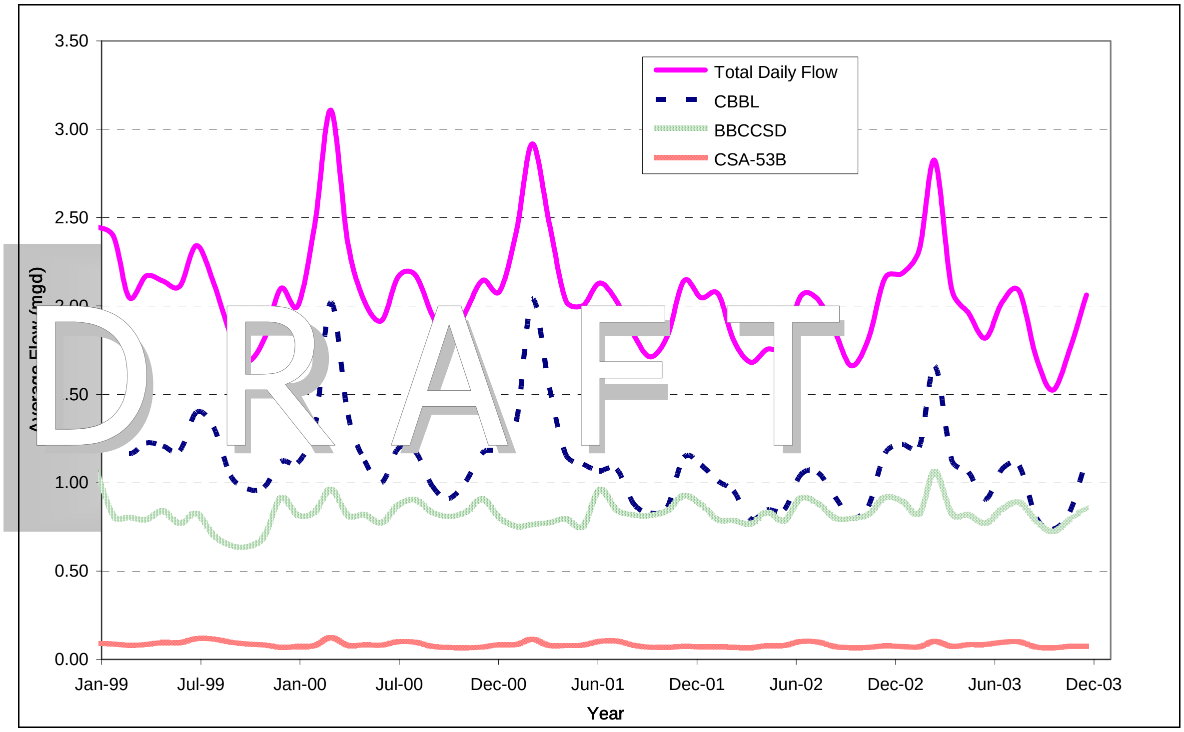

FIGURE 3-1. AVERAGE DAILY WASTEWATER FLOWS (JANUARY 1999 – DECEMBER 2003)

