San Juan Hydrologic Unit Regional Water Plan

Prepared By

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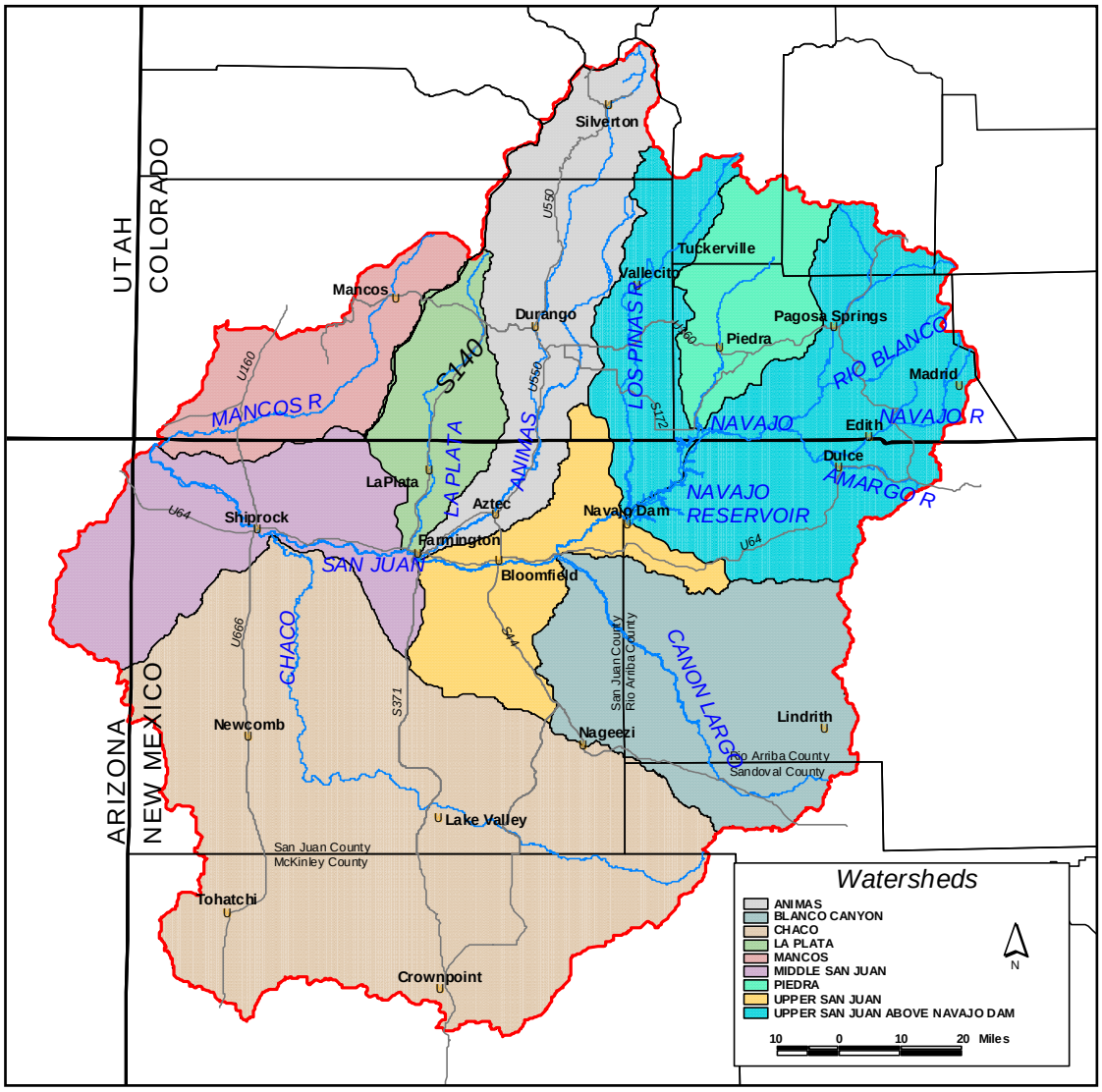
1.0 Introduction

The San Juan Hydrologic Unit is located in the northwest corner of New Mexico and extends into Colorado, Utah, and Arizona. For the purposes of this study, the San Juan Hydrologic Unit was divided into nine watersheds. This report evaluates the water supply available to New Mexico in seven of the nine watersheds. The two watersheds that are not included in this study are the Piedra Watershed and the Mancos Watershed. They are not included because the water demands from these basins are either completely within another state or reservation.

Figure 1-1: San Juan Hydrologic Unit.



1.1. Water Rights

The San Juan Hydrologic Unit Regional Water Plan addresses current and future municipal, industrial and agricultural water demands and available supplies. The analysis of demands does not use water rights as demands. This is because the existence of a water right does not assure a current or future demand for the right.

The aggregate of adjudicated water rights within the basin significantly exceed the current demands for municipal, industrial and agricultural uses. Future demands will likely use some or all of the difference between water rights and current demands. However, this regional planning effort does not identify specific water rights and their potential future uses. This would be more appropriately accomplished with a hydrographic survey and general adjudication.

1.1.1. Summary of Water Rights

Surface water right for the San Juan Basin can be separated into two groups, first, rights assigned from the San Juan County Decree ("Decree Rights") and, second, appropriations assigned after 1948 ('Permit Rights"). The irrigation Decreed Rights (assigned through 1948) are shown in Table 1-1[1]. In addition to the irrigation rights shown in Table 1-1, the San Juan County Decree set forth the following Decreed Rights, 10 cfs continuous flow for the Town of Farmington (7,245 AFY), 205 cfs to be used in Town of Farmington hydro-electric plant (148,515 AFY), and 200 cfs to be used in the Aztec hydro-electric plant (144,893 AFY)[2]. The total amount of Decreed Rights is 432,930 AFY.

The second group of rights consists of new appropriations approved by the New Mexico State Engineer issued from 1948 through 1968. These rights are shown in Table 1-2[3]. The total amount of Permit Rights for the San Juan Basin is 1,268,467 AFY with the USBR accounting for 1,173,800 AFY of this total. The total amount of surface water rights (including Decreed Rights and Permit Rights) in San Juan County is 1,701,397 AFY.

In addition to the surface rights there are 3,920 under ground water rights located in San Juan Basin that have a water right diversion up to 23,709 AFY[4]. Domestic and irrigation wells account for over half of the ground water rights with 7,329 AFY and 6,103 AFY respectively. The total amount of water rights in the San Juan Basin (including surface and underground rights) is 1,725,106 AFY.

[1] Taken from Table 3 and Table 5 of A Study on River Flows in the San Juan Basin Prepared in Defense of Applications to Divert Animas-La Plata Contract Water, State of New Mexico Engineering Report.
[2] Page 27 of A Study on River Flows in the San Juan Basin Prepared in Defense of Applications to Divert Animas-La Plata Contract Water, State of New Mexico Engineering Report.
[3] Taken from Table 7 of A Study on River Flows in the San Juan Basin Prepared in Defense of Applications to Divert Animas-La Plata Contract Water, State of New Mexico Engineering Report and from Water Supply Master Plan, 1981.
[4] New Mexico OSE WATERS database on December 31, 2002.

Table 1-1: Decreed Surface Irrigation Rights

Ditch	River Diversion/ AC (AFY)	Judment Lands to 1948 (AC)	Max Diversion (CFS)	Total Demand (AFY)
BID Citizens	5.03	4,422.2	110.50	22,228
Turley	4.76	270.4	6.70	1,288
Martin-Valencia	4.81	41.7	2.50	201
Twin Rocks	4.63	345.0	8.62	1,597
Ralston	4.66	364.2	9.20	1,696
Cedar Hill	4.66	340.8	8.52	1,587
Inca	4.76	698.1	17.76	3,324
Stacey	4.76	483.2	12.08	2,301
Aztec	4.76	1,383.0	34.57	6,586
Sargent	4.89	173.8	4.50	851
Lower Animas	4.76	2,118.9	52.98	10,090
Farmer's	4.92	1,306.7	32.66	6,430
Eledge Mill	5.03	1,031.9	25.79	5,187
Kello-Blanchett	5.03	526.0	13.15	2,644
Halford-Independent	5.11	2,678.9	66.97	13,678
Terrel	5.03	345.3	8.63	1,736
Star	5.13	1,361.6	34.03	6,988
Echo	5.11	1,584.5	39.61	8,090
Farmington (Allen)	5.11	650.0	16.25	3,319
North Farmington-Wright Leggett	5.11	1,996.6	49.92	10,194
Willet	5.11	49.1	1.61	251
Farmer's Mutual	5.26	4,181.5	104.53	22,014
			Total	132,277

Table 1-2: Post 1948 Surface Water Rights

Lisence or Permit No.	River	Acres or Purpose	Diversion (CFS)	Quantity (AFY)	Lisence or Permit	River	Acres or Purpose	Diversion (CFS)	Quantity (AFY)
2472	San Juan	76.2	2	223.30	2801	Animas	Municipal	3.8	671.60
2475-A	San Juan	253	96	535.70	2802	San Juan	38.14	0.67	114.42
2529	San Juan	38.4	5.64	115.20	2806	San Juan	Irrigation	1.2	209.22
2552 & 2553	San Juan	116	3.6	348.00	2830	Animas	Industrial	0.16	108.00
2557	Animas	33	4.5	100.98	2834	Animas	19.95	1.68	59.85
2574	Animas	40	0.5	120.00	1396	Animas	Industrial	2.2	18.54
2593 (1 & 2)	San Juan	1056.3	26.3	3,405.60	2837	Animas	24.78	13	74.34
2593-3	San Juan	Municipal		1,155.90	2839	Animas	8.5	1	25.50
2593-4	San Juan	24	2.67		2848	San Juan	Irrigation	90	23,000.00
2593-5	San Juan	21.7	0.78	65.10	2866	Animas	7.98	0.96	24.42
2593-2	San Juan	Industrial	0.12	67.67	2870	San Juan	483.67	12	1,451.01
2603	Animas	131	4	399.55	2883	Animas	20600		49,510.00
2637	Animas	15	3.34	45.00	2884	Animas	75.1	2.00	225.30
2648	San Juan	Industrial	0.133	44.00	2995	Animas	Municipal	50	7,200.00
2660	Animas	35.7	3	71.40	3020 & 309	Animas	Recreation	1.95	107.52
2690	San Juan	63.8	3.3	191.40	02554-1	San Juan	Domestic		45.00
2718	San Juan	Industrial	1.5	1,053.00	02554-1-A	San Juan	Domestic		164.70
2720	San Juan	11.1	1	33.30	3215				
2740 (1)	San Juan	Industrial	0.233	16.46				**Subtotal**	11,657.22
2740 (2)	San Juan	Industrial	35	1,566.23					
2740 (3)	San Juan	Industrial		766.23	2838		USBR		55,000
2800 & 2965	San Juan	Industrial		800.00	2847		USBR		235,000
2758	Animas	Industrial	0.7	53.00	2849		USBR		630,000
2776	San Juan	Industrial	0.1	48.20	2873		USBR		28,800
2794	San Juan	27.3	0.4	32.00	2917		USBR		225,000
2800	San Juan	Industrial	2.75	400.00				**Subtotal**	1,173,800
								Total	1,185,457

2.0 Water Demands

For the purposes of the Regional Water Plan, demands were categorized into three categories. The categories are defined as follows:

1. Municipal – includes demands for all residents regardless of their supply (surface water or ground water). Municipal includes all commercial and institutional uses, such as schools and parks.
2. Agricultural – demands include all crops, pastures, or fields that are routinely irrigated.
3. Industrial – demands from the power and mining industry that are not connected to any municipal system.

In addition, demands are further designated at either

- Diversions
- Depletions

Diversions are withdrawals from the water supply. For example, this is the amount of water taken out of the river.

Depletion is the amount of water consumptively used and not returned to the hydrologic system. Examples of depletions are evaporation and plant uses.

The Water Demands portion of the San Juan Hydrologic Unit Regional Water Plan provided present and projected future water demands as both diversions and depletions by watershed.

2.1. Population Projections and Explanation of Methodology

Parsons reviewed existing population and economic projections for the San Juan Hydrologic Unit (SJHU) from the University of New Mexico's Bureau of Business and Economic Research (BBER). The purpose of this review was to determine whether existing population projections for the San Juan Hydrologic Unit (SJHU) are adequate, or whether a different population projection methodology should be used to estimate future water demand from population growth.

Parsons was required to evaluate potential population growth in the study area based on projected economic activity, changes in demographic trends (such as mortality rates and the number of children per household), planning policies and development regulations by public agencies with jurisdiction over land use, and other relevant factors. Parsons' assignment was to develop a "transparent" projection model in 10-year increments through the year 2060. Transparency means that all assumptions are defined, the data inputs to the model are based on readily available information, the methodology is explained in understandable terms and can be readily replicated, and the methods for refining the model are clear as assumptions change.

The relationship between population growth and employment-based economic activity is very important. Individuals move into and out of regions primarily because of the availability of employment or the lack hereof. Even in regions dominated by retirement communities, employment related to services and leisure also create high rates for non-retiree population growth.

2.1.1. Planning Assumptions and Estimating Factors

Parsons attempted to identify planning and economic factors that could affect population growth in the short term (less than ten years), mid term (10 to 20 years), and long term (more than 20 years). Parsons contacted cities and county planners, business organizations, and major employers within the eight basins. Only the City of Farmington has adopted a comprehensive plan with demographic and economic projections. The Farmington plan contains assumptions regarding large-scale changes in the population or economic conditions for Farmington or surrounding areas. No other city or county population projections or related planning documents were uncovered.

During its contacts and data search, Parsons was unable to identify significant planning, economic, or other events or trends that would substantially affect population growth in relation to long-term historic rates. No large commercial or government developments are indicated in the immediate future. Such developments are very difficult to predict and private firms involved in such plans do not like to share such information as it may affect business dealings. For this reason, Parsons developed a population forecast based on regression analysis.

2.1.2. BBER Population forecast Methodology

The Bureau of Business and Economic Research (BBER) of the University of New Mexico provides population estimates for counties in New Mexico. The BBER outlined its population forecast methodology in a report available on the agency's web site[5]. The BBER formula uses the following formula:

Future Population = Current Population +
Births – Deaths +
In Migration – Out-Migration

Each release of the U.S. Census provides a recalibration point for projections. Most predicting agencies will take advantage of the new "real" data and republish/extend their predictions.

2.1.2.1. Methodology for Estimating Natural Growth (Births minus Deaths)

The New Mexico Department of Health annually tracks births and deaths by county. The natural rate of population increase (births minus deaths) is a primary component of population forecasts. Changes in the rate of natural increase provides an indication of demographic changes related to average life span, number of children per household, and average age at which women have children, among other trends. In each of the four counties comprising the areas within the eight SJHU basins, the rate of natural population increase has fallen over the past 50 years as a percentage of the population. Excepting war, natural disasters, and other calamities, natural population growth does not change dramatically from year to year.

2.1.2.2. Net Migration (In-Migration Less Out-Migration)

In-migration and out-migration occur due to numerous individual decisions on the part persons moving in and out of a region. When in-migration exceeds out-migration, population growth exceeds that generated by natural increase. When the reverse is true, population growth is less than one would expect from natural increase. When out-migration greatly exceeds in-migration, population declines can occur, despite natural population growth. Population declines have occurred in many parts of the country at various times of economic hardship and following natural disasters.

Economic opportunities, especially employment opportunities, are among the primary reasons that people move from place to place. In some case, net migration is affected by retirement decisions. Retirement communities experience in-migration without regard to employment opportunities, although such migration leads to employment growth in goods and services businesses oriented to retirees. The presence of coveted natural resources, superior location with respect to trade routes, attractive scenic locations, and recreation opportunities are other reasons that regions experience net in-migrations, which leads to employment growth.

Reliable data on net migration patterns by county and watershed are not available for New Mexico. Neither the U.S. Census nor the State of New Mexico tracks net migration directly at a geographic level that can be used as inputs to a population projection by watershed. Differences between known populations and known birth/death rates can be

[5] New Mexico Population Outlook in the 21st Century by A.N. Alcantara of the BBER & UNM

used to indirectly establish net migration. Such an approach to estimating migration patterns does not provide direct measures needed to establish migration patterns for population forecasting.

New Mexico has experienced several significant in- and out-migrations in recent history. The construction and opening of the Four Corners Power Station (in San Juan County) and Los Alamos National Laboratories (neighboring Sandoval County) employed many people in construction and later as employees of the laboratories. San Juan County, in particular, had an increase of 150% between 1950 and 1960, following which the population actually fell below its 1960 level after the Four Corners facilities opened. The construction companies moved on, and facility staffing leveled off. Part of the net migration may also have been due to the rise and fall of mining operations in the area.

2.1.3. BBER Projections

The BBER projects population for each county of New Mexico. Projections currently available on the BBER website list estimates from 1990 through 2020 in five-year increments. These projections have underestimated actual population growth. For the year 2000, this is true of three of the four counties involved in the SJHU, but is not true of the overall state population and not true of their historical projections. Historically, BBER projections have been significantly higher at times and significantly lower at other times compared to actual population growth. The BBER county population projections are presented in Table 3.

Table 3: Historical Population Comparison Actual Vs BBER

	NM DOH			*BBER*		
	1980	*1990*	*2000*	*1980*	*1990*	*2000*
McKinley	56,536	60,686	74,798	61,500	72,000	72,172
Rio Arriba	29,282	34,365	41,190	29,800	36,100	38,521
Sandoval	34,400	63,319	89,908	27,900	60,800	93,284
San Juan	81,433	91,605	113,801	79,200	98,000	108,432

2.1.4. Use of regression analysis for population projections

Regression analysis is a statistical method of predicting one variable based on one or more other known or observed variables. In the context of a population projection, regression analysis provides a method of predicting future population growth based on historical patterns of changes in population. Historic patterns of change depend on a number of variables discussed above (the rate of natural increase, net migration, employment growth, etc.)

There are several types of regression analysis that can be used for population projections. The most appropriate method depends on patterns of past population growth. The objective is to choose a type of regression model that can best predict future trends based on historic patterns. Four of the more common methods are described in Appendix A.

