Section 2
Water Supply Sources

2.1 Current Water Supply Sources

The City of Big Bear Lake Department of Water and Power (DWP) current water supplies include local ground water for the Big Bear Valley portion, and imported water from the Crestline Lake Arrowhead Water Agency (CLAWA) for Rim Forest. Groundwater accounts for 98-99% of the water supply, with imported water from CLAWA accounting for 1-2% of the water supply.

DWP's existing water supply and distribution system consists of the following:

- approximately 176 miles of water pipeline,
- 32 active vertical wells
- 23 slant wells, with supply flowing into the system by gravity
- 16 storage reservoirs, which provide storage for domestic and fire flow,
- 12 booster pump stations, which transfer water to upper pressure zones,
- 23 chlorination stations,
- 22 sample stations.

The existing water supply operates between the elevations of 5,620 feet and 7,460 feet.

Table 2-1
Current and Planned Water Supplies 2005-2025

Water Supply Sources	2005	2010	2015	2020	2025
Wholesale Provider – Crestline Lake Arrowhead Water Agency	66	66	66	66	66
Supplier Produced Groundwater	2,450	2,817	2,152	2,475	2,797
Transfers In/Out	25	0	0	0	0
Exchanges In/Out	0	0	0	0	0
Recycled Water	11	11	1,000	1,000	1,000
Total Supply	2,552	2,894	3,218	3,541	3,863

The supplier produced groundwater figure shown above (Table 2-1) is the total quantity of groundwater produced in three of the four DWP's system areas, as needed to meet demand. It is assumed that only the required amount of groundwater to meet demand will be pumped, resulting in lower amounts of groundwater produced in future years when recycled water becomes available. The quantities presented in this table represent the anticipated quantities needed from each source in the indicated year.

The DWP system consists of 5 separate service areas; Fawnskin, Rim Forest, Lake William, Erwin Lake/Sugarloaf and the City of Big Bear Lake / Moonridge systems. Of those five service areas, the Rim Forest service area is supplied by the Crestline Lake Arrowhead Water Agency. The Rim Forest service area is separate and distant from the rest of the DWP's service areas. It is assumed for purposes of this UWMP that due to the lack of available vacant lots in the Rim Forest area, that there will be no future growth in the area. Therefore the quantity of imported water from CLAWA for the Rim Forest service area will remain consistent through 2025.

For the recycled water component, it was assumed that the Recycled Water Master Plan, described in Section 5, is implemented as written, with Phase 1 completed by 2010, with the first deliveries of 500 acre-feet of recycled water to the groundwater recharge site, beginning in 2011. The second phase of the Recycled Water Plan is assumed to be completed in 2014, with an additional 500 acre-feet of recycled water delivered to the groundwater recharge site beginning in 2015, for a total of 1,000 acre-feet of recycled water.

2.1.1 Groundwater

DWP extracts groundwater from 55 wells in state-licensed water systems throughout the Big Bear Valley area. Two systems, the Big Bear Lake/Moonridge water system and the Fawnskin water system, are located in the Big Bear Lake Watershed, and have individual water supply facilities; they are not physically connected to each other. The three remaining systems are the Rim Forest water system and the Erwin Lake/Sugarloaf and Lake William water systems, located in the unincorporated area of the County of San Bernardino. The Rim Forest water system is also located physically distant from the rest of the DWP system and is not physically connected to them. The water supply for Rim Forest is provided by imported water from the Crestline Lake Arrowhead Water Agency.

Each of these water systems contains at least one ground water subunit. The following water systems are supplied primarily from the following subunits:

- Big Bear Lake/Moonridge water system
  - Mill Creek subunit
  - Village subunit
  - Rathbone subunit
  - Division subunit
- Lake William water system
  - Erwin subunit
- Fawnskin water system
  - Grout Creek subunit
  - North Shore subunit
- Erwin Lake / Sugarloaf water system
  - West Baldwin subunit
  - Erwin subunit

The so called Big 4 service area, which includes City of Big Bear Lake / Moonridge, and Sugarloaf /Erwin Lake portions of the valley consists of twelve pressure zones and accounts for nearly 90% of the total land area served by the DWP. Elevations in this service area range from 6,750 feet and 7,460 feet above mean sea level.

The Fawnskin service area consists of two pressure zones with elevations ranging from 6,740 feet and 7,080 feet above mean sea level. This service area covers about 0.7 square miles of area.

The Lake William service area consists of one pressure zone with elevations ranging from 7,100 feet to 7,300 feet above mean sea level. This service area covers an area of about 0.18 square miles.

Table 2-2 outlines the current and planned water supplies through 2025. The quantities presented in this table represent the anticipated quantities needed from each source in the indicated year.

Table 2-2 Current and Planned Water Supplies – AF/Y					
Water Supply Sources	**2005**	**2010**	**2015**	**2020**	**2025**
Supplier Produced Groundwater	2,450	2,817	2,152	2,475	2,797
Transfers In / Out	25	0	0	0	0
Exchanges In / Out					
Recycled Water (Current and Projected)	11	11	1000	1000	1000

2.1.1.1 Historic Pumping

Historic total groundwater pumped by DWP from 2000 through 2005 is presented in Table 2-3 below. Average yearly production for the period was 2,738 acre-feet per year. However, as a result of a stringent tiered rate structure and efficient water use campaign current (2005) water use is significantly less than average. Throughout this period, groundwater accounted for 98-99% of the total DWP supply.

Table 2-3 Amount of Groundwater Pumped – AF/year						
Subunit (Basin) Name	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
Village	297.8	285.1	354.1	252.8	273.6	268.6
Rathbone	1,319.7	1,156.7	1011.9	944.8	840.2	967.6
Division	386.0	496.7	403.0	331.1	357.0	342.2
Erwin	515.9	529.7	615.1	614.6	716	542.8
North Shore	310.3	380.6	361.1	315.5	310.6	220.9
Grout Creek	127.0	126.0	124.8	116.9	104.1	108.49
Gray's Landing	0	0	0	0	0	0
Mill Creek	0	0	0	0	0	0
Totals	2,956.7	2,974.8	2,870	2,575.7	2,601.5	2,450.6
% of total water supply*	98%	98%	98%	98%	98%	98%

* remaining 2% is imported water to Rim Forest

None of the groundwater basins in the DWP service area are adjudicated. At present, the Village subunit is in overdraft. Pumping in the Village subunit will be decreased in future years in hopes of allowing the subunit to recover.

The amount of groundwater projected to be pumped is presented below in Table 2-4. Starting in 2015, when the Recycled Water Plan is expected to be fully implemented and delivering 1000 acre-feet per year, groundwater will represent about 70% of the DWP supply.

Table 2-4 Amount of Groundwater projected to be pumped – AF/Y				
Subunit (Basin) Name	**2010**	**2015**	**2020**	**2025**
Village	269	145	172	200
Rathbone	1,095	840	935	1031
Division	396	303	338	373
Erwin	644	494	551	607
North Shore	340	261	291	320
Grout Creek	122	125	128	130
Gray's Landing	0	0	0	0
Mill Creek	50	100	100	100
Totals	2,916	2,268	2,515	2,761
% of total water supply	98%	69%	72%	74%

2.1.2 Recycled Water

Currently, the DWP does not use recycled water within its service area. The Big Bear Area Regional Wastewater Agency (BBARWA) does supply some recycled water to 139 customers, but this water is not provided to the customers by the DWP, but rather directly from BBARWA's treatment plant. Wastewater is presently treated at the BBARWA treatment plant, and then conveyed to a 480 acre site in the Lucerne Valley where it is used to irrigate alfalfa fields.

As discussed in Section 5, Recycled Water Master Plan, BBARWA, consulting with DWP, has prepared a Recycled Water Master Plan. This Plan outlines proposed uses for recycled water within the Big Bear Valley, including groundwater recharge, and landscape irrigation. It is anticipated that this Plan will be implemented such that the first deliveries of recycled water will occur in 2011. Recycled water use is discussed in further detail in Section 5 of this UWMP.