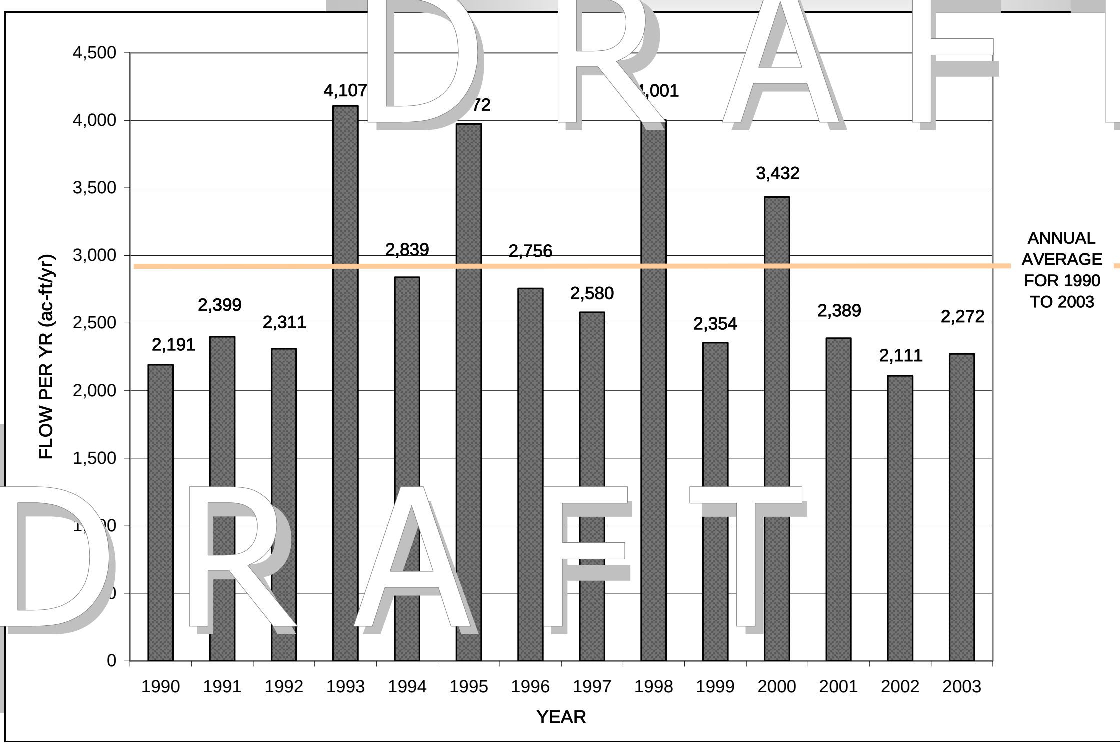

FIGURE 3-2. YEARLY WASTEWATER FLOWS – WATER YEARS 1990 – 2003

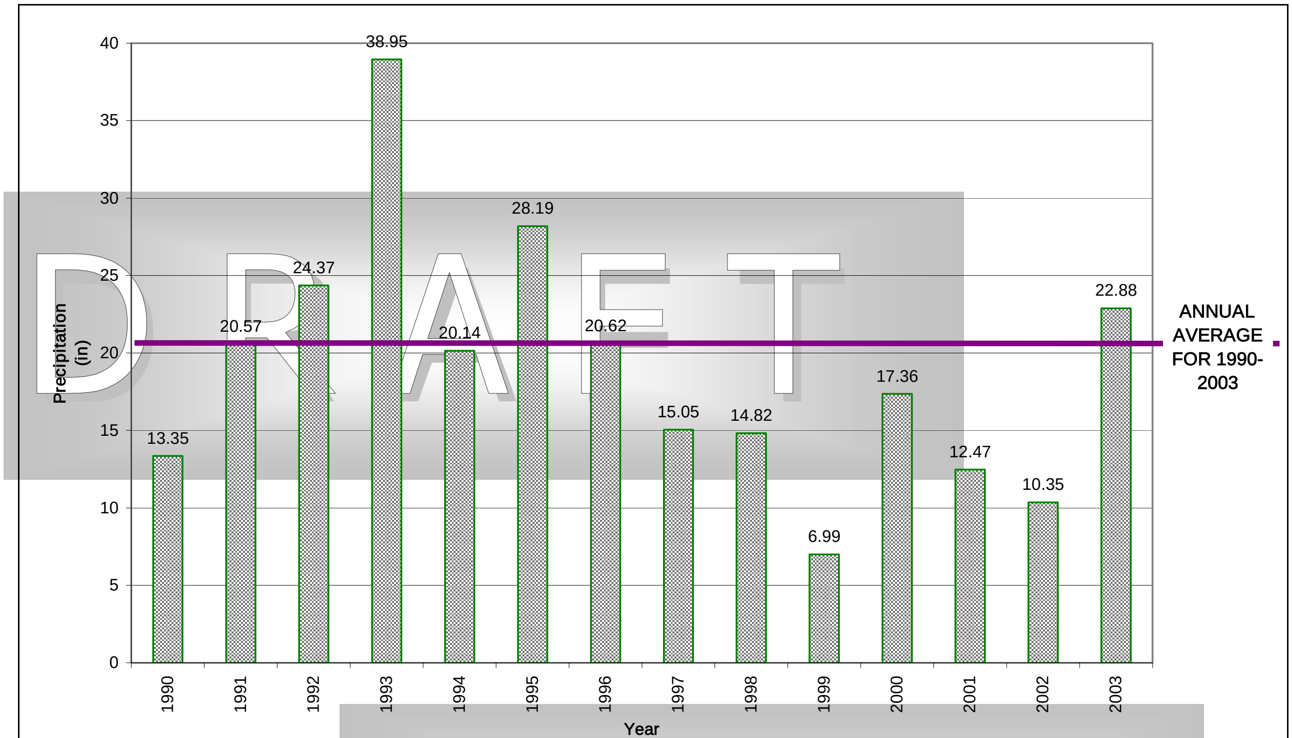

FIGURE 3-3. PRECIPITATION – WATER YEARS 1990 – 2002 (COOPERATIVE STATION NUMBER 040741)