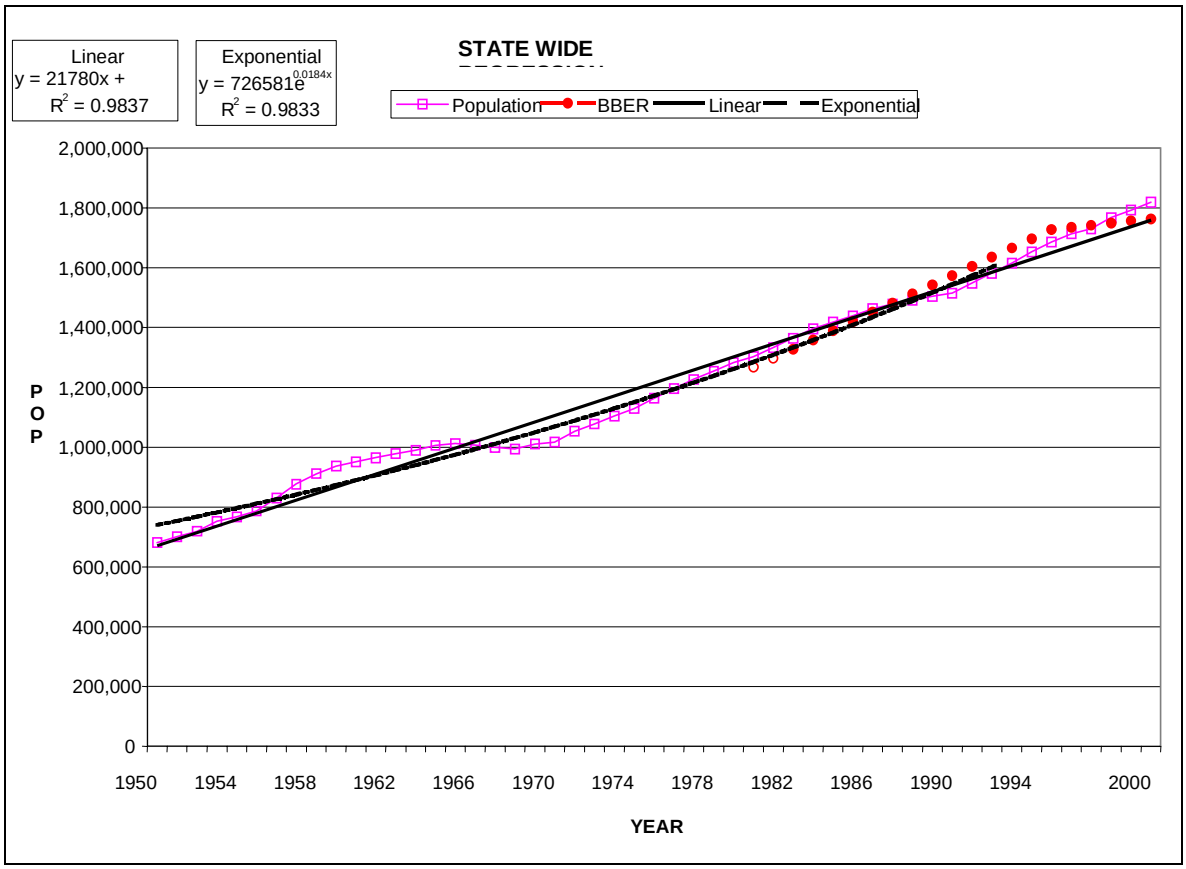
2.1.5. Proposed Projections

2.1.5.1. Linear vs. Exponential Regression

Using the statewide data both linear and exponential regression were performed. The statewide data is well within the limits of known data, interpolating would produce a

reasonably accurate number. Extrapolating beyond 2000, the linear regression will understate, and the exponential will overstate, actual population (see Figure 2).

Figure 2: Comparison of State-wide Projections with Regression Analyses



Using both methods should provide a reasonable lower and upper bound for future populations. However, the more distant the prediction, the less accurate this bracket will be. The statewide population can be seen to exceed both regression lines in the fifties and undershoot both during the sixties. During the seventies and eighties the population follows both lines closely, and then begins to diverge in the nineties. This probably relates to the economic boom of the nineties with firms relocation manufacturing facilities to the southwest (Intel for example). Recent slow economic slow down may result in the population to again slow its growth.

2.1.5.2. Step down using State wide data

Step down refers to the percentage share of a smaller region to the known value within which it resides. For example, step down could be performed to estimate rainfall for a county based on the proportion, by area, the county represents in relation to the entire state, and multiplying that proportion by the total state rainfall. A step-down approach will not be an accurate estimator of a sub-area trend unless the factors affecting the trend are similar in both the sub-area and the entire geographic area. Step-down is frequently used because statistical methods used for projections are more accurate when the population base is larger.

2.1.5.3. Watershed Population Estimates

Parsons used U.S. Census block geographic data and geographic information systems (GIS) to determine the 2000 population within the San Juan Hydrologic Unit and each watershed. The Census Bureau population data by block was downloaded from the website: http://www.geographynetwork.com/data/tiger2000/. The geographic watershed boundaries were downloaded from the website http://www.epa.gov/surf and were modified to the study watershed boundaries.

The census block data was then associated with watershed boundaries using GIS shape files. Blocks straddling boundaries were trimmed spatially using GIS and the attributed population was extrapolated by the percentage of block within each watershed, which assumes even distribution of population within the block. This assumption will likely yield a reasonably accurate result, given the relative small size of each census block group in relation to the watershed area. There will be some error associated with such an assumption of even spatial population distribution, however. Each of these "shape files" was then joined to produce a database file denoting 2000 population per watershed.

2.1.5.4. Watershed Projections

The New Mexico Department of Health tracks annual population by county including births and deaths. One could perform a regression analysis using the county specific numbers, but since the population is so much smaller, economic migrations reduce the accuracy of the regression studies. For example, in San Juan County, significant population growth during the 1950s and the reduction in the population during the 1960s require that trend analysis begin in 1970. The large population swings during the previous two decades could lead to an inaccurate projection if used in a regression analysis, and there is no evidence, at present, to suggest that large changes will recur during the 60-year project period. The comparison numbers using step down for the watershed are shown in Table 4.

Table 4: Step-down Predictions

	STEP DOWN BASED ON WATER BASIN Using Statewide data back to 1950. Linear Regression				*STEP DOWN BY COUNTY Using data from 1970 forward. Linear regression except Sandoval*			
	2005	**2010**	**2015**	**2020**	**2005**	**2010**	**2015**	**2020**
Animas	46,016	48,677	51,338	53,999	46,696	50,137	53,579	57,020
Blanco Canyon	1,607	1,700	1,793	1,886	1,635	1,770	1,905	2,040
Chaco	9,334	9,874	10,413	10,953	9,411	10,083	10,754	11,425
La Plata	15,528	16,426	17,324	18,222	15,757	16,919	18,080	19,241
Mancos	12	12	13	14	12	13	14	14
Middle San Juan	12,133	12,834	13,536	14,237	12,312	13,219	14,127	15,034
Upper San Juan	28,150	29,778	31,406	33,033	28,564	30,668	32,772	34,877
Upper San Juan Above Navajo Dam	1,151	1,217	1,284	1,350	1,151	1,217	1,284	1,350

2.1.5.4.1. Projections Comparison and 2000 Census Verification

Goodness values were maximized by starting a linear regression analysis in the years indicated in Table 5. Inclusion of counts before these years decreases the goodness of fit (goodness value) between historic data and projected trends. With the exception of Sandoval County, the linear and exponential regression methods provide a good fit with historic population trends. The linear is a closer match, but tends to undercount the actual population based on a comparison of projection results and prior census counts. Similarly, the exponential approach tends to overestimate the actual population. The question is, "where in between the values will the actual population fall?", and this cannot be predicted with 100 percent certainty. For example, in 1995, the exponential regression projection nearly matched the actual population estimate for that year, but overestimated the population based on the 2000 Census count. Using historical county data and with the same projection methods, linear regression is much closer to the actual population than exponential.

Statewide, the exponential technique is closer. Sandoval County does not project particularly well using the regression techniques. However, Sandoval only accounts for 1.4% of the SJHU population, so this lack of accuracy is not of great concern.

Table 5: Linear vs. Exponential Regression

	HISTORICAL COMPARISON BY COUNTY								
	NM DOH			*LINEAR REGRESSION*			*EXPONENTIAL REGRESSION*		
	1980	*1990*	*2000*	*1980*	*1990*	*2000*	*1980*	*1990*	*2000*
McKinley	56,536	60,686	74,798	54,159	63,672	73,693	54,889	65,540	76,873
Rio Arriba	29,282	34,365	41,190	29,282	34,244	40,346	29,354	34,529	41,061
Sandoval	34,400	63,319	89,908	33,353	57,286	87,446	35,001	64,127	106,067
San Juan	81,433	91,605	113,801	72,834	97,233	111,753	72,951	100,554	118,212
Total	201,651	249,975	319,697	189,628	252,435	313,237	192,194	264,749	342,211

The results of these regressions are shown in Table 6.

Table 6: Goodness for County Regression

County	Start Year	Pearson
McKinley	1970	98.78%
Rio Arriba	1980	97.60%
Sandoval	1980	96.89%
San Juan	1970	97.00%

2.1.5.4.2. Comparison of Regression Results with BBER Projections

To establish the quality of the BBER projections Parsons used its historical "ten-year out" projections and compared those with the Department of Health's annual count. On a county-by-county basis for the SJHU, the BBER projections have not been close to actual population data, as shown in Table 7.

Table 7: Actual vs. BBER Population Projections

HISTORICAL COUNTY POPULATION COMPARISON

	NM DOH			*BBER*			*Percent Different*		
	1980	*1990*	*2000*	*1980*	*1990*	*2000*	*1980*	*1990*	*2000*
McKinley	56,536	60,686	74,798	61,500	72,000	72,172	8.8%	18.6%	-3.5%
Rio Arriba	29,282	34,365	41,190	29,800	36,100	38,521	1.8%	5.0%	-6.5%
Sandoval	34,400	63,319	89,908	27,900	60,800	93,284	-18.9%	-4.0%	3.8%
San Juan	81,433	91,605	113,801	79,200	98,000	108,432	-2.7%	7.0%	-4.7%

Using the linear regression provides a closer match between past trends and projections by county, Table 8 shows a comparison of the actual population and highlights whether the BBER or Linear Regression is closer.

Table 8: BBER vs. Linear Regression

HISTORICAL COMPARISON

	NM DOH			*BBER*			*LINEAR REGRESSION BY COUNTY*		
	1980	*1990*	*2000*	*1980*	*1990*	*2000*	*1980*	*1990*	*2000*
McKinley	56,536	60,686	74,798	61,500	72,000	72,172	54,159	63,672	73,693
Rio Arriba	29,282	34,365	41,190	29,800	36,100	38,521	29,282	34,244	40,346
Sandoval	34,400	63,319	89,908	27,900	60,800	93,284	33,353	57,286	87,446
San Juan	81,433	91,605	113,801	79,200	98,000	108,432	72,834	97,233	111,753
Total	201,651	249,975	319,697	198,400	266,900	312,409	189,628	252,435	313,237

Neither of the regression methods used will reflect significant changes in net migration trends. If accurate information on net migration trends becomes available, another input could be added to the projection model to increase its accuracy. When new population data becomes available by county or by watershed, this model could be used to update population projections by both linear and exponential regression. Decennial predictions are summarized for convenience.

2.1.5.4.3. Note on the Accuracy of the U.S. CENSUS

The U.S. Census does not estimate the accuracy of its population counts as part of published census data. Census counts are not without error, but there is no way to be certain of the extent of over- or undercounts. Both the Navajo Nation and the Jicarilla

Nation are challenging their reservation population Census counts. Population projections that use historic census counts as the known variable for regression analysis will consequently be subject to errors associated with the census counts.

2.1.5.5. Summary of Population Projections

The BBER makes predictions based on an accepted methodology. Using the data available to them, they have made projections using their methodology. When sufficient time has passed that the projections can be compared to current population estimates or census counts, the BBER projections have both under- and overestimated the actual or estimated population. Such variance is not unexpected with most projection techniques. The amount of variation in the BBER projections can be partly controlled by using a combination of linear regression, which will tend to underestimate the actual population, and exponential regression, which will tend to overestimate the actual population. Using projected population numbers from both of these techniques would define a "bracket" within which the actual population will likely fall.

For this study, it was decided that a single population projection is best for presenting information to the public and in identifying long-range water planning projects. Therefore, the average of the linear and exponential regression results developed by the Parsons' model is being used to project the future water demands. This method is further supported for the 2044-planning horizon since the divergence of the linear and exponential regressions is much smaller than at 2060. The population model is on file in the offices of the San Juan Water Commission and was provided the Interstate State Stream Commission.

2.2. **Animas Watershed**

2.2.1. Present uses

The present water uses for the Animas Watershed were calculated. Both the quantity of water that was diverted for use and the quantity of water that was depleted as a result of the use was estimated.

2.2.1.1. Water diversions by category of use

2.2.1.1.1. Municipal

The quantity of water that was diverted for municipal use within the Animas Watershed in New Mexico was calculated based on the available information. Diversion records for the year 2000 for the surface water treatment plants that supply the City of Aztec and Farmington were used to establish an average monthly diversion per capita day requirement. Once the average monthly diversion per capita day requirement was determined, it was applied to the total population within the watershed to determine a total diversion demand for the Animas Watershed.

The diversion records for the City of Aztec's municipal water system are provided in Appendix B-1. Table 9 summarizes the monthly diversions from the City of Aztec's various diversion locations during the year 2000. The total diverted was 543,597,000 gallons (1,668 acre-feet per year). In addition to meeting the water needs for the City of Aztec, the City of Aztec sells treated water to the Flora Vista Water Users (FVWU) and the Southside Water Users (SWU). To determine the diversion requirements for the City of Aztec only, the quantity of the diversions required to supply FVWU and SWU had to be removed. The delivery records for the City of Aztec's water treatment plant during the year 2000 are provided in Appendix B-2 and are summarized in Table 10. The City of Aztec's deliveries are calculated as the total deliveries minus the deliveries to FVWU and SWU. The total quantity of water treated during the year 2000 was 470,622,000 gallons (1,444 acre-feet per year) or 87% of the total diverted. The significant difference between the quantity of water diverted and the quantity of water treated is primarily due to operational requirements at the water treatment plant (i.e. backwashing of filters). The monthly percentages of the quantity of water delivered versus the quantity of water diverted are provided in Table 11. These monthly percentages were then used to calculate what portion of the total diversions was required to deliver water to the City of Aztec. The calculated monthly diversion requirements to meet the delivery requirements for the City of Aztec are presented in Table 12.

Table 9: Monthly Surface Water Diversion to the City of Aztec's municipal water system – Year 2000 (gallons)

	Animas River	Lower Animas Ditch	Aztec Ditch	Total Diversions
Jan	31,130,000	0	4,806,000	35,936,000
Feb	30,357,000	0	0	30,357,000
Mar	23,933,000	0	15,216,000	39,149,000
Apr	54,995,000	0	0	54,995,000
May	41,450,000	0	10,873,000	52,323,000
Jun	11,758,000	0	52,816,000	64,574,000
Jul	3,134,000	0	57,025,000	60,159,000
Aug	0	0	50,442,000	50,442,000
Sep	2,880,000	0	43,620,000	46,500,000
Oct	0	0	40,202,000	40,202,000
Nov	0	0	40,949,000	40,949,000
Dec	0	0	28,011,000	28,011,000
Total	199,637,000	0	343,960,000	543,597,000

Table 10: Summary of City of Aztec Water Treatment Plant Monthly Deliveries Year 2000 (gallons)

	Total Deliveries	FVWU Deliveries	SWU Deliveries	City of Aztec Deliveries
Jan	29,349,000	2,996,000	2,458,000	23,895,000
Feb	25,337,000	2,103,000	1,970,000	21,264,000
Mar	26,024,000	1,632,000	2,388,000	22,004,000
Apr	38,356,000	864,000	2,604,000	34,888,000
May	50,143,000	15,000	3,113,000	47,015,000
Jun	57,016,000	0	3,492,000	53,524,000
Jul	57,767,000	0	3,119,000	54,648,000
Aug	56,009,000	0	3,378,000	52,631,000
Sep	43,070,000	0	3,216,000	39,854,000
Oct	34,207,000	0	1,885,000	32,322,000
Nov	27,254,000	0	2,420,000	24,834,000
Dec	26,090,000	0	2,607,000	23,483,000
Total	470,622,000	7,610,000	32,650,000	430,362,000

Table 11: Monthly Surface Water Deliveries and Diversions for the City of Aztec water treatment plant – Year 2000 (gallons)

	Total Deliveries	Total Diversions	% Delivery of Diversion
Jan	29,349,000	35,936,000	82%
Feb	25,337,000	30,357,000	83%
Mar	26,024,000	39,149,000	66%
Apr	38,356,000	54,995,000	70%
May	50,143,000	52,323,000	96%
Jun	57,016,000	64,574,000	88%
Jul	57,767,000	60,159,000	96%
Aug	56,009,000	50,442,000	111%
Sep	43,070,000	46,500,000	93%
Oct	34,207,000	40,202,000	85%
Nov	27,254,000	40,949,000	67%
Dec	26,090,000	28,011,000	93%
Total	470,622,000	543,597,000	

Table 12: Calculated Diversion for City of Aztec – Year 2000 (gallons)

	Calculated Deliveries	% Delivery of Diversion	Calculated Diversions
Jan	23,895,000	82%	29,140,000
Feb	21,264,000	83%	25,619,000
Mar	22,004,000	66%	33,339,000
Apr	34,888,000	70%	49,840,000
May	47,015,000	96%	48,974,000
Jun	53,524,000	88%	60,823,000
Jul	54,648,000	96%	56,925,000
Aug	52,631,000	111%	47,415,000
Sep	39,854,000	93%	42,854,000
Oct	32,322,000	85%	38,026,000
Nov	24,834,000	67%	37,066,000
Dec	23,483,000	93%	25,251,000
Total	430,362,000		495,272,000

From the calculated diversions for the City of Aztec, a diversion per capita day was calculated. The 2000 census population for the City of Aztec is 6,378.

Table 13: Calculated Diversion per capita day for the City of Aztec – Year 2000

	Calculated Diversions (gallons)	GPCD Diversion
Jan	29,140,000	147
Feb	25,619,000	139
Mar	33,339,000	169
Apr	49,840,000	260
May	48,974,000	248
Jun	60,823,000	318
Jul	56,925,000	288
Aug	47,415,000	240
Sep	42,854,000	224
Oct	38,026,000	192
Nov	37,066,000	194
Dec	25,251,000	128
Total/Average	495,272,000	212

A similar approach was used to determine the diversion requirements for the City of Farmington. The diversion reports for the City of Farmington's municipal water system are provided in Appendix B-3. Table 14 summarizes the monthly diversions from the City of Farmington's various diversion locations during the year 2000. The total diverted was 4,976,765,000 gallons (15,274 acre-feet per year). The monthly summary of the total treated water produced at the City of Farmington's water treatment plants and the quantity of treated water delivered to the City of Farmington are provided on Table 15. The total produced was 4,164,915,000 gallons (12,783 acre-feet per year) or 84% of the total diverted.

The City of Farmington diverts water from the Animas River to Farmington Lake. As a result, the City of Farmington has some flexibility when it diverts its water. For the purposes of this report, the total annual diversions were distributed over the months based on the annual percentage of water deliveries to water diversions.

The monthly percentages of the quantity of water delivered versus the quantity of water diverted are provided in Table 16. These monthly percentages were used to calculate what portion of the total diversions was required to deliver water to the City of Farmington. The calculated monthly diversion requirements to meet the delivery requirements for the City of Farmington are presented in Table 17.