2.1.3 Water Transfers

2.1.3.1 Water Code section 10631

Describe the opportunities for exchanges or transfers of water on a short term (less than one year) or long-term basis.

The Big Bear Valley is located in the San Bernardino Mountains in the Transverse Ranges of Southern California. Land surface elevations in the area range from approximately 6,000 to 9,900 feet above mean sea level, with Big Bear Lake itself at 6,740 feet amsl. The immediate areas outside the valley are generally at the base of the mountain ranges, at elevations between 1,000 – 2,500 feet amsl. Given the large change in elevation between the Big Bear Valley and the surrounding areas, transfers or exchanges via import from outside the mountain areas would be extremely costly and technically difficult. However, there is an opportunity for the transfer or exchange of water, as discussed below (Table 2-5).

Table 2-5 Transfer and Exchange Opportunities – AF/Y (Table 2-5)					
Source Transfer Agency	**Transfer or Exchange**	**Short Term**	**Proposed Quantities**	**Long Term**	**Proposed Quantities**
Big Bear City Community Services District	Both	Yes	Unknown	Yes	Unknown

2.1.3.2 Big Bear City Community Services District (CSD)

The Big Bear City CSD is the water supplier for a portion of the Big Bear Valley, providing water to the unincorporated portions of Big Bear City and the eastern portion of the valley. Through two emergency supply interconnections between the CSD and DWP systems, the most recent installed in 1996, transfers are possible between the two purveyors. These interconnections are for emergencies such as natural or man-made disasters that would disrupt or damage the DWP's or the CSD's ability to continue to serve the public. In addition, transfers and exchanges generally occur as a water saving measure. When either agency needs to do system repair and maintenance, they will transfer the excess water rather than discharge it to the environment. The interconnections are intended to be used until either agency declares its use no longer necessary.

There are no set agreements between the CSD and DWP for limits on the quantity of water that could be transferred. Each transfer is evaluated on a case by case basis, but in no way would be allowed to affect the transferring agencies ability to supply their own customers needs.

2.1.3.3 Crestline Lake Arrowhead Water Agency (CLAWA)

The Crestline Lake Arrowhead Water Agency is the water supplier for the Crestline, Lake Arrowhead, and Rim Forest portion of the San Bernardino Mountains. Lake Arrowhead is located in the San Bernardino Mountains, west of Big Bear Lake and at an elevation of approximately 5100 feet amsl. CLAWA is presently the wholesale provider to the Rim Forest portion of the DWP service area, providing approximately 66 acre feet of water per year.

CLAWA does have some excess capacity that could be transferred to the DWP, but there is presently no mechanism to transfer the water. The closest CLAWA transmission line to the DWP is approximately 12 miles away, following the state highway linking the two areas. Transfers or exchanges with CLAWA would be cost prohibitive at this time, and at any time in the foreseeable future.

2.1.3.4 State Water Project – Morongo Pipeline

The Morongo Pipeline, carrying state water, is located approximately 25 miles from the Big Bear Valley. A pipeline could be constructed, at considerable cost, to the Morongo Pipeline from the DWP to provide an extra source of water, or opportunities for transfers and exchanges. While it is possible, it is unlikely that water could be obtained from this source, due to the large elevation difference, approximately 5,000 feet, the large distance from the existing pipeline, approximately 25 miles, and a variety of governmental obstacles.

2.1.3.5 Big Bear Lake Municipal Water District

The main feature of the Big Bear Valley is Big Bear Lake itself. This lake was created in 1884 by damming Bear Creek with Bear Valley Dam. The lake bottom, Bear Valley Dam and the right to manage the lake surface is owned by Big Bear Municipal Water District. The water rights to the lake water itself are owned by Bear Valley Mutual Water Company. At this time, there is no agreement that would allow diverting lake water for DWP use. It is unlikely that such an agreement would be possible at this point in time.

2.2 Planned Water Supply Sources

DWP is currently in the process of preparing a Water Master Plan. The purpose of the Water Master Plan is to develop a long-range water supply plan and capital improvement plan that reliably meets the needs of DWP's service area from now until 2035. Data derived from the Water Master Plan to analyze DWP's future demand and supply is discussed further in Section 7.

Table 2-6 summarizes the hydrologic years used to assess the supply reliability for the 2005 UWMP. The Big Bear Valley contains a large rain shadow, which drastically affects the quantity of rainfall received throughout the Valley. Rainfall totals at the Big Bear Dam, located at the west end of the Valley, can be 4-5 times higher than the totals at Baldwin Lake, located at the east end of the Valley. The hydrologic years used in the table were selected based on local weather, hydrology, and the availability of supply information from the DWP. Rainfall data was available back to the year 1884 for the Big Bear Dam weather station, but only back to the year 1950 for the CSD weather station.

Table 2-6
Basis of Water Year Data

Water Year Type	Base Year(s)	Historic Sequence
Normal Water Year	1982	1884-2004
Single-Dry Water Year	2002	1884-2004
Multiple-Dry Water Years	2001-2003	1884-2004

The current and planned water supplies out to the year 2025 are in Table 2-7. This table assumes that the Recycled Water Master Plan is implemented and Stage 1 is completed by 2010, and Stage 2 is completed by 2014. Per the Recycled Water Master Plan, Stage 1 is projected to provide 500 AF per year of recycled water, while Stage 2 is projected to provide an additional 500 AF per year for a total of 1,000 AF per year starting in 2015. See Section 5 for more information on the Recycled Water Master Plan.

Table 2-7
Current and Projected Water Supplies (AF/Y)

Water Supply Sources	2005	2010	2015	2020	2025
Wholesale Provider – Crestline Lake Arrowhead Water Agency	66	66	66	66	66
Supplier Produced Groundwater	2,450	2,817	2,152	2,475	2,797
Transfers In/Out	25	0	0	0	0
Exchanges In/Out	0	0	0	0	0
Recycled Water	11	11	1,000	1,000	1,000
Total Supply	2,552	2,894	3,218	3,541	3,863

2.3 Future Water Supply Sources

Future water supply sources include recycled water, exchanges and transfers. As discussed in Sections 2.3.2 and 2.3.3, transfers and exchanges are not viable water supply sources for the DWP. Recycled water, as discussed in Section 2.3.1, and Section 6, is the most viable future source of water for the DWP. It is anticipated that the recycled water program will begin deliveries of recycled water in 2011. Table 2-8 summarizes the timing of new projected recycled water supplies, as well as the reliability of this supply under different water year types. The availability of recycled water is not anticipated to be affected by drought, because the average annual amount of recycled water represents less than half the average annual amount of wastewater treated at the plant.

Table 2-8
Future Water Supply Projects

Project Name	Project Start	Normal Year – AF to agency	Single Dry Year – AF to agency	Multiple Dry Years – AF to agency		
				Year 1	Year 2	Year 3
Recycled Water Master Plan **Stage 1**	2011	500	500	500	500	500
Recycled Water Master Plan **Stage 2**	2015	500	500	500	500	500
Total		1000	1000	1000	1000	1000

2.3.1 Future Recycled Water

The DWP continues to explore opportunities to economically and feasibly utilize recycled water. As a result of the BBARWA's Recycled Water Master Plan, to which the DWP provided advisory and review capacity, BBARWA and the DWP estimate that in the future it will be able to potentially recycle 2,100 AFY of water for use within its service area. This amount could replace future potable water demands if implemented. Future recycled water supplies are discussed in more detail in Section 6.

2.3.2 Future Water Exchanges and Transfers

As discussed above, the DWP has the ability to transfer water between the CSD and the DWP on an as required basis. Exchanges in the past have only occurred as an effort to save water when one agency, needing to do repairs and maintenance, transfers the excess water to the other agency rather than discharge to the ground. These exchanges do not occur regularly or with any predictable frequency, therefore, exchanges are not taken into consideration when examining future water supplies. The quantity of future exchanges is also impossible to quantify.