3.1.2 Population

Population growth in the Big Bear area has been projected in terms of Equivalent Dwelling Units (EDUs). Historical EDU data show a historical growth rate of approximately 1 percent, based on data from 1990 to 2002, while projections by DWP, BBCCSD, and the County of San Bernardino, County Service Area 53B show a future growth of 0.7 percent. Historical growth and the projected growth show no apparent correlation with the decreasing trend in the production of wastewater flow. The growth in EDUs without an increase in wastewater flow likely results from seasonal population in this area, which adds EDUs without adding permanent population. BBARWA estimates that permanent residents represent approximately 33 percent of existing EDUs. Due to changing demographics in the area (i.e., effects of teleworkers and retirees moving to the Valley), it is estimated that the permanent residents could represent between 40 and 50 percent of the population in the future.

3.1.3 Supply Projections

Based on the historical wastewater flow data discussed in Section 3.1.1, no justification is apparent for an increase in wastewater flow in the future. The growth in EDUs in the area is represented by a growth in water meters, which may represent an increase in vacation homes occupied by part-time residents, not permanent residents. Approximately, 65 percent of the total number of EDUs within the boundaries of the service area of each agency was occupied by part-time residents. The additional vacation homes may not significantly increase wastewater flow. The flow is governed mainly by I&I. Another factor affecting wastewater flows is the water conservation measures that have been put in place by the DWP. These measures include plumbing fixture retrofit required on change of service, which consist primarily of low-flow toilets.

Inflow consists of the water that enters the sewer system through improper connections, such as roof drains that flow directly to the sewer, catch basins in the street or private property, or low backyards that drain directly to the sanitary sewer pipe by way of a cleanout. Infiltration is groundwater that enters the sewer system though leaks in the pipe, stormwater that enters through sump pumps, or house foundation drains that are connected to the sanitary sewer (City of Sandpoint, 2004).

During drought periods, a decrease in wastewater flow occurs because I&I have decreased, which limits the production of recycled water. Other factors that can limit wastewater flow include the implementation of low-flow fixtures, such as water-saving toilets and showers. Based on the assumption that wastewater flow would not increase in the future, the lowest recorded level of flow of 2,111 afy (2002) will be used as the upper limit for recycled water supply. For the purposes of this analysis, this flow will be rounded to 2,100 afy. This flow will result in 1,600 afy being available for supply to recycled water users after losses in the treatment processes are accounted.

3.1.4 Potable Water Demand

In 2000, the BBCCSD and DWP each conducted a water supply analysis to address future water requirements. Each agency adopted an Urban Water Management Plan (UWMP). In the UWMP for BBCCSD, the projected water available for supply was based on average well production from 1988 to 1999. The most productive 3 years in recent history of the BBCCSD occurred from 1993 to 1995, accounting for a best-case supply scenario of 2,775 gpm. The least productive 3 years from the same period occurred from 1988 to 1990, accounting for a worst-case water availability scenario of 1,631 gpm. Water available for supply from the most productive years is averaged with water availability from the least productive years to calculate projected water available for supply of 2,203 gpm over a 20-year planning period ending in 2020. Water supply sources include vertical wells, slant wells, and springs. With a current (2005) maximum-day demand requirement of 2,031 gpm, the BBCCSD source capacity is sufficient in the best-case (2,775-gpm) and average-year (2,203-gpm) water-supply availability scenarios. However, under the worst-case (drought) availability scenario of 1,631 gpm, the maximum-day demand requirement exceeds water availability. Table 3-1 offers a comparison of the projected maximum-day water requirements versus the average projected water availability by year.