Table 14: Monthly Surface Water Diversion to the City of Farmington's municipal water system – Year 2000 (gallons)

	Animas Pump Station #1	Animas Pump Station #2	Farmers Ditch	Total Diversions
Jan	0	0	0	0
Feb	0	0	114,317,000	114,317,000
Mar	0	94,669,000	292,245,000	386,914,000
Apr	0	251,400,000	308,070,000	559,470,000
May	0	234,935,000	297,774,000	532,709,000
Jun	0	252,744,000	237,583,000	490,327,000
Jul	0	256,588,000	203,687,000	460,275,000
Aug	0	282,509,000	236,181,000	518,690,000
Sep	14,000,000	250,996,000	497,207,000	762,203,000
Oct	5,280,000	152,563,000	544,496,000	702,339,000
Nov	0	0	252,033,000	252,033,000
Dec	0	197,488,000	0	197,488,000
Total	19,280,001	1,973,892,002	2,983,593,000	4,976,765,000

Table 15: Summary of City of Farmington's Water Treatment Plants Monthly Deliveries Year 2000 (gallons)

	Total Deliveries	City of Farmington's Deliveries
Jan	230,780,000	185,839,000
Feb	218,240,000	176,248,000
Mar	244,640,000	199,943,000
Apr	320,780,000	266,037,000
May	445,295,000	381,792,000
Jun	518,080,000	447,385,000
Jul	533,500,000	461,213,000
Aug	507,280,000	449,751,000
Sep	401,000,000	354,301,000
Oct	302,520,000	257,689,000
Nov	225,600,000	183,607,000
Dec	217,200,000	180,123,000
Total	4,164,915,000	3,543,928,000

Table 16: Monthly Surface Water Deliveries and Diversions for the City of Farmington's water treatment plants 2000 (gallons)

	Total Deliveries	Calculated Diversions	% Delivery of Diversion
Jan	230,780,000	275,765,010	84%
Feb	218,240,000	260,780,639	84%
Mar	244,640,000	292,326,684	84%
Apr	320,780,000	383,308,345	84%
May	445,295,000	532,094,550	84%
Jun	518,080,000	619,067,235	84%
Jul	533,500,000	637,492,993	84%
Aug	507,280,000	606,162,034	84%
Sep	401,000,000	479,165,305	84%
Oct	302,520,000	361,488,997	84%
Nov	225,600,000	269,575,294	84%
Dec	217,200,000	259,537,916	84%
Total	4,164,915,000	4,976,765,000	

Table 17: Calculated Diversion for City of Farmington 2000 (gallons)

	Deliveries	% Delivery of Diversion	Calculated Diversions
Jan	185,839,000	84%	221,237,000
Feb	176,248,000	84%	209,819,000
Mar	199,943,000	84%	238,027,000
Apr	266,037,000	84%	316,711,000
May	381,792,000	84%	454,514,000
Jun	447,385,000	84%	532,601,000
Jul	461,213,000	84%	549,063,000
Aug	449,751,000	84%	535,418,000
Sep	354,301,000	84%	421,787,000
Oct	257,689,000	84%	306,773,000
Nov	183,607,000	84%	218,580,000
Dec	180,123,000	84%	214,432,000
Total	3,543,928,000		4,218,962,000

From the calculated diversions for the City of Farmington, a diversion per capita day was calculated. The 2000 census population for the City of Farmington is 37,844.

Table 18: Calculated Diversion per capita day for the City of Farmington 2000

	Calculated Diversions (gallons)	GPCD Diversion
Jan	221,237,000	189
Feb	209,819,000	191
Mar	238,027,000	203
Apr	316,711,000	279
May	454,514,000	387
Jun	532,601,000	469
Jul	549,063,000	468
Aug	535,418,000	456
Sep	421,787,000	372
Oct	306,773,000	261
Nov	218,580,000	193
Dec	214,432,000	183
Total/Average	4,218,962,000	305

Using the calculated diversions per capita day for the cities of Aztec and Farmington, a monthly diversion per capita day for the Animas Watershed was calculated by weighted average. The weighted averages are presented in Table 19. The weighted average is based on total diversions for each month.

Table 19: Average Diversion per Capita day for Animas Watershed 2000

	City of Aztec's Diversion (gallons)	City of Aztec's Diversion GPCD Day	City of Farmington's Diversion	City of Farmington's Diversion GPCP	Weighted Diversion GPCD Day
Jan	29,140,000	147	221,237,000	189	184
Feb	25,619,000	139	209,819,000	191	185
Mar	33,339,000	169	238,027,000	203	199
Apr	49,840,000	260	316,711,000	279	276
May	48,974,000	248	454,514,000	387	373
Jun	60,823,000	318	532,601,000	469	454
Jul	56,925,000	288	549,063,000	468	451
Aug	47,415,000	240	535,418,000	456	438
Sep	42,854,000	224	421,787,000	372	358
Oct	38,026,000	192	306,773,000	261	253
Nov	37,066,000	194	218,580,000	193	193
Dec	25,251,000	128	214,432,000	183	177

To calculate the municipal diversions for the Animas Watershed, the monthly weighted diversions per capita day was applied to the population within the Animas Watershed. The population for the Animas Watershed was determined using census blocks from the

2000 Census. There are 1,651 census blocks that cover the Animas Watershed, of which only 919 contain any population. Several of the census blocks extended outside of the Animas Watershed. For these areas, only the population within the Animas Watershed was included. Figure 3 shows the census blocks that contribute to the population within the Animas Watershed. The total population for the Animas Watershed in the year 2000 was 40,769. Using the total population and the information from Table 19, the total diversion demand for the Animas Watershed was calculated in Table 20.

Figure 3: Census Blocks within the Animas Watershed

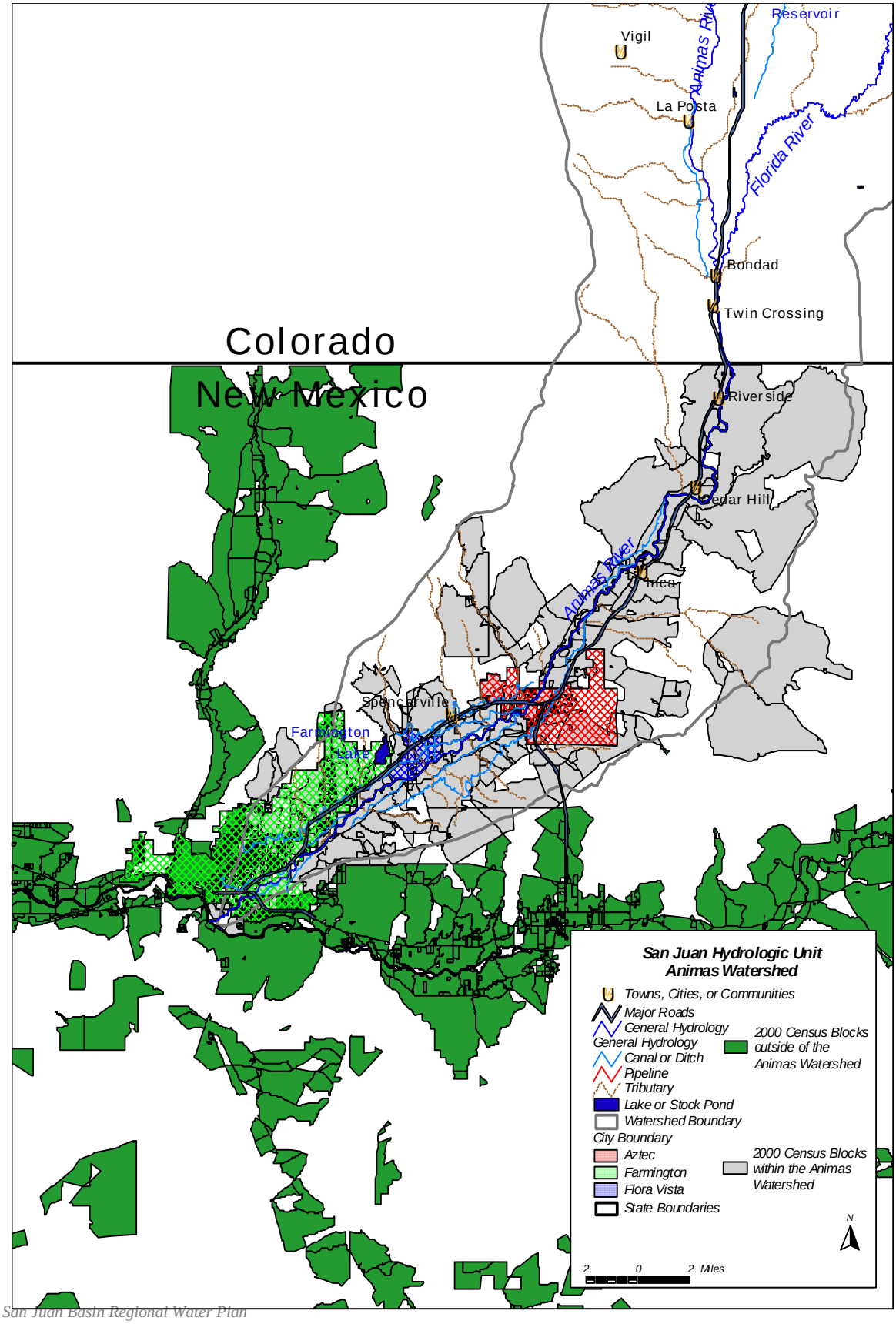


Table 20: Animas Watershed Diversions (Municipal 2000)

	GPCD Diversion	Diversions (gallons)	Diversions (acre-feet)
Jan	184	232,546,376	714
Feb	185	218,725,685	671
Mar	199	251,503,961	772
Apr	276	337,567,320	1,036
May	373	471,411,947	1,447
Jun	454	555,273,780	1,704
Jul	451	569,991,389	1,749
Aug	438	553,561,482	1,699
Sep	358	437,859,060	1,344
Oct	253	319,751,267	981
Nov	193	236,052,510	724
Dec	177	223,699,503	687
Average/Total		4,407,944,280	13,528

2.2.1.1.2. Agricultural

Diversion records were not available for the agricultural uses. To estimate the diversions, the following assumptions were required. The diversion requirements were estimated based on the depletions calculated in Table 28, section 2.1.1.2.2. Only acreage within the basin is included, although diversions from this Animas River serve acreage outside the watershed. Diversions were calculated as twice the depletion quantity plus 10 percent for incidental losses associated with canal seepage. This calculation assumes that 50% of the water applied to the ground was lost to percolation or direct runoff. The total irrigated acreage and the diversion requirements for agricultural use for the Animas Watershed are presented in Table 21. Another assumption is that lawn and garden watering from canals is accounted for only in the water supply budget because there is no available data on acreage or diversion for these urban uses.

Table 21: Agricultural Diversions for the Animas Watershed (AF)

Acres	May	June	July	August	September	October	Total Diversion
4,458	2,333	4435	5152	4492	2928	629	19,969

2.2.1.1.3. Industrial

Small industrial uses supplied by the water treatment plants were not specifically identified and are included in the municipal demands. Other industrial diversions within the Animas Watershed were obtained from the New Mexico Office of the State Engineer records (See Appendix E-1). The industrial diversions within the Animas Watershed are surface water diversions and are presented in Table 22. The diversions provided are total annual values. For the purposes of this study the diversions were distributed equally over the entire year. The total industrial diversions for the Animas Watershed are 36 acre-feet and are distributed monthly in Table 23.

Table 22: Industrial Diversions within the Animas Watershed

Industry	Diversion (acre-feet)
Meridian Oil	36
Total	36

2.2.1.1.4. Summary of Animas Watershed Diversions

The total monthly diversions within the Animas Watershed are summarized in Table 23. The values presented in Table 23 are in acre-feet.

Table 23: Total Monthly Diversions in the Animas Watershed (AF)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Municipal	714	671	772	1,036	1,447	1,704	1,749	1,699	1,344	981	724	687	13,528
Agricultural	0	0	0	0	2,333	4435	5152	4492	2928	629	0	0	19,969
Industrial	3	3	3	3	3	3	3	3	3	3	3	3	36
Total	717	674	775	1,039	3,783	6,142	6,904	6,194	4,275	1,613	727	690	33,533

2.2.1.2. Water depletions by category of use

Depletions are the quantity of water that is diverted from the watershed that does not return to the system. Depletions include transbasin diversions, human consumption, plant consumptions, and industrial process consumption.

2.2.1.2.1. Municipal

Municipal depletions can be calculated based on the quantity of water that is delivered from the water treatment plant and the quantity of water that returned through the wastewater treatment plant. Table 24 shows the calculated total monthly depletions and depletions per capita day for the City of Aztec. Because many of the communities within the watershed do not have a secondary water system, some of the treated water delivered is used to irrigate lawns and gardens. To account for the return flows from irrigated lawns and gardens, it was assumed that 50% of the depletions above the average winter baseline would be return flows. This assumption was based on the "Return Flow Plan and Crediting Program for San Juan Water Commission, March 1998". The average winter baseline for the City of Aztec was calculated as 23 gpcd based on the depletions for November through March shown in Table 24.

Table 24: City of Aztec Depletions

	Calculated Deliveries (gallons)	Wastewater Treatment Plant Return Flows	Calculated Depletions (gallons)	GPCD Depletions
Jan	23,895,000	18,869,000	5,026,000	25
Feb	21,264,000	17,028,000	4,236,000	23
Mar	22,004,000	18,546,000	3,458,000	17
Apr	34,888,000	18,103,000	16,785,000	55
May	47,015,000	18,602,000	28,413,000	83
Jun	53,524,000	18,403,000	35,121,000	103
Jul	54,648,000	19,410,000	35,238,000	101
Aug	52,631,000	20,234,000	32,397,000	93
Sep	39,854,000	20,312,000	19,542,000	63
Oct	32,322,000	21,068,000	11,254,000	40
Nov	24,834,000	19,403,000	5,431,000	28
Dec	23,483,000	19,191,000	4,292,000	22
Total	430,362,000	229,169,000	201,193,000	

Table 25 summarizes the monthly depletions and calculates the GPCD depletions for the City of Farmington. The wastewater treatment plant was assumed to service only the City of Farmington and not the other communities that receive water from the City of Farmington water treatment plant. To account for the return flows from irrigated lawns and gardens, 50% of the depletions above the average winter baseline were considered to be return flows as described above. The average winter baseline for the City of Farmington was calculated as 42 gpcd, based on the depletions for November through March as shown in Table 25.

Table 25: City of Farmington Municipal & Residential Depletions

	City of Farmington Deliveries	Total Wastewater Return Flows	Depletions (gallons)	GPCD Depletions
Jan	185,839,000	130,650,000	55,189,000	47
Feb	176,248,000	128,230,000	48,018,000	44
Mar	199,943,000	144,660,000	55,283,000	47
Apr	266,037,000	153,530,000	112,507,000	71
May	381,792,000	159,260,000	222,532,000	116
Jun	447,385,000	162,560,000	284,825,000	146
Jul	461,213,000	169,750,000	291,463,000	145
Aug	449,751,000	172,620,000	277,131,000	139
Sep	354,301,000	162,010,000	192,291,000	106
Oct	257,689,000	159,240,000	98,449,000	63
Nov	183,607,000	141,050,000	42,557,000	37
Dec	180,123,000	138,150,000	41,973,000	36
Total/Average	3,543,928,000	1,821,710,000	1,722,218,000	

Table 26: Average Municipal and Residential Depletions per Capita day for Animas Watershed

	City of Aztec's Depletions (gallons)	City of Aztec's GPCD Depletions	City of Farmington's Depletions (gallons)	City of Farmington's GPCD Depletions	Weighted GPCD Depletions
Jan	5,026,000	25	55,189,000	47	45
Feb	4,236,000	23	48,018,000	44	42
Mar	3,458,000	17	55,283,000	47	45
Apr	16,785,000	55	112,507,000	71	69
May	28,413,000	83	222,532,000	116	112
Jun	35,121,000	103	284,825,000	146	141
Jul	35,238,000	101	291,463,000	145	140
Aug	32,397,000	93	277,131,000	139	134
Sep	19,542,000	63	192,291,000	106	102
Oct	11,254,000	40	98,449,000	63	61
Nov	5,431,000	28	42,557,000	37	36
Dec	4,292,000	22	41,973,000	36	35
Total	201,193,000		1,722,218,000		

Using the total population and the information from Table 26, the total depletions for the Animas Watershed were calculated in Table 27.

Table 27: Animas Watershed Depletions

	GPCD Depletions	Depletions (gallons)	Depletions (acre-feet)
Jan	45	56,872,755	175
Feb	42	49,656,642	152
Mar	45	56,872,755	175
Apr	69	84,391,830	259
May	112	141,549,968	434
Jun	141	172,452,870	529
Jul	140	176,937,460	543
Aug	134	169,354,426	520
Sep	102	124,753,140	383
Oct	61	77,094,179	237
Nov	36	44,030,520	135
Dec	35	44,234,365	136
Average/Total		1,198,200,910	3,678

2.2.1.2.2. Agricultural

Agricultural depletions were calculated using the same approach used by the State of New Mexico. The original Blaney-Criddle method was used to determine the annual consumptive use requirements. The annual consumptive uses were then distributed using

monthly crop use percentages that were developed using the Modified Blaney-Criddle method.

The consumptive use coefficients (k) and consumptive use factors (f) were obtained from "Technical Report 32, Consumptive Use and Water Requirements in New Mexico." The consumptive use coefficients for the Modified Blaney-Criddle method were obtained from the "Irrigation Water Requirements, Soil Conservation Service, September 1970." The monthly consumptive use values for crops in Bloomfield, Farmington, and Shiprock are also provided in the "Technical Report 32". The consumptive use values from these three areas were averaged to develop representative consumptive use values for the San Juan Hydrologic Unit.

Irrigated acreage for the year 2000 was obtained from the New Mexico Interstate Streams Commission (ISC) in GIS format. The irrigated acreage was then divided by watershed. The acreage was totaled and compared with tabular acreage for the year 2000 provided by the ISC in a memorandum to US Bureau of Reclamation, dated Feb. 5, 2002, to confirm that all the acreage was accounted for. The irrigated acreage within the Animas Watershed was summarized for each crop type and the consumptive use for each crop was calculated. In addition to the crop consumptive use, incidental losses associated with phreatophytes and evaporation also contribute to consumptive use. It was assumed that incidental losses consumptive users were approximately 10% of the total crop consumptive use. The results are presented in Table 28.