2.3.3 Desalination

The Big Bear Lake area, and the service area of the Big Bear Lake Department of Water and Power, is located approximately 70 miles from the Pacific Ocean. Therefore, the development of desalinated water as a source of the supply for the Big Bear Lake DWP is not viable. Desalination of brackish groundwater is not necessary, given the water quality of the basins used by the DWP.

2.4 Demand Management Measures

2.4.1 Introduction

Increasing urban water conservation can provide additional water supply by permanently reducing demands. Effective water conservation practices are necessary to be able to provide adequate supplies to meet growing demands in the DWP service area. Through its own initiative, and its membership in the California Urban Water Conservation Council (CUWCC), the DWP is increasing water use efficiency within its service area.

The DWP is a recent signatory to the Memorandum of Understanding Regarding Urban Water Conservation in California (MOU) developed by the members of the CUWCC. As a signatory to the MOU, DWP is obligated to implement a set of 14 water conservation Best Management Practices (BMPs), also commonly referred to as Demand Management Measures (DMMs). The MOU established the CUWCC in 1991 to monitor and maintain the BMPs. Biennially member agencies are required to submit a report to CUWCC detailing progress towards the implementation of the 14 BMPs. Participation and compliance with the BMPs is monitored by CUWCC which offers guidelines on the implementation and assessment of the BMPs.

2.4.2 BMP Implementation

The MOU commits DWP and other signatories to develop comprehensive, economically feasible conservation programs and to consider water conservation as a viable water management option through the implementation of BMPs. BMPs are defined in the MOU as:

- An established and generally accepted practice among water suppliers that result in more efficient use or conservation of water.

- A practice for which sufficient data are available from existing water conservation projects to indicate that significant conservation or conservation related benefits can be achieved; that the practice is technically and economically reasonable and not environmentally or socially unacceptable; and that the practice is not otherwise unreasonable for most water suppliers to carry out.

The DWP is obligated to implement all of the BMPs, except BMP 10, which pertains to wholesale agencies only (Table 2-9).

Table 2-9
BMP Implementation

BMP (DMM) #	Practices	Status
1	Water survey programs for single-family residential and multi-family residential customers	Implemented
2	Residential plumbing retrofit	Implemented
3	System water audits, leak detection and repair	Implemented
4	Metering with commodity rates for all new connections, and retrofit of existing connections	Implemented
5	Large landscape conservation programs and incentives	Implemented
6	High efficiency washing machine rebate program	Not Implemented
7	Public Information Programs	Implemented
8	School Education Programs	Implemented
9	Commercial/Industrial/Institutional water conservation	Implemented
10	Wholesale agency assistance program	Not Applicable
11	Conservation Pricing	Implemented
12	Water conservation coordinator	Implemented
13	Water waste prohibition	Implemented
14	Residential ULFT replacement program	Implemented

As part of the Urban Water Management Plan, Big Bear Lake DWP is required to provide a description of their BMPs that are currently being implemented or are scheduled to be implemented.

The Big Bear Valley has experienced a six year drought, with substantially less than normal rainfall during that period. In December 2002, the Board of Commissioners declared a water shortage emergency. In order to maximize the use of existing water supplies and prevent wasteful or inefficient consumption of water within the Valley, the DWP recently implemented several additional ordinances and measures that address these issues.

2.4.3 BMP 1: Water Survey Programs for Single-Family and Multi-Family Residential Customers

The DWP is currently conducting targeted and untargeted residential surveys at no cost to the customer. The DWP contacts and conducts targeted water surveys on the top residential users in the system, with a goal of contacting the top 20% of users. Untargeted surveys include customer requests, and those generated as a result of the Retrofit on Change or Service program. These system surveys are a cost effective means of getting customers to participate in the DWP's community water-use efficiency campaign.

As part of these surveys, the DWP checks the landscaping, irrigation systems, and indoor plumbing fixtures to make recommendations for improving the customer's water-use efficiency. If field personnel notice leaks or unusually high water consumption, they will leave a door tag alerting the customer to check for leaks. In addition, field personnel will also look for landscape ordinance and water shortage ordinance violations, and issue a door tag if a violation is observed.

Determining the actual water savings from water surveys is difficult. While there are obvious savings from eliminating leaks, and improving water-use efficiciency, these amounts are difficult to separate from savings from other measures. In addition, the DWP has not kept records of the recommendations and improvements made during these surveys. The actual expenditures to conduct the residential surveys are estimated based on the number of surveys and the time required to perform each survey. CUWCC's methodology for calculating water savings resulting from indoor water surveys assumes savings from showerhead retrofits, ULFT retrofits, and leak repairs. It is not reasonable to assume each survey will result in all or any of these changes. It should be noted that this methodology introduces double counting of toilet and showerhead retrofits because these fixtures are offered as part of separate BMPs (BMPs 2 and 14).

The goal of the DWP residential survey program is to perform a minimum of 200 surveys a year, focusing on the top residential water users. The CUWCC guideline for implementation of BMP 1 is 15% of the single-family and 15% of the multi-family units to receive water use surveys within 10 years of implementation. Based on these guidelines, the DWP would need to conduct approximately 200 single-family and approximately 20 multi-family surveys per year for the next 10 years.

Based on an estimated cost of $50 per residential survey, and an estimated 21 gpd per household water savings (DWP estimates), the estimated cost per acre-foot of the first year's water savings is $2,200 (Tables 2-10 and 2-11).

Table 2-10
Past Residential Water Use Surveys

	2001	2002	2003	2004	2005
# of single family surveys (a)	0	25*	40*	75*	315
# of multifamily surveys	NA	NA	NA	NA	NA
Actual Expenditures - $	0	$1,250	$2,000	$3,750	$15,750
Actual Water Savings – AF/Y (b)	0	0.59	0.94	1.76	7.4

Table 2-11
Projected Residential Water Use Surveys

	2006	2007	2008	2009	2010
# of single family surveys (a)	295	265	220	180	180
# of multifamily surveys	20	20	20	20	20
Anticipated Expenditures - $	$15,750	$14,500	$12,500	$11,000	$11,000
Anticipated Water Savings – AF/Y (b)	7.4	6.7	5.6	4.7	4.7

* estimated # of surveys performed based on actual costs.

(a) Approximately 105 residential surveys were completed form 8/05 through 12/05, when the DWP began tracking surveys. Based on this information, an annualized estimate for 2005 would be 315. Since the survey are currently being driven by the turnover in the real estate market combined with the DWP's Retrofit on Change in Service Program, we would expect this annual rate of surveys to continue through 2006, with annual declines thereafter.

(b) Water savings shown are for the first year only, and not carried through to following years. The actual water savings will be greater as the savings accumulate over the years.

2.4.4 BMP 2: Residential Plumbing Retrofit

2.4.4.1 Retrofits Performed

The exact number of homes constructed prior to 1992 is not known. For the purposes of this BMP, the number of homes built prior to 1992 will be estimated by using the number of accounts in 1991. In 1991, it is estimated that there were 13,000 single family residential units, and 420 multi-family residential units in the DWP service area. Homes and businesses built after 1992 are assumed to have low flow plumbing fixtures installed already. To obtain 75% saturation of single family residences retrofitted, which is the saturation requirement of the BMP, 9,750 homes will need retrofitting. For multi-family residences, 315 will need retrofitting, to reach the 75% saturation requirement. The goal of the DWP is to reach 75% saturation of single and multi family residences, a total of approximately 10,000 retrofits, by 2015. Assuming 2 bathrooms per residence, 20,000 showerheads and conservation kits will need to be distributed.

To date, the DWP has distributed approximately 13,800 showerheads and water conservation kits, reaching a saturation point of approximately 69% of the total single and multi-family residences (Table 2-12 and 2-13). This was determined by comparing the number of low flow devices distributed to single and multi-family residences by the DWP to the number of accounts prior to 1992. In the past, records on single and multi-family distributions were not kept, just the total cost of the devices.