Table 3-1
BBCCSD DEMAND VERSUS SUPPLY

Year	Maximum-Day Water Requirements (gpm)	Projected Water Supply Available (gpm)
2000	1,864	2,203
2005	2,031	2,203
2010	2,198	2,203
2015 [a]	2,365	2,203
2020 [a]	2,531	2,203

Note: [a] Demand exceeds supply

The BBCCSD projected available water supply will keep pace with the projected maximum-day demand requirement until shortly after 2010. By the year 2020, a deficit of approximately 328 gpm will occur. The BBCCSD UWMP states that an additional well (Well 3B) with an estimated capacity of 1,000 gpm is being developed, which could meet the maximum-day requirement through the planning period, including the worst-case scenario. Well 3B is located at Shore Drive and Maltby Boulevard, 50 feet southeast of Well 3. The drilling was completed in 2000. However, this well has high fluoride concentrations and will require a fluoride treatment system installed prior to placing the well in service. Since the UWMP was produced, three more wells have been developed. Wells 8, 9, and 10 were drilled in 2003, but only Wells 9 and 10 are currently in production.

Well 9 is located at the Big Bear City Park and produces 150 to 180 gpm. Well 10 is located next to Perry Reservoir by Big Bear High School and produces 105 gpm. Well 8, located next to the BBARWA WWTP, is not in service because it produces high concentrations of iron and manganese. The existing flow from the operational and water-producing wells yields an additional 255 to 285 gpm, which is 23 to 53 gpm short of the projected maximum-day demand requirement estimated by the BBCCSD. However, if water from Well 3B and Well 10 were treated to reduce the concentrations of fluoride, iron, and magnesium to acceptable levels, the BBCCSD would have adequate water supply to meet demands beyond 2020.

The DWP published a UWMP in 2000 that projected water supply based on well and spring data from recent history, averaging the least productive years with the most productive years. The projected water supply from all sources was determined to be 1,608 gpm over a 20-year planning period ending in 2020. This value is less than the 2005 maximum-day requirement of 3,778 gpm and the 2020 maximum-day requirement of 4,155 gpm. However, when DWP compares the total existing supply capacity of the wells to the maximum-day requirement, the current and future maximum-day demand requirements are exceeded. The total capacity of the water production facilities is a minimum of 4,751 gpm and has a maximum of 5,048 gpm. The DWP wells are operated intermittently based on the water levels in existing storage reservoirs. The wells are active only for certain portions of the day and some are not used in the winter. Table 3-2 offers a comparison of the projected maximum-day water requirements, the projected water available for supply, and the existing water production capacity.

The DWP UWMP addresses system capacity versus the projected maximum-day requirements and does not attempt to project the ability of the aquifer to sustain a minimum of 4,751-gpm pumping rate during drought conditions.

The water availability projections in the DWP UWMP were based upon instantaneous supply production data. This flow rate can be reduced and the capacity available in the aquifer system depleted during drought conditions. Therefore, the amount of groundwater available for supply can vary greatly based upon past pumping, hydrologic conditions, and the amount of water recharged into the groundwater basins.

Table 3-2
DWP DEMAND VERSUS SUPPLY

Year	Maximum-Day Water Requirements (gpm)	Projected Available Water Supply (gpm)	Minimum Existing Water Production Capacity (gpm)
2000	3,651	1,608	4,751
2005	3,778	1,608	4,751
2010	3,905	1,608	4,751
2015	4,031	1,608	4,751
2020	4,155	1,608	4,751

Notes:

The projected water supply is based on well and spring production data from recent history, averaging the least productive years with the most productive years.

Minimum existing supply capacity is based on the minimum design capacity of the supply facilities and does not take into account groundwater conditions.

3.1.5 Recycled Water Demand

The BBARWA currently operates a small-scale recycling program that requires three permits. This recycling program allows for distribution of recycled water for construction, irrigation, and other permitted activities. Within this program, the BBARWA has about 188 users. Irrigation users are the largest number of accounts, but use a significantly smaller amount of water than construction users. In 2004/2005, over 13 afy of recycled water were sold, with only 12 percent going to irrigation users. Irrigation use currently is permitted by a Valley-wide permit, where recycled water is delivered to individual homeowners in trucks and distributed from onsite holding tanks.

Based on the potable water supply projections, a significant potential for water shortages exists, especially during drought periods as is evident under the existing water conservation measures put in place by the local water purveyors. Recycled water is an alternative supply to meet demands currently served by potable water; thus, increasing available potable water supplies and their reliability while reducing the impacts resulting from drought conditions. Potential recycled water demand is evaluated in the Market Assessment Section.

