119%	129%	137%	150%

Table 7-6
Projected Single Dry Year Supply and Demand Comparison – AF/Y

	2010	2015	2020	2025
Supply total	2,526	3,526	3,526	3,526
Demand total	3,062	3,318	3,541	3,863
Difference (S-D)	-536	208	-15	-337
Diff. as % Supply	21%	6%	0.4%	9%
Diff. as % of Demand	18%	6%	0.4%	9%

Any individual year between 2005 and 2025 that receives the equivalent rainfall to the single-dry year, and sees a reduction in well production capacity that is equivalent, will likely encounter shortages in supply, which could be made up with conservation, or groundwater in storage. Once recycled water is available, anticipated for 2011, the additional supply will cover shortages in groundwater due to a single-dry year. The availability of recycled water is not affected by weather patterns since the projected quantity of water to be recycled represents less than half the quantity treated on a yearly basis.

7.4 Projected Multiple Dry Year Supply and Demand Comparison

To determine the reliability of DWP's supplies under a multi-year drought scenario, the 2001-2003 drought period was used as a hydrologic base years to obtain supply and demand forecasts in five year intervals (Table 7-7). Each five-year increment (e.g. 2006-2010) assumes the same multiple dry year period condition, and uses the 2003 figures for the remaining two years of each five year increment.

Table 7-7 shows the supply for years 2006-2010, 2011-2015, 2016-2020, and 2021-2025 based on the calculations described above under single-dry year. The reduction in well production capacity experienced throughout the multiple dry year period was applied to each five year increment.

Table 7-7
Projected Supply and Demand Comparison During Multiple Dry Year Period

Demand (AF)				Supply				
Year	Demand	Un-accounted for water	Total Demand	Groundwater	Recycled Water	Total Supply	Difference (S-D)	% of Supply
2006	2511	126	2637	2733	0	2733	97	4%
2007	2573	129	2702	2469	0	2469	-233	-9%
2008	2634	132	2766	2498	0	2498	-268	-11%
2009	2696	135	2831	2498	0	2498	-333	-13%
2010	2757	138	2895	2498	0	2498	-397	-16%
2011	2819	141	2960	2733	500	3233	273	8%
2012	2880	144	3024	2469	500	2969	-55	-2%
2013	2942	147	3089	2498	500	2998	-91	-3%
2014	3003	150	3153	2498	500	2998	-155	-5%
2015	3065	153	3218	2498	1000	3498	280	8%
2016	3126	156	3282	2733	1000	3733	451	12%
2017	3187	159	3346	2469	1000	3469	122	4%
2018	3249	162	3411	2498	1000	3498	87	2%
2019	3310	166	3476	2498	1000	3498	23	1%
2020	3372	169	3541	2498	1000	3498	-42	-1%
2021	3433	172	3605	2733	1000	3733	129	3%
2022	3495	175	3670	2469	1000	3469	-201	-6%
2023	3556	178	3734	2498	1000	3498	-236	-7%
2024	3618	181	3799	2498	1000	3498	-301	-9%
2025	3679	184	3863	2498	1000	3498	-365	-10%

Starting in 2011, Stage 1 of the Recycled Water Project is anticipated to be complete, supplying 500 acre-feet of recycled water. Starting in 2015, Stage 2 recycled water is anticipated to be available, providing additional 500 acre-feet of water supply for a total of 1,000 acre-feet.

During these multi-year dry periods, the reduction in water production capacity results in insufficient supply to meet demand. This is particularly the case in 2006 through 2010 before recycled water is anticipated to be available. Also, in the years 2021 through 2025, with the additional recycled water available, there will be shortfalls in supply. These shortfalls are relatively minor, averaging around 10% percent, and could be overcome by instituting water conservation measures, or by additional pumping from the basins, tapping the storage capacity of the aquifers and further dropping the water levels in some basins. In the event of a multi-year drought, it is likely that the Water Shortage Emergency Plan would be implemented, resulting in a reduction in water demand ranging from 5% to 45%, depending on which stage of the Plan is implemented.