Table 28: Monthly Agricultural Depletions within the Animas Watershed

	Acres	May	June	July	August	September	October	Total CU
Alfalfa	1,018	289	510	602	529	333	76	2,339
Corn	125	18	47	75	68	41	0	249
Vegetables	37	5	12	19	19	12	3	70
Orchard	70	11	31	37	25	13	0	117
Pasture	2,903	696	1236	1485	1298	864	192	5,771
Grain	81	47	92	10	0	0	0	149
Sod	151	36	64	77	67	45	10	299
GPA	73	9	24	37	36	23	5	134
Subtotal	4,458	1,111	2,016	2,342	2,042	1,331	286	9,128
Incidental Losses		111	202	234	204	133	29	913
Total	4,458	1,222	2,218	2,576	2,246	1,464	315	10,041

2.2.1.2.3. Industrial

Industrial depletions within the Animas Watershed were obtained from the New Mexico Office of the State Engineer records (See Appendix E-1). All of the industrial depletions within the Animas Watershed are surface water depletions. The depletions provided are total annual values. For the purposes of this study the depletions were distributed equally over the entire year. The total industrial depletions for the Animas Watershed are 36 acre-feet (100% of the diversions) and are distributed monthly in Table 29.

2.2.1.2.4. Summary of Animas Watershed Depletions

The total monthly depletions within the Animas Watershed are summarized in Table 29. The values presented in Table 29 are in acre-feet.

Table 29: Summary of Depletions in the Animas Watershed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Municipal	175	152	175	259	434	529	543	520	383	237	135	136	3,678
Agricultural	0	0	0	0	1,222	2,218	2,576	2,246	1,464	315	0	0	10,041
Industrial	3	3	3	3	3	3	3	3	3	3	3	3	36
Total	178	155	178	262	1,659	2,750	3,122	2,769	1,850	555	138	139	13,755

2.2.2. Future water uses

2.2.2.1. Zoning / Buildout

The existing land ownership was evaluated within the Animas Watershed. The total acreage of private lands was calculated to ensure that the population density (people per acre) did not exceed a typical population density for buildout. Typical buildout populations are in the range of 4 to 6 people per acre. The total acreage of private lands within the Animas Watershed was calculated at approximately 59,600 acres. Using the 2060 buildout population of 105,212, the population density within the Animas Watershed would increase to an average of approximately 1.8 people per acre. Therefore the availability of land for growth to develop does not limit growth in the Animas Watershed. This calculation assumes that all of the private lands are available for development. If growth were limited to non-irrigated lands, the population density would still not affect the growth rate.

2.2.2.2. Projected Population and Water Demands

Future water use projections are based on the same three categories that were used in current water demand analysis. Those categories are:

- municipal ,
- industrial, and
- agricultural.

There are several assumptions that are the basis for projecting demand for each of these categories through the planning horizon.

Parsons applied gallons per capita day values for each watershed to population projections to calculate future municipal demands. By using a combination of the water use in the urban areas, it is assumed that as population develops, that the entire watershed will become more urbanized, with lawns and water use that is more typical of urban and suburban developments. Parsons assumed that the level of development in the commercial or business sector would mirror population growth within the area. That is to say that the percentage of commercial demand in the future will be the same as it is today. The issue of weekenders coming into the City of Farmington for services is accounted for in these numbers, because the additional demand placed on the municipal water system is present today and accounted for in the gallons per capita day values.

Major industrial growth was not anticipated by any of the entities contacted to identify economic trends in the area. Plans to consider expansion of the San Juan Generating

Power Plant was the only projected increase in the industrial water demand. One additional unit might be added to the plant by the year 2020 and a second before 2040. Each of these coal-fired units would require approximately 6 million gallons of water daily for operation. Additionally, Parsons assumed a nominal annual growth rate of 2% for other industry in the area, with a corresponding 2 percent annual increase in annual water consumption.

Agricultural water demand is best explained as a preservation state. Parsons assumed that irrigated agricultural acreage would remain the same over the next forty years. That does not mean that the actual location of the acreage will not change, but it is assumed that any acreage that is displaced by urban development will be picked up in new acreage outside of the current irrigated acreage. Water use is constant through the planning horizon for this reason. Another assumption made in that the crops produced in the area will not change significantly in type or distribution. The projected water use for the Animas watershed is presented in the following tables and graphs. Figure 4 shows population growth and associated municipal diversion demands, Figure 5 and Table 30 show values for projected diversions. Figure 6 and Table 31 show values for projected depletions. Figure 7 and

Table 32 show monthly diversions for the planning horizon year of 2044.

Figure 4: Animas Watershed Population Projections and Municipal Diversions

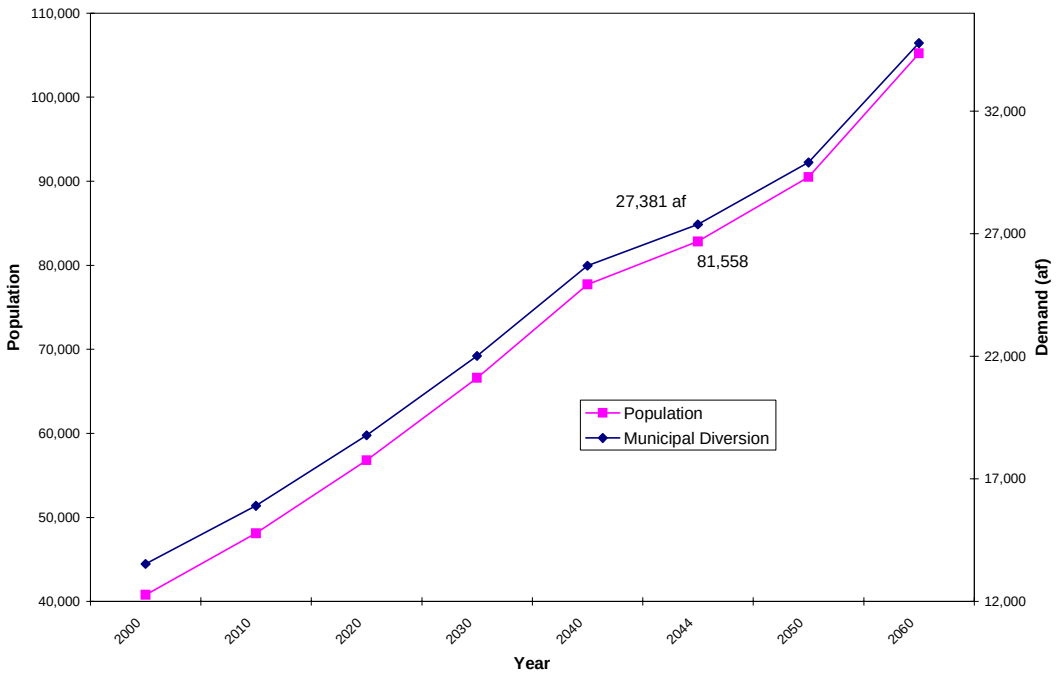


Figure 5: Animas Watershed Projected Annual Diversions

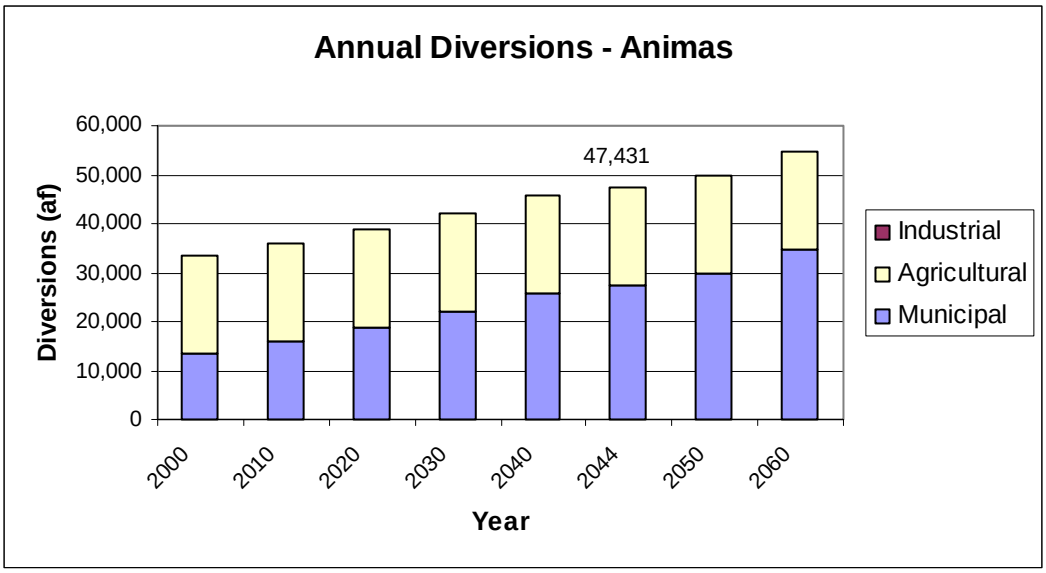


Table 30: Animas Watershed Projected Annual Diversions (AF)

Year	Population	Municipal	Industrial	Agricultural	Total
2000	40,769	13,528	36	19,969	33,533
2010	48,102	15,901	43	19,969	35,913
2020	56,797	18,775	52	19,969	38,795
2030	66,595	22,013	62	19,969	42,045
2040	77,731	25,695	75	19,969	45,738
2044	82,834	27,381	81	19,969	47,431
2050	90,488	29,912	90	19,969	49,970
2060	105,212	34,779	107	19,969	54,855

Figure 6: Animas Watershed Projected Annual Depletions

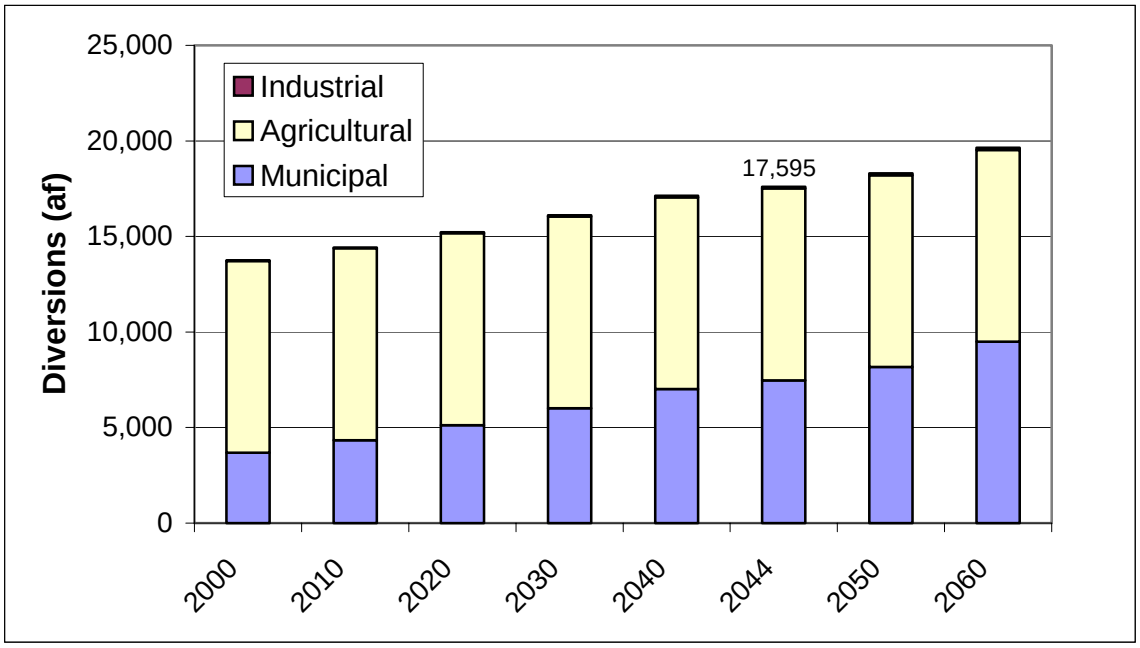


Table 31: Animas Watershed Projected Annual Depletions (AF)

Year	Population	Demand	Industrial	Agricultural	Total
2000	40,769	3,678	36	10,041	13,755
2010	48,102	4,340	43	10,041	14,424
2020	56,797	5,124	52	10,041	15,217
2030	66,595	6,008	62	10,041	16,111
2040	77,731	7,013	75	10,041	17,128
2044	82,834	7,473	81	10,041	17,595
2050	90,488	8,163	90	10,041	18,294
2060	105,212	9,492	107	10,041	19,640

Figure 7: Animas Watershed Monthly Diversions (2044)

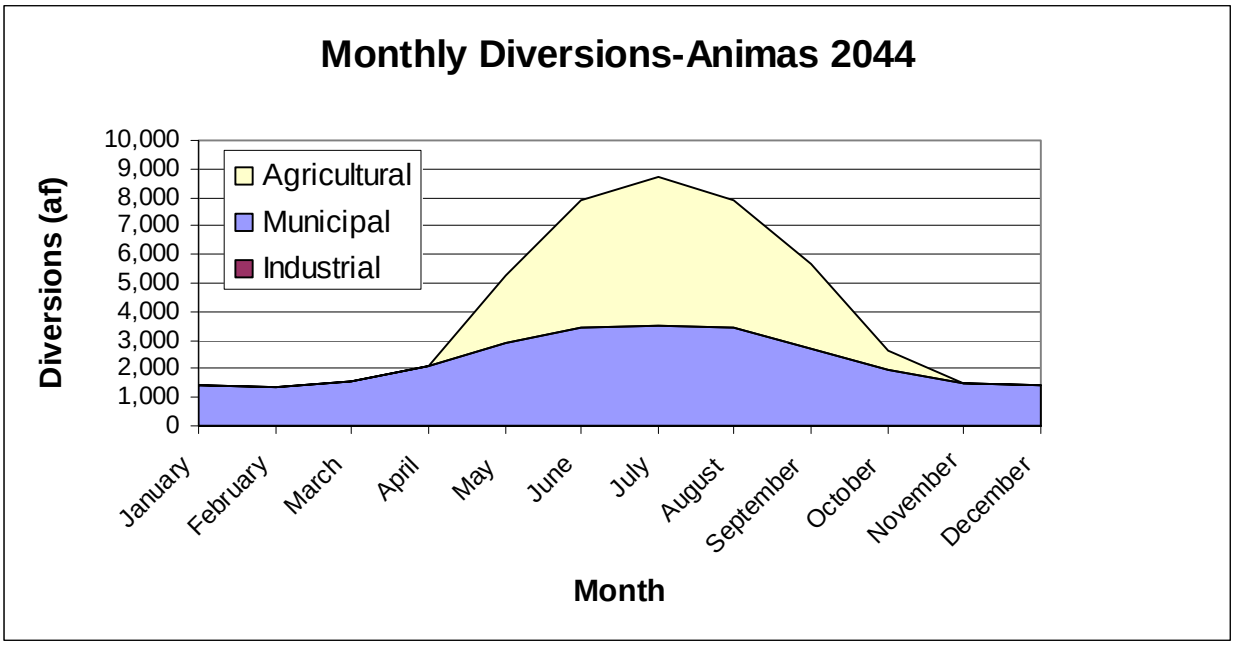


Table 32: Animas Monthly Diversions in 2044 (AF)

	Municipal	Industrial	Agricultural	Total
Jan	1,445	7	0	1,452
Feb	1,358	7	0	1,365
Mar	1,563	7	0	1,569
Apr	2,097	7	0	2,104
May	2,929	7	2,333	5,268
Jun	3,449	7	4,435	7,891
Jul	3,540	7	5,152	8,699
Aug	3,439	7	4,492	7,937
Sep	2,720	7	2,928	5,655
Oct	1,986	7	629	2,621
Nov	1,465	7	0	1,472
Dec	1,390	7	0	1,397
			Total	47,430

Projected total demand for the Animas watershed in 2044 is 47,431 acre-feet with a peak of 8,699 acre-feet in July, which is mostly composed of municipal demand increases as the population doubles over the next forty years.

2.3. **Blanco Canyon Watershed**

2.3.1. Present uses

Data on present water uses for the Blanco Canyon Watershed were not available. As a result, the diversions and depletions were estimated.

2.3.1.1. Water diversions by category of use

2.3.1.1.1. Municipal

To estimate the diversion requirements for the Blanco Canyon Watershed, diversions per capita day for Lower Valley Water Users Cooperative Association were used and applied to the Blanco Canyon population. The population for the Blanco Canyon Watershed was determined using census blocks from the 2000 Census. There are 3,026 census blocks that cover the Blanco Canyon Watershed, of which only 159 contain any population. Of the 159 census blocks with population 147 of them are outside of the Jicarilla Apache Nation. Several of the census blocks extend outside of the Blanco Canyon Watershed. For these areas, only the population within the Blanco Canyon Watershed was included. Figure 8 shows the census blocks that contribute to the population within the Blanco Canyon Watershed. The population for the Blanco Canyon Watershed identified in Figure 8 for the year 2000 was 1,131. In addition, transbasin diversions for municipal uses serve approximately 80 homes east of Lindrith. This equates to an approximately 57 acre-feet usage. Using this population and the additional 57 acre feet, the total diversion demand for the Blanco Canyon Watershed was calculated in Table 33.

Figure 8: 2000 Census Blocks within the Blanco Canyon Watershed

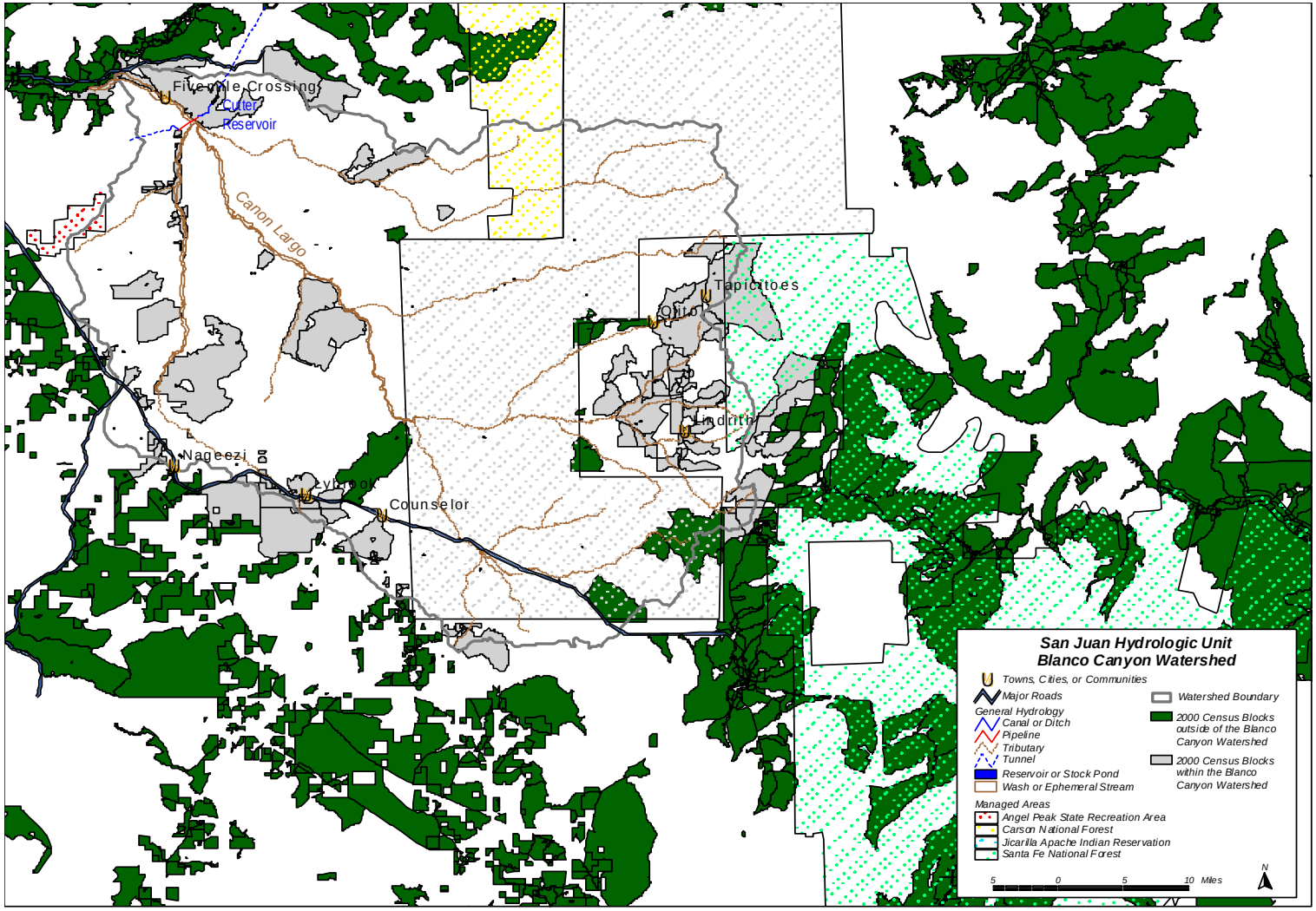


Table 33: Assumed Municipal diversions for the Blanco Canyon Watershed

	GPCD Watershed Diversions	Watershed Diversions (gallons)	Watershed Diversions (acre-feet)
Jan	31	1,086,891	3
Feb	75	2,459,925	8
Mar	80	2,804,880	9
Apr	94	3,189,420	10
May	122	4,277,442	13
Jun	158	5,360,940	16
Jul	143	5,013,723	15
Aug	160	5,609,760	17
Sep	106	3,596,580	11
Oct	106	3,716,466	11
Nov	73	2,476,890	8
Dec	68	2,384,148	7
Average/Total		41,977,000	128

The additional 57 acre feet of transbasin diversion results in an annual total of 185 acre feet.