Water savings based on the retrofit of low flow showerheads, faucet aerators, and toilet displacement devices was estimated by the CUWCC to be 5.5 gallons per day (gpd), 1.5 gpd, and 4 gpd respectively. All three devices are generally distributed concurrently, so for the purposes of this BMP, the total estimated water savings is based on the cumulative savings of all three devices, or 11 gallons per day. A probability of installation of 50 percent, per the CUWCC, was used as well as an average lifespan of 2 years.

Table 2-12
Actual Low Flow Device Distribution

	1992-	2002	2003	2004	2005 *
# of Residential devices	3,475	4,400	4,400	1,270	340
Actual expenditures - $	$8,140	$10,327	$10,307	$2,971	$796
Estimated water savings – AF/Y **	42.8	54.2	54.2	15.6	4.2

* 2005 data through June 2005
** Estimated water savings through lifetime of devices

Table 2-13
Projected Low Flow Device Distribution

	2006	2007	2008	2009	2010
# of single family devices	1,050	1,050	1,050	1,150	1,150
# of multi-family devices	200	200	200	100	100
Planned expenditures - $	$2,950	$2,950	$2,950	$2,950	$2,950
Planned water savings – AF/Y **	15.4	15.4	15.4	15.4	15.4

** Estimated water savings through lifetime of devices

From the calculated water savings estimate, and the cost per device distributed and retrofitted, the average cost per acre-foot of water savings is $190. This cost is roughly in line with the cost per acre-foot for toilet retrofits ($106 retrofits, $335 direct install) and significantly less expensive than other BMPs, such as water survey programs ($2,200) and High efficiency washing machines ($1,185).

2.4.4.2 Retrofit Ordinances

There are several enforceable ordinances in effect requiring replacement of high-flow showerheads, faucets, and toilets with their low flow counterparts. The first is a "Retrofit upon Change in Service" resolution requiring all properties to retrofit to low flow fixtures and toilets upon change of service. In addition, the DWP has in place a Water Offset Demand ordinance, which requires new developments to offset their incremental estimated water demand as a result of the development. All developers

are required to pay a water demand offset charge with which the DWP will designate for retrofit projects that create water capacity.

"Retrofit Upon Change in Service"
The DWP instituted a Retrofit upon Change in Service ordinance, Resolution No. DWP 2005-03, in February 2005. The ordinance requires all existing structures to upgrade to low flow fixtures upon change in service.

The Resolution states, *"All existing structures, upon requests for change in service, shall be retrofitted with low flow faucets, showerheads, and toilets, as a prerequisite for continued service. All three items must have flow rates or gallons per flush that are 2.0 gallons per minute/flush or less. The property owner shall file with the DWP a written certification, signed under penalty of perjury, confirming that all faucets, showerheads, and toilets have been retrofitted as set forth herein."*

Based on this ordinance, all property owners, whether residential or commercial, are required to retrofit the property with low flow fixtures as a condition of continued service.

"Water Demand Offset Program"
In February, 2005, a Water Demand Offset Program was passed, approved and adopted by the Board of Commissioners of the DWP, and the City Council of the City of Big Bear Lake. This program, now part of the Big Bear Lake Municipal Code, Chapter 13.26, requires developers to offset the water demand of their future developments with water savings or conservation elsewhere in the DWP system. This could be accomplished via retrofits, or the payment of an offset capacity charge. These monies are used by the DWP to offset the demand elsewhere in the system. Since the implementation of this program, the DWP has used the proceeds to fund showerhead, faucet aerator, and Ultra Low Flow Toilet retrofits.

In addition to the above ordinances, the DWP has distributed low flow showerheads and faucet aerators to all customers upon request. A water conservation kit, which included a showerhead, faucet aerator, toilet water displacement kit, and water conservation literature and brochures, are also distributed to customers upon request. The availability of the showerheads, aerators, and water conservation kits were advertised through inserts in the water bills, and newspaper and radio advertisements. In addition, the Water Conservation Coordinator and the Water Conservation Specialists distribute low flow devices in the performance of their daily duties. Since 2002, the DWP has tracked the monthly distribution and cost of the low flow devices via monthly statements of the Water Conservation Department budget.

2.4.5 BMP 3: System Water Audits, Leak Detection, and Repair

To determine the extent of and potential for system leaks, the DWP conducts regular metered water production versus metered water sales mass balance audits to detect unusual changes in the water operation. The goal is to minimize water losses and increase overall system efficiencies.

The DWP performed a full system audit in 2001, when 167 miles of the distribution system was surveyed. They have been active in locating and repairing leaks (Table 2-14), and respond immediately to repair leaks that occur. Field personnel are trained to recognize potential service and main line leaks. Pipelines with chronic leak problems are replaced.

Table 2-14
Leak Detection and Repair 2001-2005

	2001	2002	2003	2004	2005
% of unaccounted water	11.41%	7.60%	7.72%	6.25%	4.8%
Miles of distributions lines	167	0	0	0	0
# of Main leaks repaired	82	66	47	42	40
Pipeline replaced *	52,147 feet = 9.88 miles				
Actual Expenditures - $	$103,565	$70,262	$55,165	$50,547	$52,918

* Total feet of pipeline replaced 2000-2005. Yearly data not available

When the DWP purchased the system from Southern California Water Company in 1989, the percent of unaccounted for water was at 29.6%. At that time, the DWP applied for and obtained a low-interest loan from the State of California, and began a significant leak detection and repair program. Between 1990 and 2000, the DWP replaced over 108,000 feet (20.5 miles) of the leakiest pipes in the system, reducing the unaccounted for water from 29.6% to 11.05%. Additional improvements have further reduced the unaccounted for water to 4.8% in 2004, a rate that is expected to continue into the future. Since 1990, over 30.3 miles of pipelines have been replaced in the DWP system.

Sufficient revenue is and will continue to be allocated for conducting system water audits, leak detection, and repairs.

2.4.6 BMP 4: Metering with Commodity Rates for All New Connections and Retrofit of Existing Connections

As of November, 2005, the DWP has a total of 15,316 accounts. These are further broken down into 13,435 single family residential units, 1,317 multi-family residential units, 525 commercial accounts, and 39 institutional and government accounts. All accounts are metered and are billed based on the volume of water used, per hundred cubic feet (Table 2-15). Meter replacement was not projected since all accounts are presently metered.

Table 2-15
Unmetered Accounts

	2001	2002	2003	2004	2005
# of unmetered accounts	2	2	1	0	0
# of retrofit meters installed	0	1	1	0	0
# of accounts without commodity rates	0	0	0	0	0

The DWP is committed to requiring all accounts within their service area to have meters. Beginning in 1989, the DWP required a water meter on all new services and all existing nonmetered services upon a change of ownership and all consumers who used large quantities of water. The last nonmetered account was changed to a metered account in 2003. Presently, all water services are metered and are billed based on the volume of water used.

The DWP has considered implementing a program to provide incentives to switch mixed-use accounts to dedicated landscape meters, but determined that such a program would not be cost effective. An actual feasibility study was not performed, but the Water Conservation Coordinator did some investigation and calculations to determine that there is not enough irrigation demand outside the government customers to justify the program. The customers with the greatest landscape water use are schools, the City of Big Bear Lake, and parks. These government agencies are on fixed fee accounts. Adding dedicated irrigation meters to these customers would not provide water use reduction, or cost savings. The DWP has found it more cost effective and more water efficient, to actively pursue the total reduction in the quantity of irrigated landscapes. This is done via the Landscape ordinance, and the turf buy-back program.

To estimate the actual water savings from the implementation of the BMP is difficult. The DWP was originally owned by the Southern California Water Company (SCWC), a private organization. When the City of Big Bear Lake purchased the assets of the SCWC, they immediately began installing meters on unmetered accounts. In addition to this program, the DWP implemented many other water conservation programs at the same time.