3.2 Market Assessment

A market assessment was conducted to identify potential users of recycled water. This assessment involved evaluating all available data including land use, water consumption data, and local knowledge of the BBARWA staff. The market assessment began by evaluating land use and other mapping sources to develop a preliminary assessment of where recycled water could be applied in the area. Then the DWP and the BBCCSD were contacted to gather historical water consumption data for each water agency, including a list of historically large water consumers. Additional consumption data were requested for: (1) all parks and schools and (2) specific commercial businesses, including car washes, laundries, and nurseries that were not on the water agencies' list of top users. The BBARWA staff also used their local knowledge to identify potential recycled water customers, which expanded the list of potential users. The steps used to evaluate potential users are discussed further in the following subsections.

3.2.1 Potential User Identification

Preliminary assessment revealed that potential uses of recycled water include urban irrigation, industrial/commercial, environmental impoundment, and groundwater recharge. To identify potential users various data sources were reviewed.

3.2.1.1 Land Use Analysis

The first step in identifying potential recycled water users was to analyze land uses in the area, because certain land uses are more suitable for receiving recycled water. Generally, recycled water is most practical for locations with large landscaped areas available for irrigation. Public facilities such as parks and schools, or recreational areas such as golf courses, are considered optimal users of recycled water. Some residential or commercial areas are also secondary candidates for large-scale irrigation. Commercial areas also use recycled water in other ways, such as in car wash and laundry applications. Environmental impoundment and groundwater recharge are the remaining applications for recycled water.

Two main agencies control land use designation in the study area, the County of San Bernardino and the City of Big Bear Lake. The County of San Bernardino is responsible for covering the unincorporated areas of Fawnskin, Minnelusa, Sugar Loaf, and Big Bear City. The San Bernardino County General Plan was adopted on July 1, 1989, and revised on March 27, 2003. The City of Big Bear Lake General Plan was adopted on August 23, 1999. The General Plans for both agencies guide land use planning and policy for the Valley (outside the National Forest boundary). Any proposal for development in these areas would require a determination of consistency with the land use designation in the General Plan or would require a General Plan Amendment.

To identify potential recycled users, an initial evaluation of the land uses in the area was performed. Land uses from the General Plan were compared against other maps (such as the Thomas Guide and the United States Geological Survey [USGS] quadrangle maps) to identify additional users. Tables 3-3 and 3-4 describe the land use categories for the County of San Bernardino and City of Big Bear Lake, respectively, and discuss the suitability of the land use for recycled water use.

TABLE 3-3
SAN BERNARDINO COUNTY LAND USE EVALUATION

Land Use Category	Land Use Name	Suitability for Reuse Application	Considered in this Evaluation	Description
RC	Resource Conservation	No	No	Open space with potential for one dwelling unit (DU) per 40 acres; very limited opportunity for any type of irrigation
AG	Agriculture	Yes	Yes	Crops compatible with recycled water
RL	Rural Living	Yes	Yes	Minimum one DU per 2.5 acres; limited opportunity to replace existing irrigation
RS	Single Residential	Yes	No	Maximum four DU per acre; very limited opportunity to replace existing irrigation; significant retrofits of individual residence; Valley wide permit for residence irrigation with tanks
RM	Multiple Residential	Yes	No	Maximum 14 DU per acre; limited opportunities to replace existing irrigation
CN	Neighborhood Commercial	Yes	Yes	Fieldwork did not identify major landscaped areas
CO	Office Commercial	Yes	Yes	Provides office and space for professional groups in community center and civic areas; fieldwork did not identify major landscaped areas
CR	Rural Commercial	Yes	Yes	Site in rural area where commercial services is intermixed with residential uses; fieldwork did not identify major landscaped areas
CH	Highway Commercial	Yes	Yes	Retail and service commercial establishments intended to meet daily convenience needs of traveling public
CG	General Commercial	Yes	Yes	Stores, offices, service establishments to meet neighborhood and community needs; fieldwork did not identify major landscaped areas
CS	Service Commercial	Yes	Yes	Mixture of commercial and industrial use; fieldwork did not identify major landscaped areas
IC	Community Industrial	Yes	Yes	One industrial facility was identified
IR	Regional Industrial	Yes	Yes	Areas suitable for major industrial centers; one industrial facility was identified
IN	Institutional	Yes	Yes	Public facilities; schools and parks were identified as optimal users
PD	Planned Development	Yes	No	Combination of residential, commercial, and/or manufacturing activities that maximize the use of natural and man-made resources
FW	Floodway	No	No	Areas for flood flow, such as the channel of a river or drainage way
SP	Specific Plan	Yes	No	Area that encompasses the boundaries of an adopted Specific Plan