2.3.1.1.2. Agricultural

No commercial agricultural irrigation diversions were included for the Blanco Canyon Watershed because there was not any agricultural acreage identified. At a meeting with citizens of Lindrith, approximately 323 acres of gardens and landscape irrigation using 646 acre-feet of water were identified. Also, approximately 107 acre-feet of stock watering water for year 2000 is included in the demands.

2.3.1.1.3. Industrial

Industrial diversions within the Blanco Canyon Watershed were obtained from the New Mexico Office of the State Engineer records (See Appendix E-1). All of the industrial diversions within the Blanco Canyon Watershed are groundwater withdrawals. The withdrawals provided are total annual values. For the purposes of this study the withdrawals were distributed equally over the entire year. The total industrial withdrawals for the Blanco Canyon Watershed are 32.9 acre-feet and are distributed monthly in Table 34.

2.3.1.1.4. Summary of Blanco Canyon Watershed Diversions

The total monthly diversions within the Blanco Canyon Watershed are summarized in Table 34.

Table 34: Total Monthly Diversions in the Blanco Canyon Watershed (AF)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Municipal	3	8	9	10	13	16	15	17	11	11	8	7	128
Agricultural	9	9	9	9	138	138	138	138	138		9	9	753
Industrial	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	2.7	32.4
Total	14.7	19.7	20.7	21.7	153.7	156.7	155.7	157.7	151.7	22.7	19.7	18.7	913.4

2.3.1.2. Water depletions by category of use

2.3.1.2.1. Municipal

The same assumptions that were used for estimating the diversions within the Blanco Canyon Watershed were used to estimate the depletions. The Lower Valley Water Users Cooperative Association GPCD values were used to calculate Blanco Canyon depletions. The results are presented in Table 35.

Table 35: Assumed Depletions for the Blanco Canyon Watershed

	Watershed GPCA Depletions	Watershed Depletions (gallons)	Watershed Depletions (acre-feet)
Jan	10	350,610	1
Feb	25	819,975	3
Mar	26	911,586	3
Apr	31	1,051,830	3
May	40	1,402,440	4
Jun	52	1,764,360	5
Jul	47	1,647,867	5
Aug	53	1,858,233	6
Sep	35	1,187,550	4
Oct	35	1,227,135	4
Nov	24	814,320	2
Dec	22	771,342	2
Average/Total		13,807,000	42

The 57 acre-feet of trans-basin diversion are completely depleted from the watershed.

2.3.1.2.2. Agricultural

Depletions for the existing irrigated acreage are approximately 323 acre-feet and stock watering depletions are 107 acre-feet.

2.3.1.2.3. Industrial

Industrial depletions within the Blanco Canyon Watershed were obtained from the New Mexico Office of the State Engineer records (See Appendix E-1). All of the industrial depletions within the Blanco Canyon Watershed are groundwater depletions. The depletions provided are total annual values. For the purposes of this study the depletions were distributed equally over the entire year. The total industrial depletions for the Blanco Canyon Watershed are 27.23 acre-feet and are distributed monthly in Table 36.

2.3.1.2.4. Summary of Blanco Canyon Watershed Depletions

The total monthly depletions within the Blanco Canyon Watershed are summarized in Table 36. The values presented in Table 36 are in acre-feet.

Table 36: Summary of Depletions in the Blanco Canyon Watershed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Municipal	1	3	3	3	4	5	5	6	4	4	2	2	42
Agricultural	9	9	9	9	74	74	74	74	74	9	9	9	432
Industrial	2.27	2.27	2.27	2.27	2.27	2.27	2.27	2.27	2.27	2.27	2.27	2.27	27
Total	12.27	14.3	14.3	14.3	80.3	81.3	81.3	82.3	80.3	15.3	13.3	13.3	501.0

2.3.2. Future water uses

2.3.2.1. Zoning / Buildout

The existing land ownership was evaluated within the Blanco Canyon Watershed. The total acreage of private lands was calculated to ensure that the population density (people per acre) did not exceed a typical population density for buildout. Typical buildout populations are in the range of 4 to 6 people per acre. The total acreage of private lands within the Blanco Canyon Watershed was calculated at approximately 128,700 acres. Using the 2060 buildout population of 6,617, the population density within the Blanco Canyon Watershed would increase to an average of less than 0.1 persons per acre. Therefore, the availability of land for growth to develop does not limit growth in the Blanco Canyon Watershed. This calculation assumes that all of the private lands are available for development. If growth were limited to non-irrigated lands, the population density would still not affect the growth rate.

2.3.2.2. Projected water demands by category of use

Future water use projections are based on the same three categories that were used in current water demand analysis. Those categories are:

- municipal ,
- industrial, and
- agricultural.

There are several assumptions that are the basis for projecting demand for each of these categories through the planning horizon.

Gallons per capita day (GPCD) values for each watershed were applied to population projections to calculate future municipal demands. For the Blanco Watershed, 160 gallons per capita day was applied to the watershed population increase above 2000 population. It is assumed that as growth occurs, future developments will require municipal demands more closely associated with urban usage than with rural usage. Consequently, a higher per capita usage than current per capita usage is used for future projections. The projected water use for the Blanco watershed is presented in the following tables and graphs. Figure 9 shows population growth and associated municipal diversion demands and shows values for projected diversions. It includes an additional 57 acre-feet for transbasin diversions.

Figure 10 and Table 37show values for projected diversions. Figure 11 and Table 38 show values for projected depletions. Figure 12 and Table 39 show monthly diversions for the planning horizon year of 2044.

Figure 9 Blanco Canyon Watershed Population Projections and Municipal Diversions

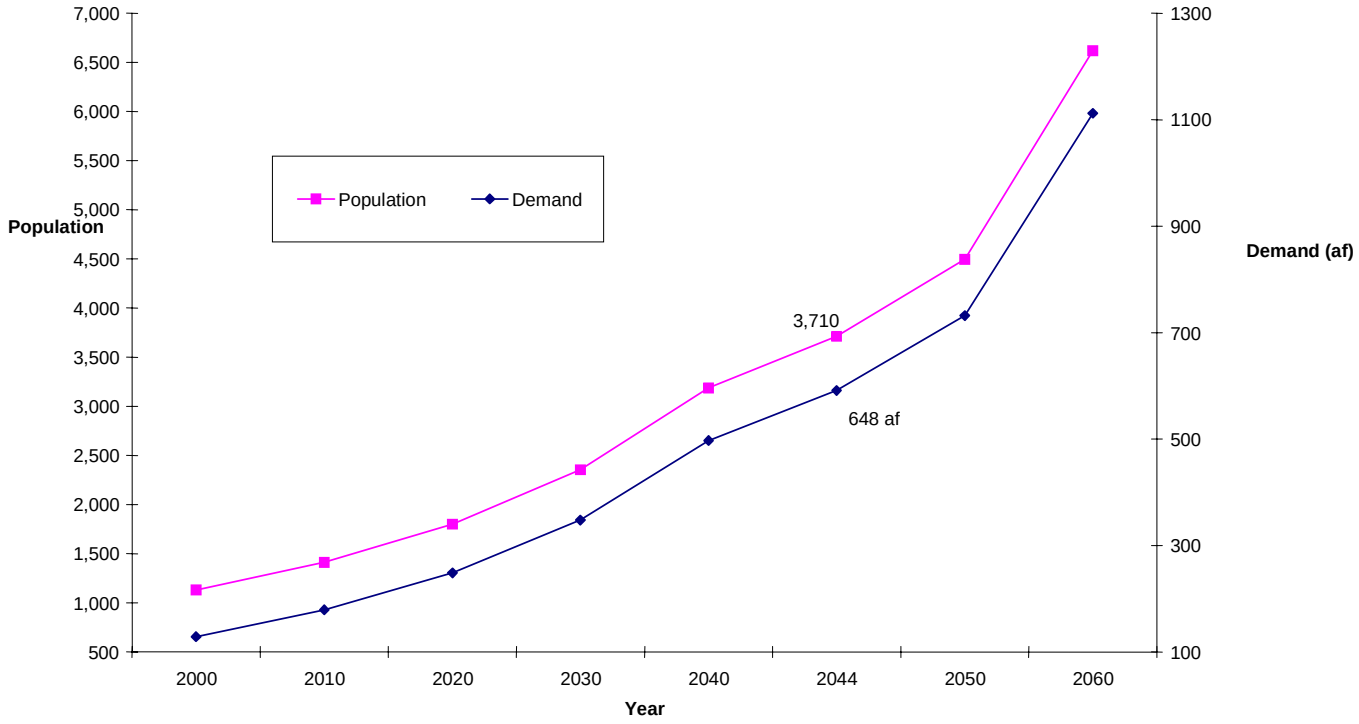


Figure 10: Blanco Watershed Projected Annual Diversions

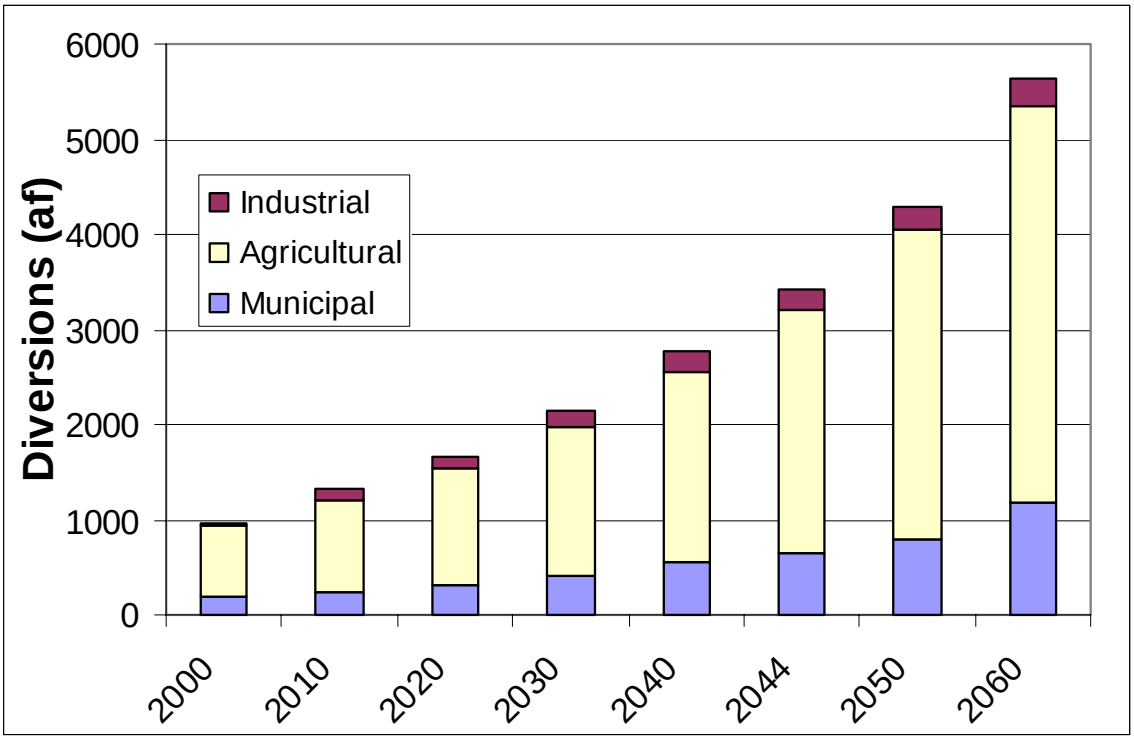


Table 37: Blanco Canyon Watershed Projected Annual Diversions (AF)

Year	Population	Municipal	Industrial	Agricultural	Total
2000	1,131	186	33	753	972
2010	1,412	236	117	962	1315
2020	1,799	306	140	1228	1674
2030	2,353	405	168	1569	2142
2040	3,186	554	202	2004	2760
2044	3,710	648	218	2559	3425
2050	4,496	789	243	3268	4300
2060	6,617	1169	291	4175	5635

Figure 11: Blanco Canyon Watershed Projected Annual Depletions

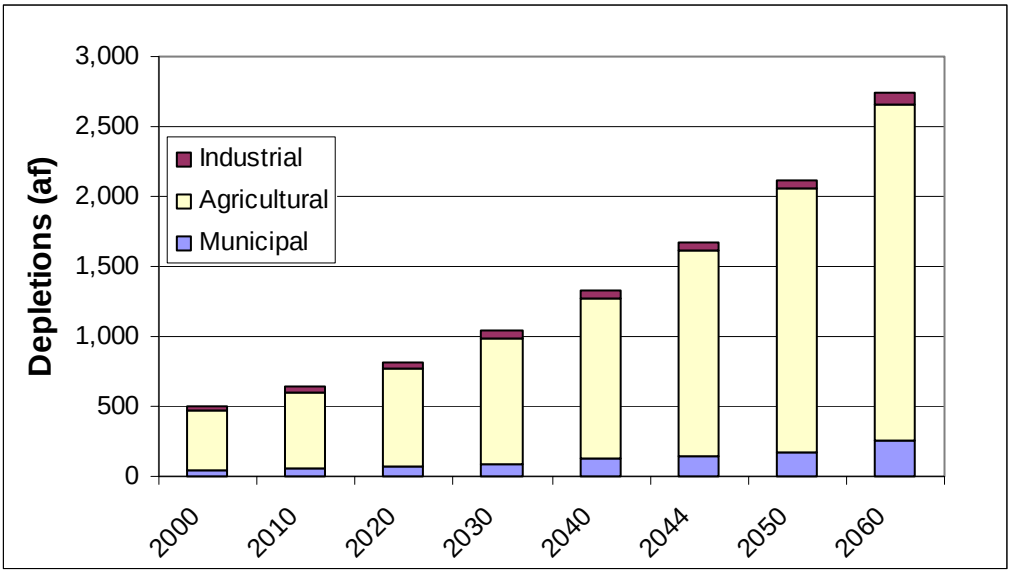


Table 38: Blanco Canyon Watershed Projected Annual Depletions (AF)

Year	Population	Municipal	Industrial	Agricultural	Total
2000	1,131	42	27	432	501
2010	1,412	53	33	552	638
2020	1,799	69	39	705	813
2030	2,353	91	47	900	1,039
2040	3,186	125	56	1,150	1,331
2044	3,710	146	61	1,468	1,676
2050	4,496	178	68	1,875	2,121
2060	6,617	264	81	2,395	2,740

Figure 12: Blanco Canyon Watershed Monthly Diversions (2044)

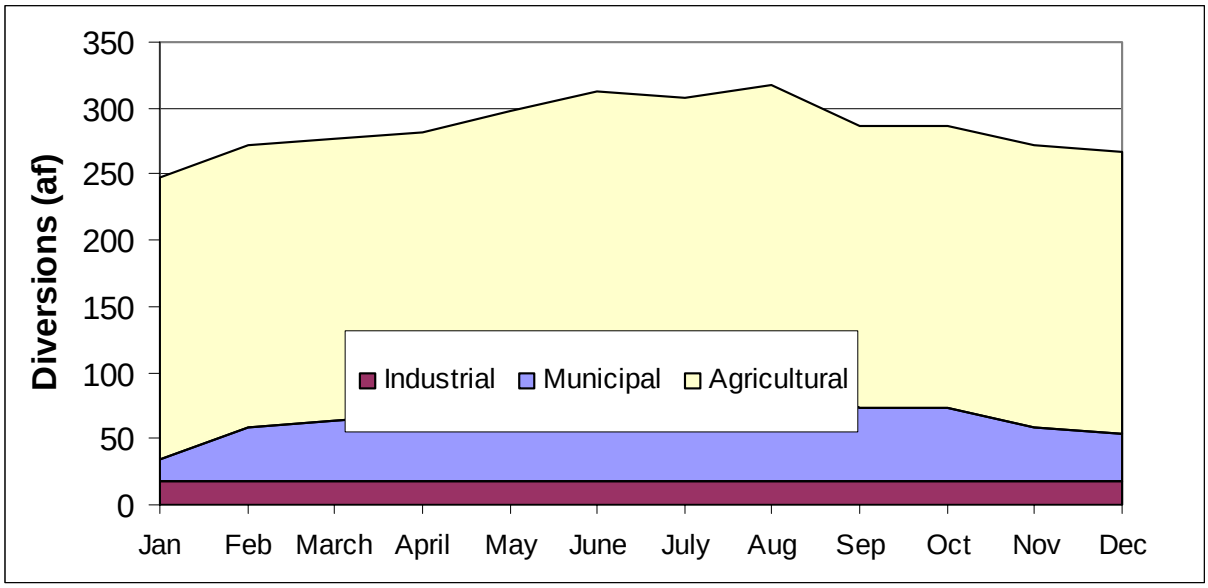


Table 39: Blanco Canyon Monthly Diversions in 2044 (AF)

Month	Municipal	Industrial	Agricultural	Total
Jan	15	18	213	247
Feb	41	18	213	272
March	46	18	213	277
April	51	18	213	282
May	66	18	213	297
June	81	18	213	312
July	76	18	213	307
Aug	86	18	213	318
Sep	56	18	213	287
Oct	56	18	213	287
Nov	41	18	213	272
Dec	35	18	213	267
Total	648	218	2559	3426

Projected total demand for the Blanco Canyon watershed in 2044 is 3426 acre-feet with a peak of 318 acre-feet in August.