2.4.7 BMP 5: Large Landscape Conservation Programs and Incentives.

The DWP does not have a formal large landscape water conservation program. Landscape surveys are performed by the Water Conservation Coordinator on request. During these surveys, the Coordinator examines the sprinkler system and landscaping, and makes recommendations for improvement. Since these surveys have been informal, records have not been kept as to the number of surveys and the costs for the surveys historically. Beginning in 2005, the DWP began tracking outdoor irrigation audits.

Landscape water usage is controlled primarily by ordinance (see "Regulations for Efficient Water Use of Landscapes" below) and tiered water rates. Large landscapes are generally limited in the Big Bear Valley due to a variety of factors, including the mountain/forest environment, and the large number of "vacant" (vacation/second) homes. Large landscapes in new construction are restricted by ordinance.

At present, the DWP has a few customers on dedicated irrigation meters. But has not assigned water use budgets to any of these accounts. The DWP provides a number of incentives to encourage landscape water use efficiency. A Turf Buy Back Program has been implemented, the DWP reimburses customers who voluntarily remove turf grass from their property. Under this program, the reimbursement rate is $0.40 per square foot for turf removed in excess of 500 square feet, along with the removal of the respective irrigation system. The Turf Buy Back Program, implemented in early 2005, has resulted in the removal of 25,590 square feet of turf grass from the DWP service area, as of December, 2005.

Through the DWP's tiered pricing structure, customers are encouraged to minimize landscape water use in order to avoid the higher priced tiers. Customers are notified in their bills about the requirement to shutdown and winterize their irrigation systems from November 1 to April 1. New customers or those changing service are notified of the landscape ordinance, and are required to comply if there is new construction or renovation. The DWP has no irrigated landscapes at its facility, and serves as an example to other Commercial, Industrial and Institutional (CII) customers.

The CUWCC's coverage requirements state that no less than 20% of CII accounts with mixed-use meters should be contacted each year and offered a landscape water use survey. The DWP will begin implementing this program in 2006, offering 20% of its commercial/industrial/institutional accounts the opportunity to have a landscape survey performed. For 2006, that is expected to be a total of 104 accounts based on a CII total of 522 accounts. A response rate of 25% is assumed, for a total of 26 surveys to be performed in 2006. Assuming a survey takes 8 hours to perform, an average cost per survey of $250 for a total of $6,500. CUWCC estimates a 15% reduction in outdoor CII water use as a result of a landscape survey. In 2004, each CII customer used an average of 0.82 acre-feet (per DWP customer records). The total water reduction as a result of 26 surveys would be 3.2 acre-feet, or approximately $2,000 an acre foot for the first year.

Table 2-16 outlines the planned implementation of this DMM.

Table 2-16
Projected Landscape Water Use Surveys

	2006	2007	2008	2009	2010
# of surveys offered	104	110	116	122	128
# of surveys performed	26	28	29	31	32
Projected expenditures	$6,500	$7,000	$7,540	$8,060	$8,320
Projected water savings (AF/Y) *	3.2	3.4	3.6	3.8	3.9

* The savings listed above are not cumulative

"Regulations for Efficient Water Use on Landscapes"
The Landscape Ordinance, was approved by the Board of Commissioners of the Department of Water and Power of the City of Big Bear Lake on October 24, 2004 for the planning and installation of appropriate water conserving landscapes within the DWP service area in the Big Bear Valley.

This regulation has several water use policies and requirements pertaining to landscaping and water conservation. These include:

- Restrictions on nonessential water uses;
  - No washing of sidewalks and driveways,
  - All water for decorative water features must be part of a recycled system,
  - No landscape irrigation during daylight hours from April 1 to November 1,
  - No use of water from fire hydrants except for fire protection,
  - Washing of vehicles without a bucket and shut off nozzle on hose,
  - No flooding of gutters, driveways or streets,
  - No leaks allowed, any found must be repaired in a timely manner.
- Restrictions of turf grass installation and other landscaping;
  - No more than 500 square feet allowed to be installed,
  - Turf and water features may not exceed 25% of landscaped area,
  - All slope and soil conditions that may cause excessive runoff must be identified and resolved during planning process,
  - Landscape plants must be grouped by similar irrigation requirements and irrigation systems must be set up to irrigate individual water-use zones in accordance with their individual needs,
  - Landscape elements must be appropriately maintained to maximize water use efficiency.
- Restrictions on Irrigations;
  - Automatic irrigation control systems are required on all landscapes greater than 1,000 square feet,

- Sprinklers are only allowed on turf and other groundcovers. All other landscape plantings must be irrigated with efficient devices, such as drip system or bubblers,

- Sprinklers may not be used on planter strips less than 10 feet wide.

- All irrigation controllers must be equipped with rain shut-off sensors.

- All irrigation systems must be shutoff and winterized between November 1 and April 1 annually.

- All sprinkler, emitter, pipe and pond leaks must be repaired in a timely fashion and all irrigation systems must be tested and inspected before regular usage each spring.

- Guidelines for promoting groundwater recharge and controlling erosion;

  - All building roof runoff must be captured in infiltration systems, downspout runoff must be directed to a dry well system.

  - All slopes must be evaluated for their erosion potential and appropriate measures taken to minimize erosion. All areas susceptible to erosion must be addressed with an erosion prevention plan.

The ordinance also includes new requirements for the submission of landscape plans, penalties for failure to comply, and an appeal process. Please note that this ordinance only applies to new construction, or renovation of existing properties. These requirements are not retroactive to existing residents and customers.

2.4.8 BMP 6: High-Efficiency Washing Machine Rebate Programs

The City of Big Bear Lake Department of Water and Power (DWP) does not presently have a high-efficiency washing machine rebate program. But the DWP does have a ordinance requiring the use of high-efficiency washing machines in new construction, in its water waste prohibition ordinance, which is part of its "Regulations for Efficient Water Use on Landscapes" ordinance. The ordinance states, "All structures in new residential developments shall be equipped with low water use dishwashers (10 gallons/load or less) and washing machines (25 gallons per load or less)." In addition, for existing residential customers, the ordinance states, "Residential customers in existing developments shall be encouraged to install water efficient dishwashers (10 gallons per load or less) and washing machines (25 gallons per load or less) upon replacement."

Water savings per washing machine installed is estimated by the CUWCC to be 21.5 gallons per day, based on a single-family household of 3 people. That works out to 7,848 gallons per year, or 0.0241 acre-feet per year. It is also estimated by the CUWCC that the cost difference between regular washing machines and high-efficiency washing machines is approximately $400. Using the cost difference as the rebate amount, the total cost per acre-foot for the first year is $16,598 per acre-foot. Assuming a 14 year life for the washing machine, per the CUWCC, the cost per acre-foot of water saved over the lifetime of the machine is $1,185. This is significantly higher than that of ultra-low flow toilet, showerhead, and faucet aerator retrofits. It should also be noted, that the price differential between high efficiency and conventional washing machines should decrease as the market for high efficiency washers develops, which will make this program more economic, and thus attractive for water savings.

There are potential water savings limitations associated with the implementation of a high-efficiency washing machine rebate program. Since 75% of the homes in the service area are vacation homes or second homes, the water savings estimated would likely only be realized for the 25% that are full time residents. In addition, there is a concern that once the rebate is received from the DWP for the washing machine, the customer could remove the machine and reinstall it in their primary home outside the DWP service area, resulting in no water savings to the DWP. And finally, since so many of the homes are vacation and second homes, those homes commonly do not have washing machines at all.

The DWP plans to implement a high-efficiency washing machine rebate program in the future, once it has exhausted the available ultra-low flow toilet, showerhead, and faucet aerator retrofits. The program is planned to begin in 2011.