TABLE 3-4
CITY OF BIG BEAR LAKE LAND USE EVALUATION

Land Use Category	Land Use Name	Suitability for Reuse Application	Considered in This Evaluation	Description
RR	Rural Residential	Yes	No	Single-family residential uses on large lots; one DU per 2.5 acres; limited opportunity to replace existing irrigation
EE	Equestrian Estates	Yes	Yes	Single-family residential uses on larger lots that can accommodate keeping horses; one DU per acre
SFR	Single Family Residential	Yes	No	Single family residential uses at densities varying from two to four units per acre; limited opportunity to replace existing irrigation; significant retrofits of individual residence; Valley-wide permit for residence irrigation with tanks
MFR	Multiple Family Residential	Yes	No	Residential uses with densities up to a maximum of 12 DU per acre; limited opportunities to replace existing irrigation
CG	Commercial - General	Yes	Yes	Broad range of commercial goods and services; fieldwork did not identify major landscaped areas
CR	Commercial – Recreation	Yes	Yes	Wide range of recreational facilities and services (i.e., marina, fishing docks, snow play, ski resorts)
CV	Commercial - Visitor	Yes	Yes	Goods and services oriented to visitors (i.e., hotels, motels, lodges, bed and breakfast facilities); fieldwork did not identify major landscaped areas
CR	Commercial – Services	Yes	Yes	Wide range of administrative, professional, and community services in institutional or office setting; fieldwork did not identify major landscaped areas
IND	Industrial	Yes	Yes	Industrial, manufacturing; one industrial facility was identified
P	Public Facilities	Yes	Yes	Various types of public facilities, including schools, parks, hospitals, public safety and government facilities; schools and parks were identified as optimal users
OS	Open Space	Yes	Yes	Natural and active open space uses that may be either publicly or privately owned
CAMP	Camp Overlay	Yes	No	Existing camps and conference center facilities

3.2.1.2 Irrigation

Recycled water use in the Valley could replace the use of potable water for nonpotable urban irrigation uses. Approval from the water purveyor supplying the user is required prior to supplying recycled water under the Service Duplication Act. (Public Utility Code Section 1501-1507). Potential irrigation users that were identified consist primarily of schools and parks, but also include a golf course, a sports facility, a mobile home park, a timeshare resort, a small hotel, the civic center, a streetscape, a church, and a cemetery. The list of potential irrigation users can be found in Appendix B.

Preliminary fieldwork was conducted in the area to identify additional locations for applying recycled water. A visual field inspection determined that most of the landscaped areas were found on public and recreational facilities, with very limited landscaped areas on residential and commercial properties. Currently, the Valley is experiencing its sixth year of drought-like conditions, and the fragile water situation has partly attributed to the scarcity of landscaped areas. Local water agencies have implemented aggressive water conservation programs that limit homeowner use of potable water for irrigation.

In an effort to help address the water shortage, the BBARWA initiated a pilot program to provide recycled water to individual homeowners and businesses. The BBARWA has worked with local agencies and the CDHS to obtain a regional “blanket” permit that allows the BBARWA to provide tertiary treated recycled water to all residential and commercial users in the Valley on a temporary basis during the existing drought. The tertiary recycled water is treated to Title 22 standards and is produced from an existing pilot MF and RO system at the BBARWA WWTP. Up to 0.4-MG of tertiary water is stored at the plant for distribution. The BBARWA manages the pilot program, but individual homeowners and business owners are responsible for operating and supervising their own recycled water use. The water is trucked by water haulers to the users, stored onsite, and applied by individual property owners. The program became operational in July 2004. Section 3.1.5 discusses the demand generated by this program.