2.4. **Chaco Watershed**

2.4.1. Present uses

Present water uses for the Chaco Watershed were not available. As a result, the diversions and depletions were estimated.

2.4.1.1. Water diversions by category of use

2.4.1.1.1. Municipal

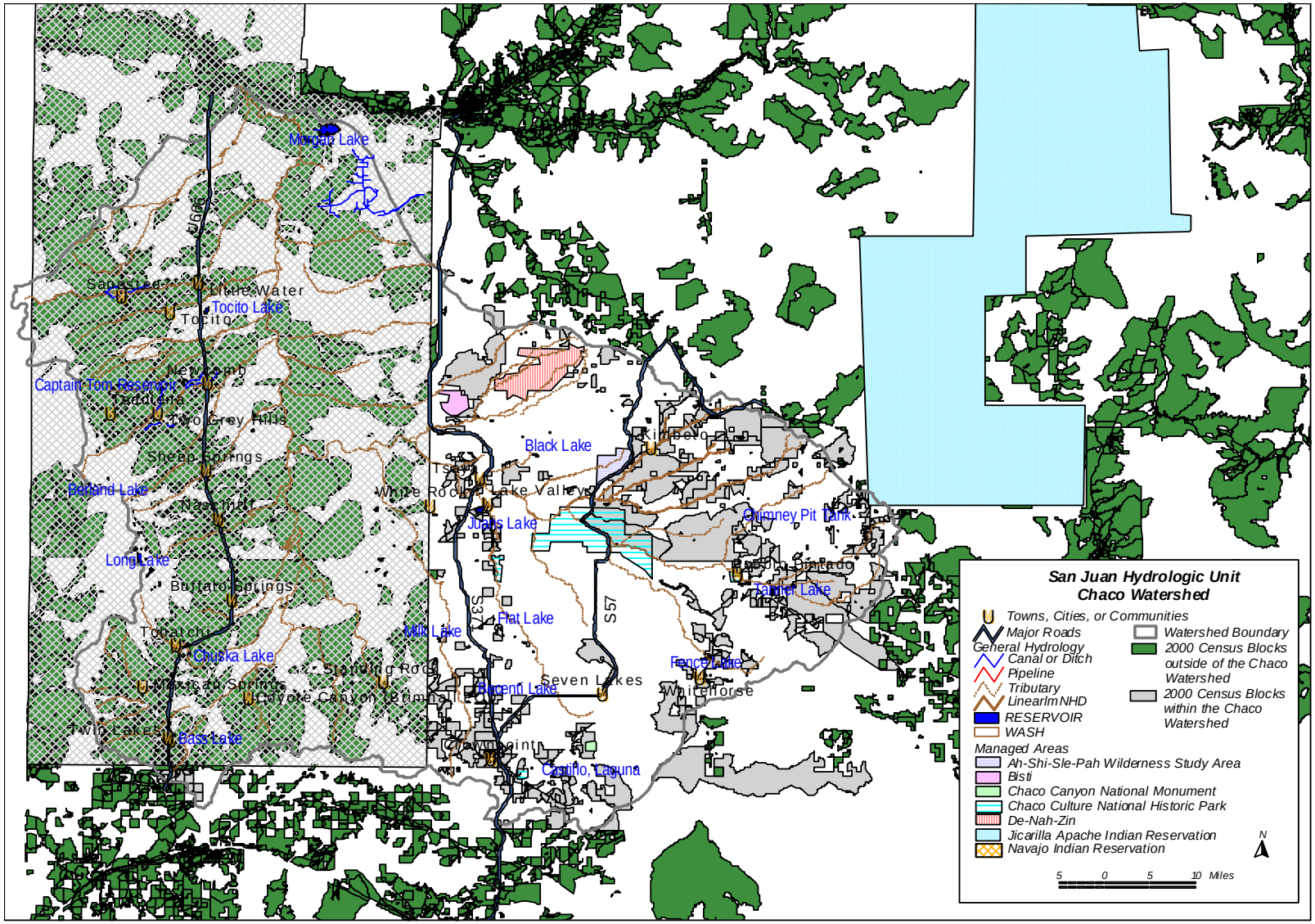
To estimate the diversion requirements for the Chaco Watershed, it was assumed that the water use within this watershed would be most comparable to that of the Lower Valley Water Users Cooperative Association. Therefore, the diversions per capita day for the Lower Valley Water Users Cooperative Association were assumed for the Chaco Watershed.

The population for the Chaco Watershed was determined using census blocks from the 2000 Census. There are 8,681 census blocks that cover the Chaco Watershed, of which only 1,485 contain any population. Of the 1,485 census blocks with population only 598 of them are outside of the Navajo Nation. Several of the census blocks extend outside of the Chaco Watershed. For these areas, only the population within the Chaco Watershed was included. Figure 13 shows the census blocks that contribute to the population within the Chaco Watershed. The population for the Chaco Watershed identified in Figure 13 for the year 2000 was 8,153. Using this population, the total diversion demand for the Chaco Watershed was calculated in Table 40.

Table 40: Assumed diversions for the Chaco Watershed

	GPCA Diversions	Diversions (gallons)	Diversions (acre-feet)
Jan	31	7,835,033	24
Feb	75	17,732,775	54
Mar	80	20,219,440	62
Apr	94	22,991,460	71
May	122	30,834,646	95
Jun	158	38,645,220	119
Jul	143	36,142,249	111
Aug	160	40,438,880	124
Sep	106	25,926,540	80
Oct	106	26,790,758	82
Nov	73	17,855,070	55
Dec	68	17,186,524	53
Average/Total		302,599,000	930

Figure 13: 2000 Census Blocks within the Chaco Watershed



2.4.1.1.2. Agricultural

No agricultural diversions were included for the Chaco Watershed outside of the Navajo Nation because there was not any agricultural acreage outside of the Navajo Nation identified. However, there is approximately 699 acre-ft per year of diversions for stock watering.

2.4.1.1.3. Industrial

No industrial demands were identified outside of the Navajo Nation.

2.4.1.1.4. Summary of Chaco Watershed Diversions

The total monthly diversions within the Chaco Watershed outside of the Navajo Nation are summarized in Table 41. The values presented in Table 41 are in acre-feet.

Table 41: Total Monthly Diversions in the Chaco Watershed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Municipal	24	54	62	71	95	119	111	124	80	82	55	53	930
Agricultural	0	0	0	0	0	0	0	0	0	0	0	0	0
Industrial	58	58	58	58	58	58	58	58	58	58	58	58	696
Total	82	112	120	129	153	177	169	182	138	140	113	111	1629

2.4.1.2. Water depletions by category of use

2.4.1.2.1. Municipal

The same assumptions that were used for estimating the diversions within the Chaco Watershed were used to estimate the depletions. The results are presented in Table 42.

Table 42: Assumed Depletions for the Chaco Watershed

	GPCA Depletions	Depletions (gallons)	Depletions (acre-feet)
Jan	10	2,527,430	8
Feb	25	5,910,925	18
Mar	26	6,571,318	20
Apr	31	7,582,290	23
May	40	10,109,720	31
Jun	52	12,718,680	39
Jul	47	11,878,921	36
Aug	53	13,395,379	41
Sep	35	8,560,650	26
Oct	35	8,846,005	27
Nov	24	5,870,160	18
Dec	22	5,560,346	17
Average/Total		99,532,000	304

2.4.1.2.2. Agricultural

No agricultural depletions were included for the Chaco Watershed outside of the Navajo Nation because there was not any agricultural acreage outside of the Navajo Nation identified. However there are approximately 699 acre-feet of annual consumption from stock watering.

2.4.1.2.3. Industrial

No industrial demands were identified outside of the Navajo Nation.

2.4.1.2.4. Summary of Chaco Watershed Depletions

The total monthly depletions within the Chaco Watershed are summarized in Table 43. The values presented in Table 43 are in acre-feet.

Table 43: Summary of Depletions in the Chaco Watershed (Outside of the Navajo Nation)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Municipal	8	18	20	23	31	39	36	41	26	27	18	17	304
Agricultural	58	58	58	58	58	58	58	58	58	58	58	58	696
Industrial	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	66	76	78	81	89	97	94	99	84	85	76	75	1000

2.4.2. Future water uses

2.4.2.1. Zoning / Buildout

The existing land ownership was evaluated within the Chaco Watershed outside of the Navajo Nation. The total acreage of private lands was calculated to ensure that the population density (people per acre) did not exceed a typical population density for buildout. Typical buildout populations are in the range of 4 to 6 people per acre. The total acreage of private lands within the Chaco Watershed was calculated at approximately 77,500 acres. Using the 2060 buildout population of 33,693, the population density within the Chaco Watershed would increase to an average of approximately 0.4 people per acre. Therefore the availability of land for growth to develop does not limit growth in the Chaco Watershed. This calculation assumes that all of the private lands are available for development. If growth were limited to non-irrigated lands, the population density would still not affect the growth rate.

2.4.2.2. Projected water demands by category of use

Future water use projections are based on the same three categories that were used in current water demand analysis. Those categories are:

- municipal,
- industrial, and
- agricultural.

There are several assumptions that are the basis for projecting demand for each of these categories through the planning horizon.
Gallons per capita day (GPCD) values for each watershed were applied to population projections to calculate future municipal demands. For the Chaco Watershed, 160 gallons per capita day was applied to the watershed population increase above 2000 population. It is assumed that as growth occurs, future developments will require municipal demands more closely associated with urban usage than with rural usage. Consequently, a higher per capita usage than current per capita usage is used for future projections. Agricultural demands are all related to stock watering and are 100 percent consumptive.
The projected water use for the Chaco watershed is presented in the following tables and graphs. Figure 14 shows population growth and associated municipal diversion demands, and show values for projected diversions. Table 44 show values for projected diversions. Table 45 show values for projected depletions. Figure 17 and Table 46 show monthly diversions for the planning horizon year of 2044.

Figure 14: Chaco Watershed Population Projections and Municipal Diversions

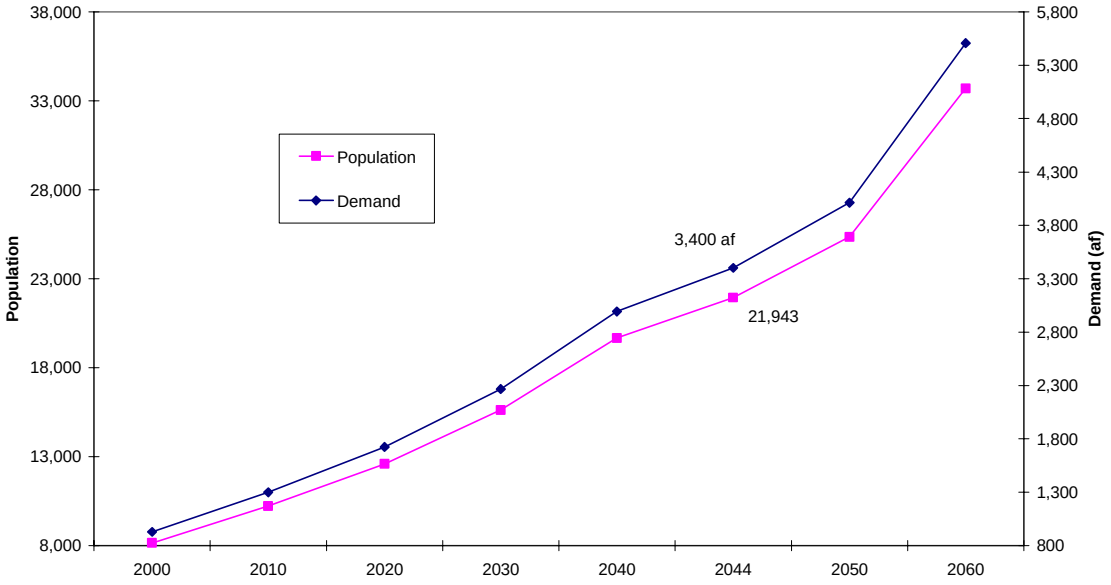


Figure 15: Chaco Watershed Projected Annual Diversions

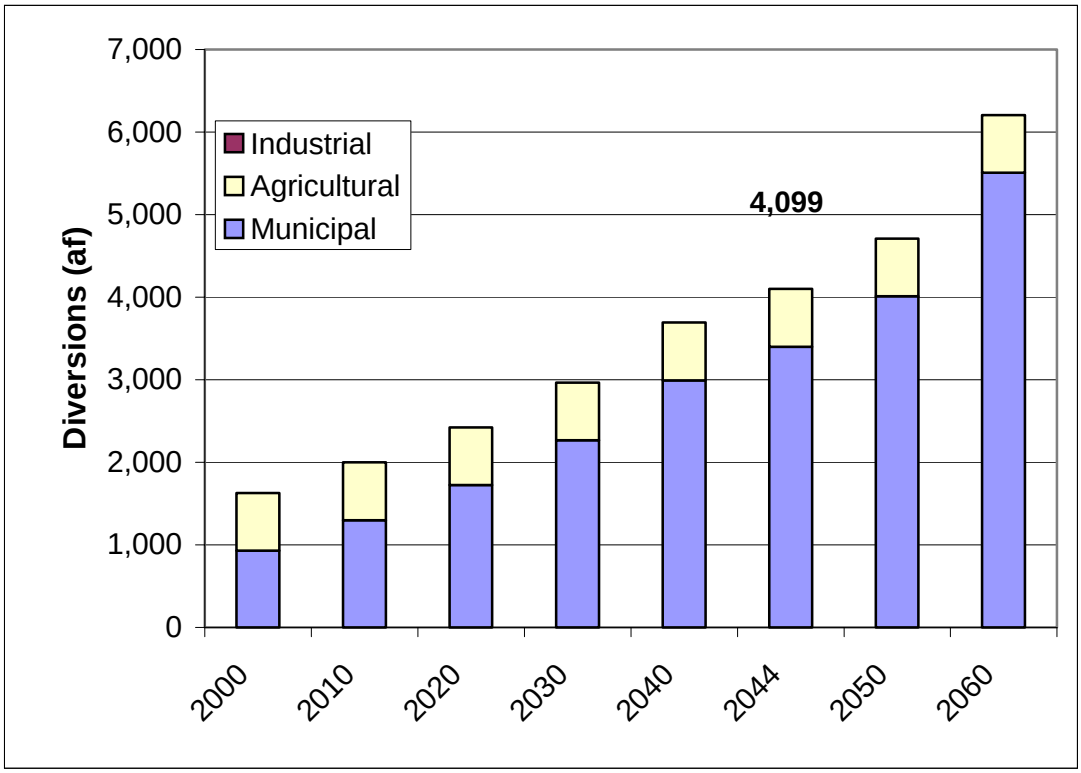


Table 44: Chaco Watershed Projected Annual Diversions (AF)

Year	Population	Municipal	Industrial	Agricultural	Total
2000	8,153	929	0	699	1,628
2010	10,219	1,299	0	699	1,998
2020	12,590	1,724	0	699	2,423
2030	15,618	2,267	0	699	2,966
2040	19,670	2,993	0	699	3,692
2044	21,943	3,400	0	699	4,099
2050	25,353	4,012	0	699	4,711
2060	33,693	5,506	0	699	6,205

Figure 16: Chaco Watershed Projected Annual Depletions

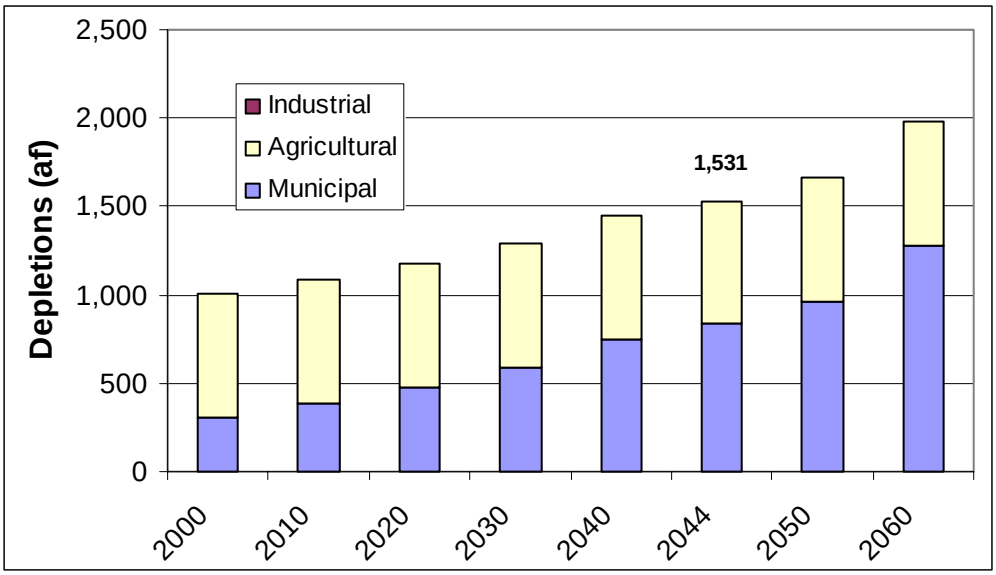


Table 45: Chaco Watershed Projected Annual Depletions

Year	Population	Municipal	Industrial	Agricultural	Total
2000	8,153	309	0	699	1,008
2010	10,219	388	0	699	1,087
2020	12,590	478	0	699	1,177
2030	15,618	592	0	699	1,291
2040	19,670	746	0	699	1,445
2044	21,943	832	0	699	1,531
2050	25,353	962	0	699	1,661
2060	33,693	1,278	0	699	1,977

Figure 17: Chaco Watershed Monthly Diversions (2044)

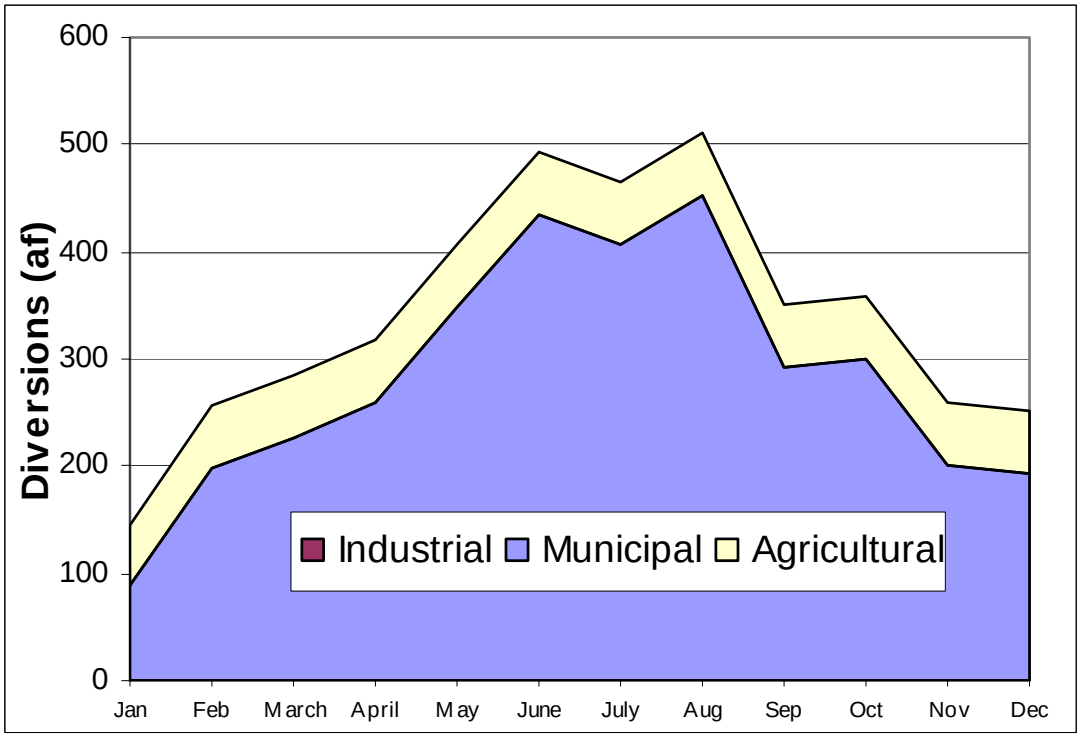


Table 46: Chaco Watershed Monthly Diversions in 2044 (AF)

Month	Municipal	Industrial	Agricultural	Total
Jan	88	0	58	146
Feb	197	0	58	256
March	227	0	58	285
April	260	0	58	318
May	347	0	58	406
June	435	0	58	493
July	406	0	58	464
Aug	453	0	58	512
Sep	293	0	58	351
Oct	300	0	58	358
Nov	201	0	58	259
Dec	194	0	58	252
Total	**3,400**	**0**	**699**	**4,099**

Projected total demand for the watershed in 2044 is 4,099 acre-feet with a peak of 512 acre-feet in August.