2.4.9 BMP 7: Public Information Programs

The City of Big Bear Lake Department of Water and Power maintains an active public information program, organized and maintained by the Water Conservation Coordinator and designed to educate the public and businesses on water supply issues and conservation. The public information program disseminates information to the public through a variety of means. These include:

- Local newspapers and radio advertisements
- Restaurant table tents, hotel door hangers, business placards
- An Informative website

Public information programs have been included in the Conservation department's budget, and the actual expenditures spent on public information have been tracked through that budget since the Water Conservation Coordinator took over the department in January 2003. From 2000-2001, various public information activities were performed (Table 2-17), but the available information on the costs of those activities is limited. Historically, the DWP has not kept records on the number of activities funded through the program. Beginning in 2006, the Conservation department will track both the number of activities, and the expenditures associated with the public information program for reporting purposes.

Table 2-17
Past Expenditures for Public Information

	2001	2002	2003	2004	2005
Paid advertising	$2,121	$13,515	$33,585	$42,719	$60,703
Bill Inserts / Newsletters / Brochures	$817	$4,790	$7,407	$5,774	$75,647
Demonstration Gardens	0	$513	$10,900	$6,836	$1,045
Speakers	0	0	$1,135	$1,135	0
Program to coordinate with other government agencies, industry and public interest groups and media	0	0	0	$5,691	$5,691
Actual expenditures - $	$2,938	$23,418	$53,030	$62,155	$143,086

Table 2-18
Planned Expenditures for Public Information

	2006	2007	2008	2009	2010
Paid advertising	$41,000	$41,000	$42,000	$42,000	$43,000
Bill Inserts / Newsletters / Brochures	$6,000	$6,000	$6,500	$6,500	$7,000
Demonstration Gardens	$6,000	$6,000	$6,500	$6,500	$7,000
Speakers	$1,000	$1,000	$1,000	$1,000	$1,000
Program to coordinate with other government agencies, industry and public interest groups and media	$6,000	$6,000	$6,000	$6,000	$4,000
Actual expenditures - $	$60,000	$60,000	$62,000	$62,000	$64,000

The activities in each category include such activities as:

- Paid advertising – advertising in the local newspapers (Big Bear Grizzly, Big Bear News, etc), advertising on the local radio station (KBHR), highway signs, bus stop signs, and other signs and advertisements.

- Bill Inserts/Newsletters/Brochures – bill inserts, conservation posters, hotel hangers, restaurant table tents, fliers, resort magnets, children's booklets, and other assorted handouts.

- Demonstration Gardens – xeriscape plant information, tours of xeriscaped homes, plants, and landscapers.
- Speakers – public speakers on water conservation / water efficiency.
- Programs to coordinate with other government agencies, industry, and media – ad campaign, strategic planning.

The DWP is committed to funding public information programs at a similar or higher level in the coming years (Table 2-18). While actual water savings are impossible to quantify, the DWP feels that continuing public education is vital in keeping water conservation in the public's mind. A public aware of the need for water conservation is more likely to conserve.

2.4.10 BMP 8: School Education Programs

At present, DWP has school programs for third and fourth grades at the three elementary schools in the DWP service area (Table 2-19). The first classroom presentation was held in 2001, and has continued to the present. Each presentation reaches two classes, with an estimated 60 students, for a total of approximately 350 students attending the presentations in 2005. The DWP has not held any workshops or presentations specifically for teachers.

Table 2-19
Past School Education Programs

	# of classes	2001	2002	2003	2004	2005
Grades K – 3rd	6	1	3	3	3	4
Grades 4th – 6th	6	0	3	3	3	3
Grades 7th – 8th	0	0	0	0	0	0
High School	0	0	0	0	0	0
Actual expenditures - $		$500	$500	$2,225	$3,815	$7,924

In addition to six regular classroom presentations held in 2005, the DWP sponsored the First Annual Children's Water Festival, in May 2005. This event was held at Northshore Elementary Schools, and was attended by approximately 460 third and fourth graders from the entire school district. Fourteen local agencies, organizations, and companies participated in the presentation of this festival. The children spent the day learning about environmental issues, water conservation, and the importance of protecting underground aquifers; participated in a variety of activities, and received a variety of materials to take home. The First Annual Children's Water Festival was a success, and the DWP is committed to participating in the Festival on a biennial basis.

Table 2-20
Planned School Education Programs

	# of classes	2006	2007	2008	2009	2010
Grades K – 3rd	6	4	4	4	4	4
Grades 4th – 6th	6	3	3	3	3	3
Grades 7th – 8th	0	0	0	0	0	0
High School	0	0	0	0	0	0
Planned expenditures - $		$8,000	$8,200	$8,400	$8,600	$9,000

The DWP will continue the existing school education program for third and fourth graders, as well as participating in Children's Water Festival, into the future (Table 2-20). Through these programs, they can reach the majority of third and fourth graders who live in the service area. This education program is a cost-effective means to provide early education of young water users in order to provide long-term beneficial impacts to the local water supply. Sufficient revenue is and will continue to be allocated for these programs.

2.4.11 BMP 9: Conservation Programs for Commercial, Industrial and Institutional (CII) Accounts

The DWP has not implemented a formal commercial, industrial, and institutional conservation program. As of November, 2005, of the 15,316 accounts, 525 are commercial accounts, and 39 are institutional (government, etc) accounts. There are no industrial accounts in the DWP system, but there are 12 customers that are located in Industrial zoned areas.

The DWP has included commercial accounts in several other conservation programs they have implemented. As part of BMP 5, Large Landscape conservation programs and incentives, the DWP has provided landscape surveys to CII customers. Ultra-low flow toilet replacements, and bathroom retrofits have been provided to CII customers as well (Tables 2-22 and 2-23). It is assumed that up to 50 CII ULFT replacements per year will occur until 2010.

CUWCC's guidelines indicate that 10 percent of CII accounts are to be surveyed in 10 years (Table 2-21). As of 2005, there were 525 commercial accounts and 39 institutional accounts. The guidelines also suggest that 10% of all commercial customers be contacted each year with an offer to have a water use survey performed. The survey must include a site visit, evaluation of water using apparatus and processes, and a report to the customer identifying recommended efficiency measures. A follow-up visit is to be held one year after the survey.

Table 2-21 Planned CII Water Use Surveys					
	2006	**2007**	**2008**	**2009**	**2010**
# of on-site surveys offered	56	56	56	56	56
# of on-site surveys performed	28	28	28	28	28
# of follow-up visits	0	28	28	28	28
Planned expenditures - $	$14,000	$14,000	$14,000	$14,000	$14,000
Estimated water savings – AF/Y**	4	4	4	4	4

* This table assumes a 50% response rate on the water survey offers.
** These totals are the first year water savings only

The estimated cost per water survey for the DWP will be approximately $500, for the initial survey and follow-up visit. Potential or planned water savings are difficult to quantify. Savings are based on the types of conservation measures available for implementation by the CII account, whether those measures are implemented or not, and whether they reach the full potential savings of the measure. The CUWCC estimates a water savings of approximately 12% following a water survey. Based on the average usage for each customer type, a normal rainfall year, the number of surveys planned, and the estimated 12% savings, the first year water savings for the planned surveys total approximately 4 acre-feet per year. Cost per acre-foot of estimated water savings is $3,500, for the first year. That cost will decrease in the event that the water savings from the surveys continue into subsequent years.

CII Toilet Replacements

Table 2-22 Past CII Toilet Replacements					
	2001	**2002**	**2003**	**2004**	**2005**
# of CII replacements	0	0	0	6	316
Actual expenditures - $	-	-	-	$450	$79,000
Actual water savings – AF/Y	-	-	-	0.21	10.9

Table 2-23 Planned CII Toilet Replacements					
	2006	**2007**	**2008**	**2009**	**2010**
# of CII replacements	50	50	50	50	50
Planned expenditures - $	$12,500	$12,500	$12,500	$12,500	$12,500
Planned water savings – AF/Y	1.74	1.74	1.74	1.74	1.74

Please note that the water savings in the tables above represents the first year savings for the toilets retrofitted, and not a cumulative savings over the life of the toilet. For the first year, the cost per acre-foot of water savings is $7,184. Assuming a 20 year life of the new toilets, the cost per acre-foot of water savings is $360 over the life span of the ULFT retrofits.