3.2.1.3 Environmental

The potential use of recycled water for environmental impoundment could include use of the water at Lake Williams and the Stickleback Marsh although these uses are not likely. Lake Williams currently is fed by natural drainage and acts as a holding basin for precipitation runoff. The lake currently has a surface area of about 3 acres and is approximately 10 to 15 feet deep. In the past, water in the lake was replenished by a well, but the well has been off-line for a number of years. Lake Williams could accept about 100,000 gpd during nonwinter months.

Another environmental use is to provide recycled water for the Shay Creek habitat for unarmored threespine stickleback fish and wetlands enhancement. This particular Stickleback fish is a state- and federally listed endangered species. When initially discovered in 1979, the range of this fish included approximately 1.75 miles of flowing stream from Shay Meadow north toward Baldwin Lake. As a result of periodic droughts and increased diversions of water, the fish now survive in one small section of a pond approximately 100 feet long by 30 feet wide. Since 1985, BBCCSD has provided approximately 30 gpm of potable water to the pond to maintain the habitat and the fish.

3.2.1.4 Industrial/Commercial

Industrial and commercial facilities are limited in the Valley; therefore, only a few potential recycled water users were identified. The Sterling Planet is a proposed industrial plant that could produce electric energy by burning biomass. The Sterling Planet facility will burn dead trees from the San Bernardino National Forest, which will reduce the potential of forest fires. These trees have been affected by the bark beetle infestation or have died as a result of the drought like conditions. Recycled water would be used at this facility in the cooling cycle. The plant would require a consistent flow of 300 gpm throughout the year, with the exception of 2 to 3 weeks a year when the plant would be shut down for scheduled maintenance. However, the Sterling Planet facility is in the planning stages; therefore, it is currently unclear if this is a reliable demand.

In addition to the Sterling Planet, a few minor commercial uses were identified, including a car wash, clothes washing laundries, and plant nurseries. The consumption of water by these commercial users would be relatively small compared to the other recycled water applications identified in this report.

Two major commercial water users in the area, Bear Mountain Ski Resort and Snow Summit Ski Area, use water for making snow but were not considered as potential recycled water users. These users have access to the water in Big Bear Lake when they need water except during very short periods at very high volumes, which the BBARWA WWTP is not capable of supporting. Due to sporadic nature of these users, they are not well suited for recycled water use.

3.2.1.5 Artificial Surface Replenishment

Artificial surface groundwater replenishment is another potential use of recycled water in the Valley. An artificial surface groundwater replenishment project would allow the BBARWA to augment water supply in the region by increasing the long-term reliability and availability of groundwater. Implementing an artificial surface groundwater replenishment project also would provide the BBARWA with a beneficial use for recycled water within the water basin of origin. Currently, wastewater is discharged in the Lucerne Valley. Since 1980, over 22 billion gallons of water have been discharged to the Lucerne Valley. Artificial surface groundwater replenishment would use the existing natural storage capacity that has been depleted through groundwater extraction.

BBARWA has performed a geohydrologic evaluation that included preliminary reconnaissance and identification of multiple sites for further investigation, site access and environmental assessment, preliminary investigations and borehole drilling, investigation of regulatory requirements, and pilot testing of groundwater replenishment sites. The investigation process narrowed the list of candidates to two potential replenishment sites, the Green Spot and the Van Dusen sites. During the investigation, monitoring wells were constructed between the proposed Green Spot Recharge Site and the potential downgradient wells. If groundwater recharge is implemented, additional monitoring wells may be necessary.

Preliminary studies and pilot testing of the two sites have been used to assess percolation rates of recharge water, impacts of recharge on groundwater levels, and migration characteristics of the stored water. The preliminary artificial recharge rates measured from the pilot recharge test were approximately 3.1 feet per day for Green Spot and approximately 1.1 feet per day for Van Dusen. In addition, the following key characteristics were determined regarding the sites:

- The total artificial recharge receptivity of the Green Spot Recharge Site is estimated to be 1,000 afy. To percolate the upper limit of this amount of water will require approximately 7 acres of recharge area. To meet CDHS requirements, the recycled water to be recharged will be blended with a percentage of diluent water from other sources (e.g., groundwater underflow, stormwater, surface water, or groundwater). The percent of diluent water has not been determined but initially will not exceed 50 percent of the total amount to be artificially recharged at the site on a 5 year rolling average. Thus, the amount of recycled water that could be recharged at this site initially is approximately 500 afy; however, this amount could potentially be exceeded in some calendar years based on the amount of diluent water and the operation of the groundwater basin.