2.5. **La Plata Watershed**

2.5.1. Present uses

Present water uses for the La Plata Watershed were not available. As a result, the diversions and depletions were estimated.

2.5.1.1. Water diversions by category of use

2.5.1.1.1. Municipal

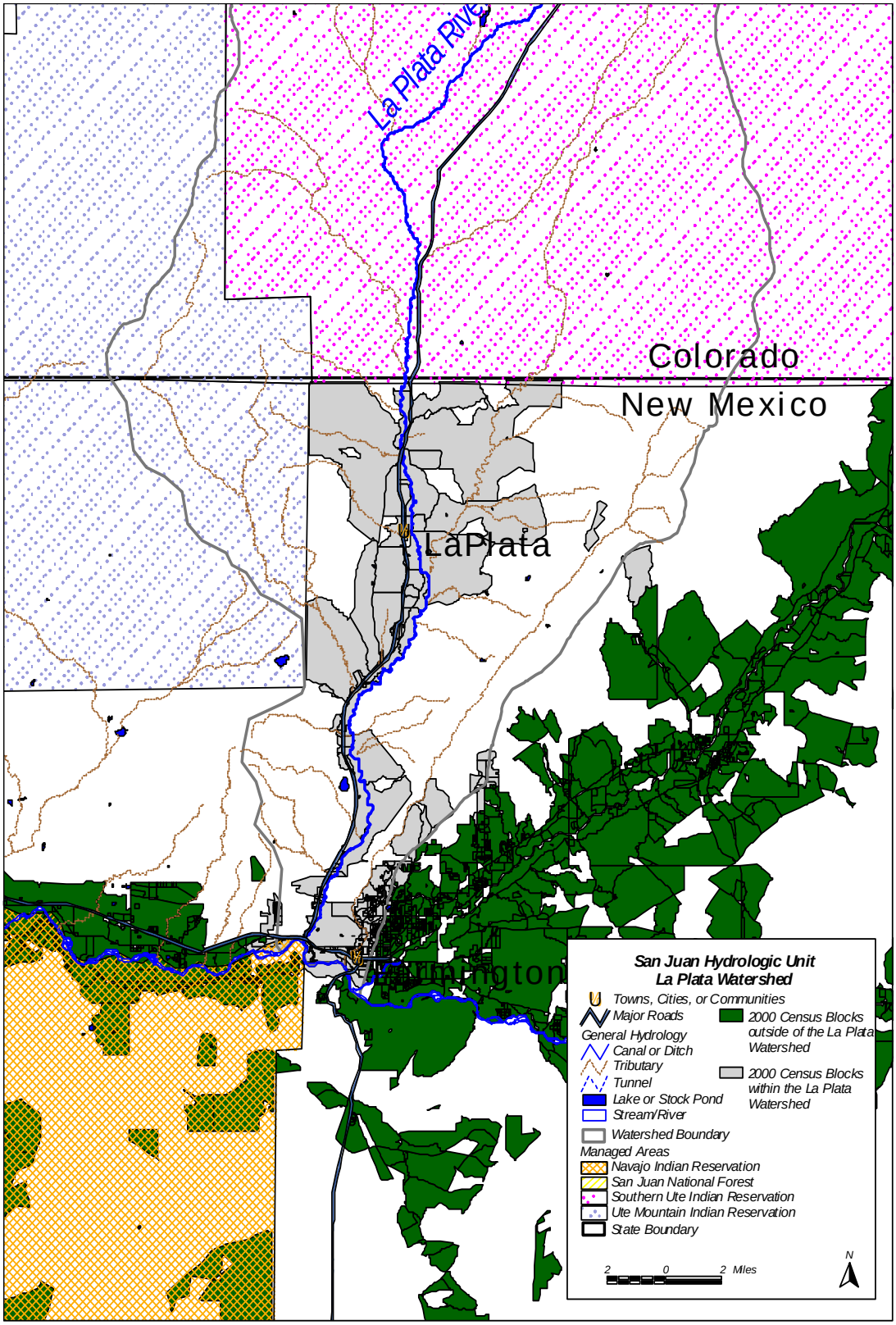
For the La Plata Watershed, it was assumed that the water use within this watershed would be most comparable to that of the Lower Valley Water Users Cooperative Association. Therefore, the diversions per capita day for the Lower Valley Water Users Cooperative Association were assumed for the La Plata Watershed.

The population for the La Plata Watershed was determined using census blocks from the 2000 Census. There are 821 census blocks that cover the La Plata Watershed within New Mexico, of which only 302 contain any population. Of the 302 census blocks with population all of them are outside of the Ute Mountain Indian Reservation. Several of the census blocks extend outside of the La Plata Watershed. For these areas, only the population within the La Plata Watershed was included. Figure 18 shows the census blocks that contribute to the population within the La Plata Watershed in New Mexico. The population for the La Plata Watershed identified in Figure 18 for the year 2000 was 12,724. Using this population, the total diversion demand for the La Plata Watershed was calculated in Table 47.

Table 47: Assumed diversions for the La Plata Watershed

	GPCA Diversions	Diversions (gallons)	Diversions (acre-feet)
Jan	31	12,227,764	38
Feb	75	27,674,700	85
Mar	80	31,555,520	97
Apr	94	35,881,680	110
May	122	48,122,168	148
Jun	158	60,311,760	185
Jul	143	56,405,492	173
Aug	160	63,111,040	194
Sep	106	40,462,320	124
Oct	106	41,811,064	128
Nov	73	27,865,560	86
Dec	68	26,822,192	82
Average/Total		472,251,000	1,450

Figure 18: 2000 Census Blocks within the La Plata Watershed



2.5.1.1.2. Agricultural

Diversion records were not available for the agricultural uses. To estimate the diversions, the following assumptions were required. The diversion requirements were estimated based on the depletions calculated in Table 51. Diversions were calculated as twice the depletion quantity plus 10 percent for incidental losses associated with canal seepage. This calculation assumes that 50% of the water applied to the ground was lost to percolation or direct runoff. The total irrigated acreage and the diversion requirements for agricultural use for the Animas Watershed are presented in Table 48.

Table 48: Agricultural Diversions for the La Plata Watershed

Acres	May	June	July	August	September	October	Total
2,781	1,558	2,794	3,170	2,765	1,815	405	12,507

2.5.1.1.3. Industrial

There are no specific diversions for industrial uses. Any industry within the La Plata Watershed receives water through municipal water systems and cannot be specifically determined.

2.5.1.1.4. Summary of La Plata Watershed Diversions

The total monthly diversions within the La Plata Watershed are summarized in Table 49. The values presented in Table 49 are in acre-feet.

Table 49: Total Monthly Diversions in the La Plata Watershed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Municipal	38	85	97	110	148	185	173	194	124	128	86	82	1,450
Agricultural	0	0	0	0	1,558	2,794	3,170	2,765	1,815	405	0	0	12,507
Industrial	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	38	85	97	110	1,706	2,979	3,343	2,959	1,939	533	86	82	13,957

2.5.1.2. Water depletions by category of use

2.5.1.2.1. Municipal

The same assumptions that were used for estimating the diversions within the La Plata Watershed were used to estimate the depletions. The results are presented in Table 50.

Table 50: Assumed Depletions for the La Plata Watershed

	GPCA Depletions	Depletions (gallons)	Depletions (acre-feet)
Jan	10	3,944,440	12
Feb	25	9,224,900	28
Mar	26	10,255,544	31
Apr	31	11,833,320	36
May	40	15,777,760	48
Jun	52	19,849,440	61
Jul	47	18,538,868	57
Aug	53	20,905,532	64
Sep	35	13,360,200	41
Oct	35	13,805,540	42
Nov	24	9,161,280	28
Dec	22	8,677,768	27
Average/Total		155,335,000	475

2.5.1.2.2. Agricultural

Agricultural depletions were calculated using the same approach used by the State of New Mexico. The original Blaney-Criddle method was used to determine the annual consumptive use requirements. The annual consumptive uses were then distributed using monthly crop use percentages that were developed using the Modified Blaney-Criddle method.

The consumptive use coefficients (k) and consumptive use factors (f) were obtained from the "Technical Report 32, Consumptive Use and Water Requirements in New Mexico." The consumptive use coefficients for the Modified Blaney-Criddle method were obtained from the "Irrigation Water Requirements, Soil Conservation Service, September 1970." The monthly consumptive use values for crops in Bloomfield, Farmington, and Shiprock are provided in the "Technical Report 32". The consumptive use values from these three areas were averaged to develop representative consumptive use values for the San Juan Hydrologic Unit.

Irrigated acreage was obtained from the New Mexico Interstate Streams Commission (ISC) in GIS format. The irrigated acreage was then divided by watershed. The acreage was totaled and compared with tabular acreage for the year 2000 provided by the ISC to confirm that all the acreage was accounted for. The irrigated acreage within the Animas Watershed was summarized for each crop type and the consumptive use for each crop was calculated. In addition to the crop consumptive use, incidental losses associated with phreatophytes and evaporation also contribute to consumptive use. It was assumed that incidental losses consumptive use were approximately 10% of the total crop consumptive use. The results are presented in Table 51.

Table 51: Monthly Agricultural Depletions within the La Plata Watershed

	Acres	May	June	July	August	September	October	Total
Alfalfa	560	159	281	331	291	183	42	1,287
Corn	2	0	1	1	1	1	0	4
Vegetables	1	0	0	0	0	0	0	0
Orchard	0	0	0	0	0	0	0	0
Pasture	2,075	498	884	1062	928	617	137	4,126
Grain	65	38	75	8	0	0	0	121
Sod	28	7	12	14	12	8	2	55
GPA	50	6	17	25	25	16	3	92
Subtotal	2,781	708	1,270	1,441	1,257	825	184	5,685
Incidental Losses	278	71	127	144	126	83	18	569
Total	3,059	779	1,397	1,585	1,383	908	202	6,254

2.5.1.2.3. Industrial

There are no specific depletions for industrial uses. Any industry within the La Plata Watershed receives water through municipal water systems and cannot be specifically determined.

2.5.1.2.4. Summary of La Plata Watershed Depletions

The total monthly depletions within the La Plata Watershed are summarized in Table 52. The values presented in Table 52 are in acre-feet.

Table 52: Summary of Depletions in the La Plata Watershed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Municipal	8	18	20	23	31	39	36	41	26	27	18	17	304
Agricultural	0	0	0	0	779	1,397	1,585	1,383	908	202	0	0	6,254
Industrial	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	8	18	20	23	810	1,436	1,621	1,424	934	229	18	17	6,558

2.5.2. Future water uses

2.5.2.1. Zoning / Buildout

The existing land ownership was evaluated within the La Plata Watershed. The total acreage of private lands was calculated to ensure that the population density (people per acre) did not exceed a typical population density for buildout. Typical buildout populations are in the range of 4 to 6 people per acre. The total acreage of private lands within the La Plata Watershed was calculated at approximately 47,600 acres. Using the 2060 buildout population of 32,837, the population density within the La Plata Watershed would increase to an average of approximately 0.7 people per acre. Therefore the availability of land for growth to develop does not limit growth in the La Plata Watershed. This calculation assumes that all of the private lands are available for development. If growth were limited to non-irrigated lands, the population density would still not affect the growth rate.

2.5.2.2. Projected water demands by category of use

Future water use projections are based on the same three categories that were used in current water demand analysis. Those categories are:

- municipal ,
- industrial, and
- agricultural.

There are several assumptions that are the basis for projecting demand for each of these categories through the planning horizon.
Gallons per capita day (GPCD) values for each watershed were applied to population projections to calculate future municipal demands. For the LaPlata Watershed, 160 gallons per capita day was applied to the watershed population increase above 2000 population. It is assumed that as growth occurs, future developments will require municipal demands more closely associated with urban usage than with rural usage. Consequently, a higher per capita usage than current per capita usage is used for future projections.
The projected water use for the La Plata watershed is presented in the following tables and graphs. Figure 19 shows population growth and associated municipal diversion demands, and show values for projected diversions.

Figure 20 and Table 53 show values for projected diversions. Figure 21and Table 54 show values for projected depletions. Figure 22 and Table 55 show monthly diversions for the planning horizon year of 2044.

Figure 19: La Plata Population Projections and Municipal Diversions

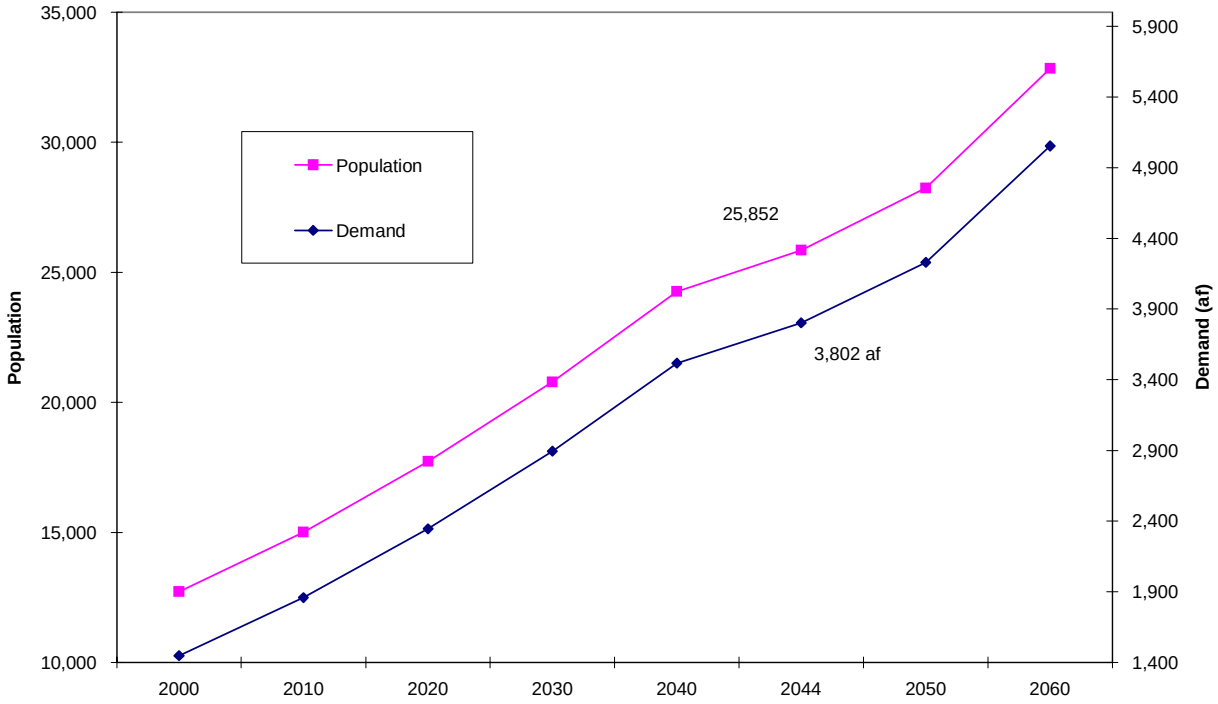


Figure 20: La Plata Watershed Projected Annual Diversions

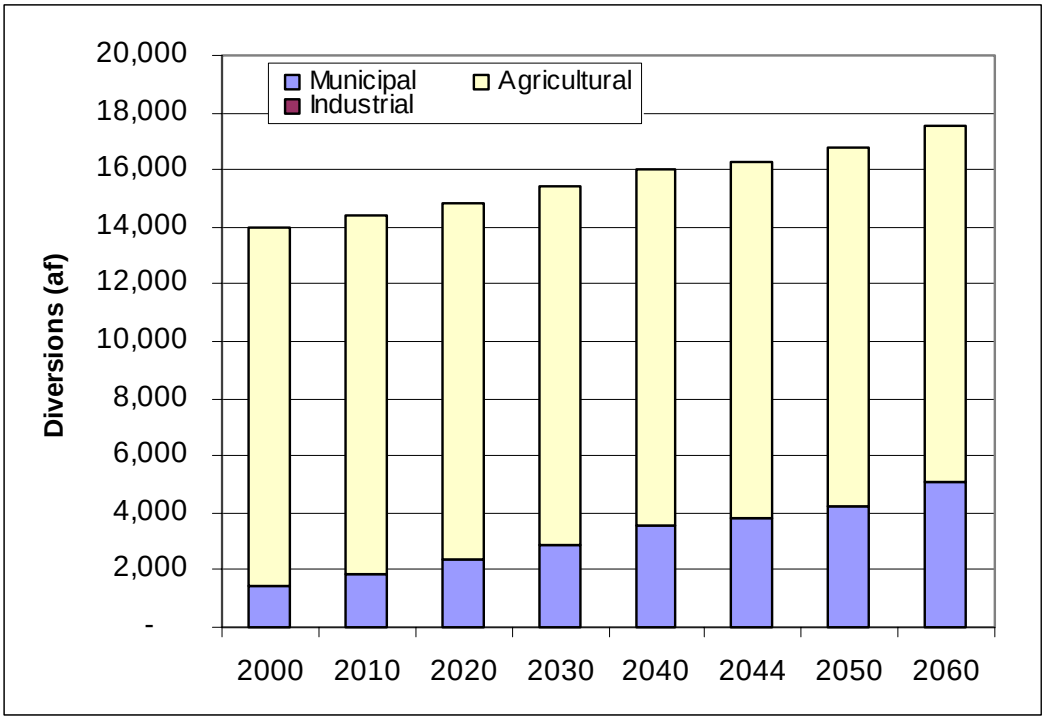


Table 53: La Plata Watershed Projected Annual Diversions (AF)