2.4.12 BMP 11: Conservation Pricing

The City of Big Bear Lake Department of Water and Power (DWP) first instituted conservation pricing to their customers in 1992. Over the years, the tiered pricing rates have been changed to further increase the cost associated with the higher tiers as an effort to encourage water conservation.

The tiered rates apply to single family residential and multi-family residential accounts (Table 2-24). The charges are based on the total quantity of water used during the 2 month billing cycle, in hundred cubic feet of water (ccf).

Table 2-24
Tiered Water Rates for Residential Accounts

Tier	Usage	Cost
Tier 1	First 24 ccf	$2.06 each
Tier 2	Next 16 ccf (25 to 40 ccf)	$2.86 each
Tier 3	Next 20 ccf (41 to 60 ccf)	$4.27 each
Tier 4	Next 40 ccf (61 to 100 ccf)	$7.04 each
Tier 5	All usage over 100 ccf	$9.77 each

For commercial, industrial and institutional (CII) accounts, the tiered pricing structure is different than above. Parks and schools are billed at a flat rate of $2.06 per ccf. The commercial pricing structure is divided into 20 different rate codes, each code corresponds to a different base volume. The base volume is charged $2.06 per ccf. Each commercial account is evaluated every couple of years and assigned to one of the 20 base volume codes. The breakdown of CII pricing codes is provided in Appendix D. While the pricing for each tier remains the same as the table above, the quantity of water used in each tier varies based on the CII code.

In addition to the above charges per ccf of consumption, the customer is also required to pay operation and maintenance, debt service, and system rehabilitation fees (Table 2-25). These fees are based on the size and type of meter installed for that customer. For the vast majority of customers, both residential and business, who have a 5/8" meter, the breakdown of the fees is shown below. These service charges are included in each billing cycle.

Table 2-25
Service Charges for Residential Accounts

Type of Charge	Cost
Operation and Maintenance	$8.36
Debt Service	$35.60
System Rehabilitation	$14.26
Total Service Charges	$58.22

For other meter sizes, the following rates apply:

Table 2-26
Fees per Meter Size

Meter Size	Residential Bimonthly	Business Monthly	Business Monthly Fire Service	Business Monthly – Compound Meter	Rim Forest Bimonthly Charges
5/8"	$58.22	$29.11	-	-	$70.04
1" (fire)	$66.22	-	-	-	$78.04
1"	$114.10	$57.05	-	$151.32	$128.30
1 ½"	$146.28	$73.14	-	-	$161.86
2"	$190.28	$95.14	-	$179.19	$207.76
3"	$321.06	$160.53	-	$183.54	$344.16
4"	$429.18	$214.59	$15.08	$214.59	$456.94
5"	-	-	-	$295.51	-
6"	$713.34	$356.67	$22.63	$409.11	$753.30
8"	$1020.14	$510.07	$30.18	-	-
10"	$1020.14	$510.07	$37.72	-	-
12"	-	-	$45.26	-	-

The DWP is presently in the process of preparing a Water Master Plan, and as part of the Water Master Plan, a Financial Plan and Rate Study will be performed. Based on the results of that rate study, a new CII pricing structure may be introduced, with fewer base codes. This new pricing structure will reflect the cost of producing water and provide more incentive to conserve. The new CII tiered pricing structure is expected to be implemented in 2007.

2.4.13 BMP 12: Water Conservation Coordinator

The DWP presently (2005) employs two full-time people working in the water conservation department, a Water Conservation Coordinator and a Water Conservation Specialist. In addition, the DWP typically hires one or two additional Water Conservation Patrol employees during the summer months (Table 2-27). The Patrol employees concentrate on enforcing the DWP's Water Conservation ordinance. The DWP plans on maintaining full-time positions for the Water Conservation Coordinator and at least one Specialist, with two part-time Patrol positions to be filled during the summer months (Table 2-28).

Bill La Haye is the present Water Conservation Coordinator for the DWP. He was originally hired in January 2003 as a Water Conservation Specialist on a part time basis. In June 2005, Bill started working full-time for the DWP as their Water Conservation Coordinator. As part of his duties as Water Conservation Coordinator, Bill manages the Water Conservation Program for the DWP as well as assists with other special projects. He coordinates the DWP's website, is the primary contact person for the media, and is the DWP's low water-use landscape specialist. His education consists of a Bachelor's Degree in Geology, and a Master's Degree in Natural Resources with an emphasis on Wildlife Management. His experience includes: installing, repairing and testing domestic and agricultural pumps and wells in Northern California, designing agricultural irrigation systems, and coordinating

research projects throughout Northern and Southern California studying natural vegetation. He is also a specialist in drought tolerant plants and landscapes in the Big Bear Valley, and owned an extensive cactus collection. Portions of his cactus collection are housed at the Huntington and Moorten's Botanical Gardens.

Jennifer McCullar is the current full-time Water Conservation Specialist. She joined the DWP in June 2005. Her primary duties include management of two of the DWP's newest conservation programs: the Retrofit upon Change in Service Program and the Offset Demand Program, as well as assisting Bill La Haye with the many ongoing programs and efforts in the Water Conservation Department. Her education consists of both an undergraduate and graduate degree in Finance. Her previous work experience includes working as the Executive Director of the Big Bear Chamber of Commerce, as well as Vice President of Structured Finance at LaSalle National Bank in Chicago, Il.

Table 2-27
Conservation Department 2001-2005

Actual	2001	2002	2003	2004	2005
# of full-time positions	0	0	0	0	2
# of part-time staff	0	1	1	3	1
Position supplied by other agency	0	0	0	0	0
Actual expenditures - $	0	$78,257	$81,704	$110,000	$200,000

Table 2-28
Planned Conservation Department 2006-2010

Planned	2006	2007	2008	2009	2010
# of full-time positions	2	3	3	3	3
# of part-time staff	2	2	2	2	2
Position supplied by other agency	0	0	0	0	0
Projected expenditures - $	$220,685	$250,000	$260,000	$270,400	$281,000

Evaluating this BMP's effectiveness is very difficult. One method would be to compare the water demand in years where the DWP did not have a Water Conservation Coordinator to those years where there was a Coordinator. Since it is the job of the Coordinator to ensure that water conservation measures are being followed, and to develop new conservation measures, it would be difficult to separate the water savings due to the conservation measures, or due to the existence of the Conservation Coordinator. The Department of Water and Power is committed to the continuation of the Conservation Department, and is confident that the water savings due to the Department offset the costs associated with maintaining the Department.

2.4.14 BMP 13: Water Waste Prohibition

The DWP has had a water waste prohibition ordinance in effect since 1989, as part of their "Regulations for Efficient Water Use on Landscapes" ordinance. The most recent update to the ordinance was enacted in October, 2004 as Resolution No. DWP 2004-08. This resolution updated many of the provisions of the earlier resolutions, making many provisions more stringent than earlier.

The ordinance prohibits the nonessential use of water, defining it as wastage of water. Some nonessential uses of water defined in the ordinance include:

- There shall be no washing, using water from a hose, of sidewalks, walkways, driveways, parking areas, patios, porches, or verandas, buildings, and structures, except when needed to protect public health and safety.

- No water shall be used to clean, fill, operate, or maintain levels in decorative fountains unless such water is part of a recycling system.

- No person shall permit water to leak from any facility on his premises, and all leaks shall be repaired in a timely manner.

- Commencing April 1st, and terminating November 1st, annually, there shall be no irrigation between the hours of 9 a.m. and 6 p.m. Irrigation shall not exceed the needs of the plants being watered or be applied at a rate and quantity that causes runoff.

- Noncommercial washing of privately owned vehicles, trailers, buses, or boats must be conducted through the use of a bucket and a hose equipped with a shut-off nozzle.

- There shall be no use of water from a fire hydrant, except for fire protection purposes.

- The size of all water features (ponds, fountains, streams, etc.) combined will be limited to 500 square feet of total surface area.

The ordinance also updates and modifies many of the landscape provisions of the previous ordinance, provides requirements for the submission of landscape plans, and provides penalties for failure to comply with any of the provisions.

The DWP has not implemented a program to survey the number and types of water softeners installed in the service area. If a water softener is present, it will be inspected during the indoor water audit survey, but records are not kept of the type or number found. No formal program encouraging the use of more efficient types of water softeners has been implemented due to the lack of knowledge of the use of water softeners in the service area. The DWP will begin to track the number and type of water softeners during home water audits surveys in 2006 and reevaluate the need

for an ordinance, and education program once further data has been obtained and analyzed.

The actual or projected costs of the water waste prohibition are associated with its enforcement. During the summers, the DWP typically hires one or two part time Water Conservation Patrol employees to aid in ordinance enforcement. The expenditures associated with the salary, benefits, etc. of these employees are detailed in BMP 12, Water Conservation Coordinator, and are also listed in Table 2-29. Two part-time patrol employees were hired in 2004, and one in 2005. The DWP anticipates having the funding for two patrol employees per year for the foreseeable future. The number of on-site visits is from BMP 1, Water Surveys, and is based on the projected number of surveys the DWP expects to perform (Table 2-30).

Table 2-29
Summary of Past Water Waste Prohibition 2001-2005

	2001	2002	2003	2004	2005
Waste ordinance in effect	Yes	Yes	Yes	Yes	Yes
# of on-site visits	N/A	N/A	N/A	N/A	N/A
Water softener ordinance	No	No	No	No	No
Actual expenditures - $	N/A	N/A	N/A	$35,000	$17,500

Table 2-30
Summary of Anticipated Water Waste Prohibition 2006-2010

	2006	2007	2008	2009	2010
Waste ordinance in effect	Yes	Yes	Yes	Yes	Yes
# of on-site visits	100	100	100	100	100
Water softener ordinance	No	No	No	No	No
Actual expenditures - $	$35,000	$36,000	$37,000	$38,000	$39,000

N/A – information not available

2.4.15 BMP 14: Residential Ultra-Low-Flush Toilet Replacement Programs.

of pre-1992 Single Family Units = 13,000

# of pre-1992 Multi-Family Units = 420

The DWP has instituted an Ultra-Low Flow Toilet (ULFT) replacement program in January 2000. This program was briefly suspended due to inadequate funding, in 2001, and continued it through 2003. The DWP purchased ultra low flow toilets, which were installed by the customer. A member of the DWP staff would go to the residence or business to verify that the toilets were actually installed and that they replaced a non-ULFT. Other than installation costs, this program was free to the customers (Tables 2-31 and 2-32).

A rebate program was then implemented in January 2004. This replacement program consisted of a rebate program, granting customers a rebate of $75 per ULFT retrofitted. The purchase and installation of the UFLT was the responsibility of the customer, and the work was inspected, to verify that the old toilet was non-ULFT, by a member of the DWP staff prior to payment of the rebate. The rebate was paid as a credit on the customer's bi-monthly water bill.

Starting in August, 2005, the DWP began providing retrofits of high flow toilets with a free ULFT retrofit. The DWP bore the full cost of the toilet and installation. This project was funded by the Water Demand Offset Ordinance requiring contractors and developers to pay a Water Demand Offset fee based on the future demand of their respective development projects. These fees were used by the DWP to fund projects toilet retrofits.

Table 2-31
Single Family ULFT Retrofits 2001-2005

	2001	2002	2003	2004	2005
# of ULF rebates	0	0	0	34	43
# of ULF direct installs	0	138	73	0	106
Actual expenditures - $ *	0	$32,016	$16,936	$2,491	$21,840
Actual water savings – AF/Y **	0	4.79	2.53	1.18	3.85

* - estimated based on 2005 cost per toilet, actual costs not available
** - estimated water savings represents the one year savings for the toilets retrofitted in that year, and not a cumulative savings over the life of the toilet.

Table 2-32
Multi-Family ULFT Retrofits 2001-2005

	2001	2002	2003	2004	2005
# of ULF rebates	0	0	0	6	2
# of ULF direct installs	0	10	1	0	2
Actual expenditures - $ *	$0	$2,320	$232	$450	$614
Actual water savings – AF/Y **	0	0.35	.03	0.21	0.14

* - estimated based on 2005 cost per toilet, actual costs not available
** - estimated water savings represents the one year savings for the toilets retrofitted in that year, and not a cumulative savings over the life of the toilet.

The average water savings as a result of a toilet retrofit to an ultra low flow model ranges from 20 to 27 gallons per day per toilet in a single family residence based on number of persons in the household, using the primary calculation method of the CUWCC methodology. The DWP, when establishing their Water Demand Offset program, calculated the water savings from toilet replacement to be 31 gallons per day per toilet. For purposes of this BMP, 31 gpd per toilet, or 0.0347 acre feet per year per toilet, in both single and multi-family will be used. The cost per acre-foot of water savings is approximately $2,111 for toilet rebates, and $6,700 for direct installs for the first year. Assuming a 20 year life for a toilet, the cost per acre-foot over the lifetime of the toilet comes out to $106 per acre-foot for rebates, and $335 per acre-foot for direct installs. While the cost per acre-foot for rebates is significantly cheaper than for direct installs, customer participation is much higher for direct installs, allowing more

toilets to be retrofit. Since the funds for toilet replacement is coming out of the Water Demand Offset fees, and not the DWP general budget, the DWP will continue to offer direct installs to their customers as well as rebates.

The DWP is committed to a large scale toilet replacement program. The vast majority of homes in the DWP service area were built before 1992, and therefore the number of potential retrofit candidates is large. Seventy-five percent of the homes in the Big Bear Valley are considered "vacant," meaning they are vacation and/or second homes. Retrofitting ULFTs into these "vacant" residences will result in significantly less water savings than if that same toilet was installed in a full time residence. The DWP is targeting full-time residents and businesses for retrofit first, based on water consumption, before beginning to retrofit the part-time residents.

The free ULFT retrofits performed in 2005, and those planned for the future, were, and will be funded with the Water Demand Offset fees. The DWP has a goal of completing 3000 retrofits, either by rebate or direct install, by 2010 (Table 2-33). The DWP has retrofitted 608 toilets to date. In order to reach 3000, they will need to retrofit 480 toilets per year from 2006 to 2010. By 2010, the diminishing returns of retrofitting part time, or "vacant" residences and businesses will begin to increase, and the DWP will look to other water conservation measures, or available retrofits, to utilize the demand offset fees on.

Table 2-33
Proposed Single Family ULFT Retrofits 2006-2010

	2006	2007	2008	2009	2010
# of ULF rebates	40	40	40	40	40
# of ULF direct installs	390	390	390	390	390
Planned expenditures - $ *	$93,500	$93,500	$93,500	$93,500	$93,500
Planned water savings – AF/Y **	14	14	14	14	14

* - estimated based on 2005 cost per toilet, actual costs not available
** - estimated water savings represents the one year savings for the toilets retrofitted in that year, and not a cumulative savings over the life of the toilet.

Table 2-34
Proposed Multi-Family ULFT Retrofits 2006-2010

	2006	2007	2008	2009	2010
# of ULF rebates	0	0	0	0	0
# of ULF direct installs	50	50	50	50	50
Planned expenditures - $	$11,600	$11,600	$11,600	$11,600	$11,600
Planned water savings – AF/Y	1.7	1.7	1.7	1.7	1.7

* - estimated based on 2005 cost per toilet, actual costs not available
** - estimated water savings represents the one year savings for the toilets retrofitted in that year, and not a cumulative savings over the life of the toilet.