Year	Population	Municipal	Industrial	Agricultural	Total
2000	12,724	1,449	-	12,507	13,956
2010	15,013	1,860	-	12,507	14,367
2020	17,726	2,346	-	12,507	14,853
2030	20,784	2,894	-	12,507	15,401
2040	24,260	3,517	-	12,507	16,024
2044	25,852	3,802	-	12,507	16,309
2050	28,241	4,231	-	12,507	16,738
2060	32,837	5,054	-	12,507	17,561

Figure 21: La Plata Watershed Projected Annual Depletions

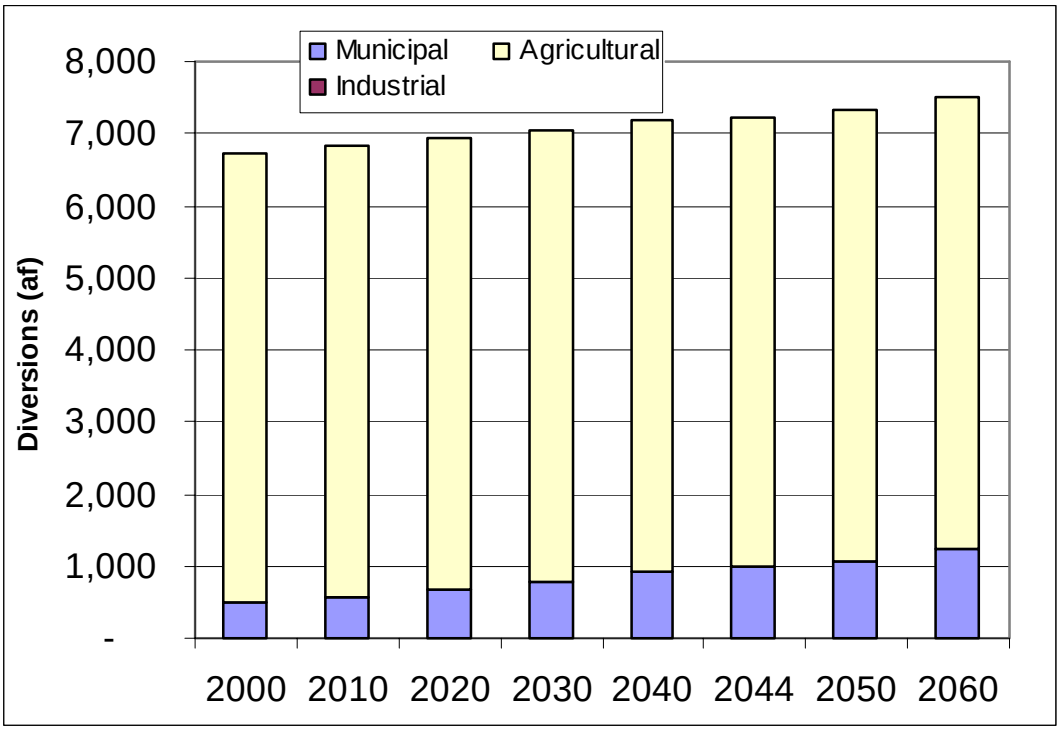
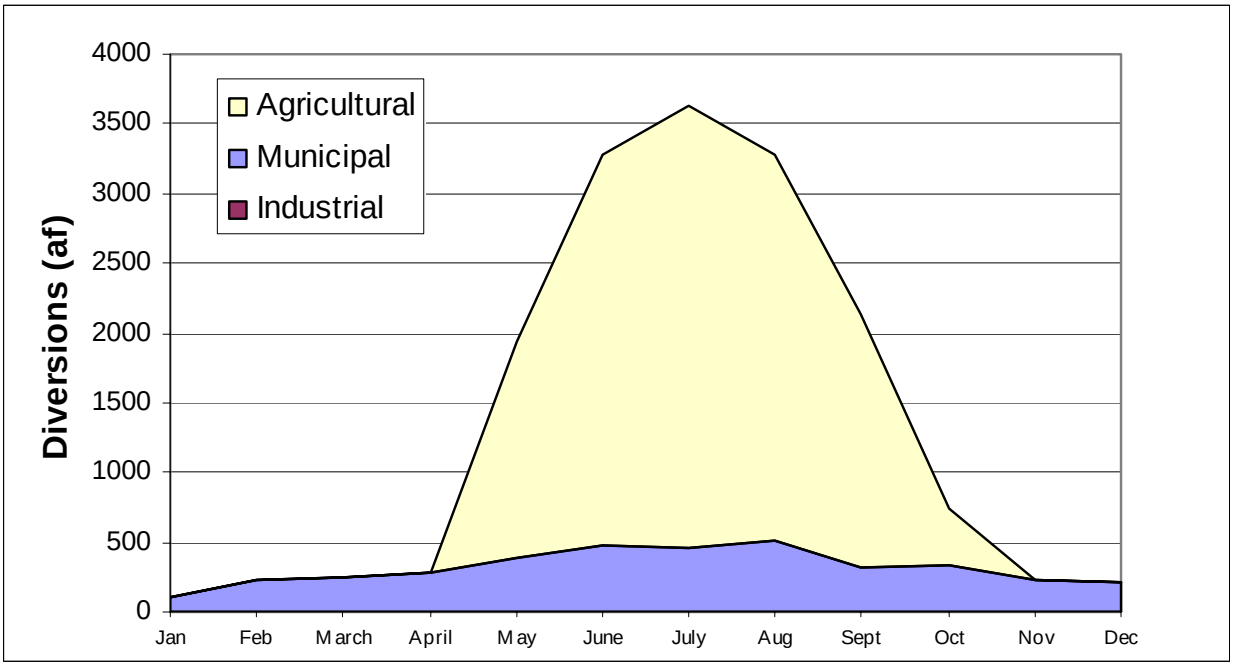


Table 54: La Plata Watershed Projected Annual Depletions (AF)

Year	Population	Municipal	Industrial	Agricultural	Total
2000	12,724	483	-	6,254	6,737
2010	15,013	569	-	6,254	6,823
2020	17,726	672	-	6,254	6,926
2030	20,784	788	-	6,254	7,042
2040	24,260	920	-	6,254	7,174
2044	25,852	981	-	6,254	7,235
2050	28,241	1,071	-	6,254	7,325
2060	32,837	1,246	-	6,254	7,500

Figure 22: La Plata Watershed Monthly Diversions (2044)



Month	Municipal	Industrial	Agricultural	Total
Jan	100	-	-	100
Feb	223	-	-	223
March	254	-	-	254
April	289	-	-	289
May	388	-	1,558	1,946
June	483	-	2,794	3,277
July	454	-	3,170	3,624
Aug	509	-	2,765	3,274
Sept	325	-	1,815	2,140
Oct	336	-	405	741
Nov	226	-	-	226
Dec	215	-	-	215
Total	**3,802**	**-**	**12,507**	**16,309**

Table 55: La Plata Monthly Diversions in 2044 (AF)

Projected total demand for the La Plata watershed in 2044 is 16,309 acre-feet with a peak of 3,624 acre-feet in July.

2.6. **Middle San Juan Watershed**

2.6.1. Present uses

The present water uses for the Middle San Juan Watershed were calculated. Both the quantity of water that was diverted for use and the quantity of water that was depleted as a result of the use were estimated.

2.6.1.1. Water diversions by category of use

2.6.1.1.1. Municipal

The quantity of water that was diverted for municipal use within the Middle San Juan Watershed in New Mexico was calculated based on the available information. Diversion records for the year 2000 for the surface water treatment plant that supplies the Lower Valley Water Users Cooperative Association (LVWUCA) was used to establish an average monthly diversion per capita day requirement. Once the average monthly diversion per capita day requirement was determined, it was applied to the total population within the watershed to determine a total diversion demand for the Middle San Juan Watershed.

The monthly diversion records for LVWUCA are provided in Appendix C-1. LVWUCA does not provide water deliveries to any other entities; therefore the calculation for the diversion per capita day can be directly calculated. The population for LVWUCA was determined using census blocks from the 2000 Census. The population for LVWUCA was assumed to be the population within the Middle San Juan Watershed that was outside of the Navajo Nation and the Ute Mountain Indian Reservation. The population for LVWUCA was calculated to be 9,523. The monthly diversions and diversions per capita day are summarized in Table 56.

Table 56: Monthly Diversions for LVWUCA and the Middle San Juan Watershed – Year 2000

	Diversions (gallons)	GPCA Diversion	Diversions (acre-feet)
Jan	9,039,000	31	28
Feb	20,763,000	75	64
Mar	23,637,000	80	73
Apr	26,951,000	94	83
May	35,938,000	122	110
Jun	44,997,000	158	138
Jul	42,110,000	143	129
Aug	47,350,000	160	145
Sep	30,249,000	106	93
Oct	31,311,000	106	96
Nov	20,851,000	73	64
Dec	19,998,000	68	61
Total/Average	353,194,000	101	1,084

2.6.1.1.2. Agricultural

Diversion records were not available for the agricultural uses. To estimate the diversions, the following assumptions were required. The diversion requirements were estimated based on the depletions calculated in Table 51. Diversions were calculated as twice the depletion quantity plus 10 percent for incidental losses associated with canal seepage. This calculation assumes that 50% of the water applied to the ground was lost to percolation or direct runoff. The total irrigated acreage and the diversion requirements for agricultural use for the Animas Watershed are presented in Table 48.

Table 57: Crop Diversion for the Middle San Juan Watershed

Acres	May	June	July	August	September	October	Total
3,006	1,784	3,212	3,788	3,324	2,103	460	14,671

2.6.1.1.3. Industrial

Industrial diversions within the Middle San Juan Watershed are associated with the power industry and were obtained from the New Mexico Office of the State Engineer records (See Appendix E-2). All of the industrial diversions within the Middle San Juan Watershed are surface water diversions and are presented in Table 58. The diversions provided are total annual values. For the purposes of this study the diversions were distributed equally over the entire year. The total industrial diversions for the Middle San Juan Watershed are approximately 50,435.5 acre-feet and are distributed monthly in Table 59Table 58: Industrial Diversions within the Middle San Juan Watershed.

Industry	Diversion (acre-feet)
BHP – Utah Minerals International	28,480.0
PNM – San Juan Gen Sta – Waterflow	21,955.5
Total	50,435.5

2.6.1.1.4. Summary of Middle San Juan Watershed Diversions

The total monthly diversions within the Middle San Juan Watershed are summarized in Table 59. The values presented in Table 59 are in acre-feet.

Table 59: Total Monthly Diversions in the Middle San Juan Watershed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Municipal	28	64	73	83	110	138	129	145	93	96	64	61	1,084
Agricultural	0	0	0	0	1,784	3,212	3,788	3,324	2,103	460	0	0	14,671
Industrial	4,203	4,203	4,203	4,203	4,203	4,203	4,203	4,203	4,203	4,203	4,203	4,203	50,436
Total	4,231	4,267	4,276	4,286	6,097	7,553	8,120	7,672	6,399	4,759	4,267	4,264	66,191

2.6.1.2. Water depletions by category of use

2.6.1.2.1. Municipal

Depletions could not be directly calculated for the Middle San Juan Watershed. Typically depletions could be calculated based on deliveries from the water treatment plant and return flows to the wastewater treatment plant. There is not a wastewater treatment plant servicing the population within the Middle San Juan outside of the Indian reservations. This population is serviced by septic tanks. To estimate the depletions within the Middle San Juan Watershed, the annual depletion as a percent of the annual diversions that was calculated in the draft "Return Flow Plan and Crediting Program for San Juan Water Commission" was used. Data from the municipalities shows that 33% percentage of the total diversion was depleted. The annual percentage was applied to each month to estimate the monthly depletions. Typically depletions are greater during the summer months, but without additional information this is the most appropriate way to calculate the depletions. The depletions per capita day for LVWUCA are summarized in Table 60.

Table 60: LVWUCA Depletions per capita day

	LVWUCA GPCA Diversion	Depletion Percentage of Diversion	Calculated LVWUCA GPCA Depletion
Jan	31	33%	10
Feb	75	33%	25
Mar	80	33%	26
Apr	94	33%	31
May	122	33%	40
Jun	158	33%	52
Jul	143	33%	47
Aug	160	33%	53
Sep	106	33%	35
Oct	106	33%	35
Nov	73	33%	24
Dec	68	33%	22

Using the LVWUCA depletions per capita day calculated above, the total depletions for the Middle San Juan Watershed outside of the Indian reservations is calculated in Table 61 based on a population of 9,523.

Table 61: Middle San Juan Watershed Depletions

	GPCA Depletions	Depletions (gallons)	Depletions (acre-feet)
Jan	10	2,952,130	9
Feb	25	6,904,175	21
Mar	26	7,675,538	24
Apr	31	8,856,390	27
May	40	11,808,520	36
Jun	52	14,855,880	46
Jul	47	13,875,011	43
Aug	53	15,646,289	48
Sep	35	9,999,150	31
Oct	35	10,332,455	32
Nov	24	6,856,560	21
Dec	22	6,494,686	20
Average/Total		116,257,000	358

2.6.1.2.2. Agricultural

Agricultural depletions were calculated using the same approach used by the State of New Mexico. The original Blaney-Criddle method was used to determine the annual consumptive use requirements. The annual consumptive uses were then distributed using monthly crop use percentages that were developed using the Modified Blaney-Criddle method.

The consumptive use coefficients (k) and consumptive use factors (f) were obtained from the "Technical Report 32, Consumptive Use and Water Requirements in New Mexico." The consumptive use coefficients for the Modified Blaney-Criddle method were obtained from the "Irrigation Water Requirements, Soil Conservation Service, September 1970." The monthly consumptive use values for crops in Bloomfield, Farmington, and Shiprock are provided in the "Technical Report 32". The consumptive use values from these three areas were averaged to develop representative consumptive use values for the San Juan Hydrologic Unit.

Irrigated acreage was obtained from the New Mexico Interstate Streams Commission (ISC) in GIS format. The irrigated acreage was then divided by watershed. The acreage was totaled and compared with tabular acreage for the year 2000 provided by the ISC to confirm that all the acreage was accounted for. The irrigated acreage within the Animas Watershed was summarized for each crop type and the consumptive use for each crop was calculated. In addition to the crop consumptive use, incidental losses associated with phreatophytes and evaporation also contribute to consumptive use. It was assumed that incidental losses were approximately 10% of the total crop consumptive use. The results are presented in Table 51.

Table 62: Monthly Agricultural Depletions within the Middle San Juan Watershed

	Acres	May	June	July	August	September	October	Total
Alfalfa	2,300	653	1153	1360	1195	753	172	5,286
Corn	111	16	41	67	60	36	0	220
Vegetables	2	0	1	1	1	1	0	4
Orchard	30	5	13	16	11	5	0	50
Pasture	479	115	204	245	214	143	32	953
Grain	25	14	28	3	0	0	0	45
Sod	8	2	3	4	4	2	1	16
GPA	51	6	17	26	26	16	4	95
Subtotal	3,006	811	1,460	1,722	1,511	956	209	6,669
Incidental Losses	301	81	146	172	151	96	21	667
Total	3,307	892	1,606	1,894	1,662	1,052	230	7,336

2.6.1.2.3. Industrial

Industrial depletions within the Middle San Juan Watershed were obtained from the New Mexico Office of the State Engineer records (See Appendix E-2). All of the industrial depletions within the Middle San Juan Watershed are surface water depletions. The depletions provided are total annual values. For the purposes of this study the depletions were distributed equally over the entire year. The total industrial depletions in the Middle San Juan Watershed are approximately 44,184 acre-feet (88% of the diversions) and are distributed monthly in Table 63.Summary of Middle San Juan Watershed Depletions

The total monthly depletions within the Middle San Juan Watershed are summarized in Table 63. The values presented in Table 63 are in acre-feet.

Table 63: Summary of Depletions in the Middle San Juan Watershed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Municipal	9	21	24	27	36	46	43	48	31	32	21	20	358
Agricultural	0	0	0	0	892	1,606	1,894	1,662	1,052	230	0	0	7,336
Industrial	3,682	3,682	3,682	3,682	3,682	3,682	3,682	3,682	3,682	3,682	3,682	3,682	44,184
Total	3,691	3,703	3,706	3,709	4,610	5,334	5,619	5,392	4,765	3,944	3,703	3,702	51,878

2.6.2. Future water uses

2.6.2.1. Zoning / Buildout

The existing land ownership was evaluated within the Middle San Juan Watershed outside of the Navajo Nation and the Ute Mountain Indian Reservation. The total acreage of private lands was calculated to ensure that the population density (people per acre) did not exceed a typical population density for buildout. Typical buildout populations are in the range of 4 to 6 people per acre. The total acreage of private lands within the Middle San Juan Watershed was calculated at approximately 32,700 acres. Using the 2060 buildout population of 24,576, the population density within the Middle San Juan Watershed would increase to an average of approximately 0.8 people per acre. Therefore the availability of land for growth to develop does not limit growth in the

Middle San Juan Watershed. This calculation assumes that all of the private lands are available for development. If growth were limited to non-irrigated lands, the population density would still not affect the growth rate.

2.6.2.2. Projected water demands by category of use

Future water use projections are based on the same three categories that were used in current water demand analysis. Those categories are:

- municipal ,
- industrial, and
- agricultural.

There are several assumptions that are the basis for projecting demand for each of these categories through the planning horizon.
Gallons per capita day (GPCD) values for each watershed were applied to population projections to calculate future municipal demands. For the Middle San Juan Watershed, 160 gallons per capita day was applied to the watershed population increase above 2000 population. It is assumed that as growth occurs, future developments will require municipal demands more closely associated with urban usage than with rural usage. Consequently, a higher per capita usage than current per capita usage is used for future projections. The projected water use for the Middle San Juan watershed is presented in the following tables and graphs. Figure 23 shows population growth and associated municipal diversion demands, and show values for projected diversions. Table 64 shows values for projected diversions. Table 65 shows values for projected depletions.
Table 66 shows monthly diversions for the planning horizon year of 2044.

Figure 23: Middle San Juan Population Projections and Municipal Diversions

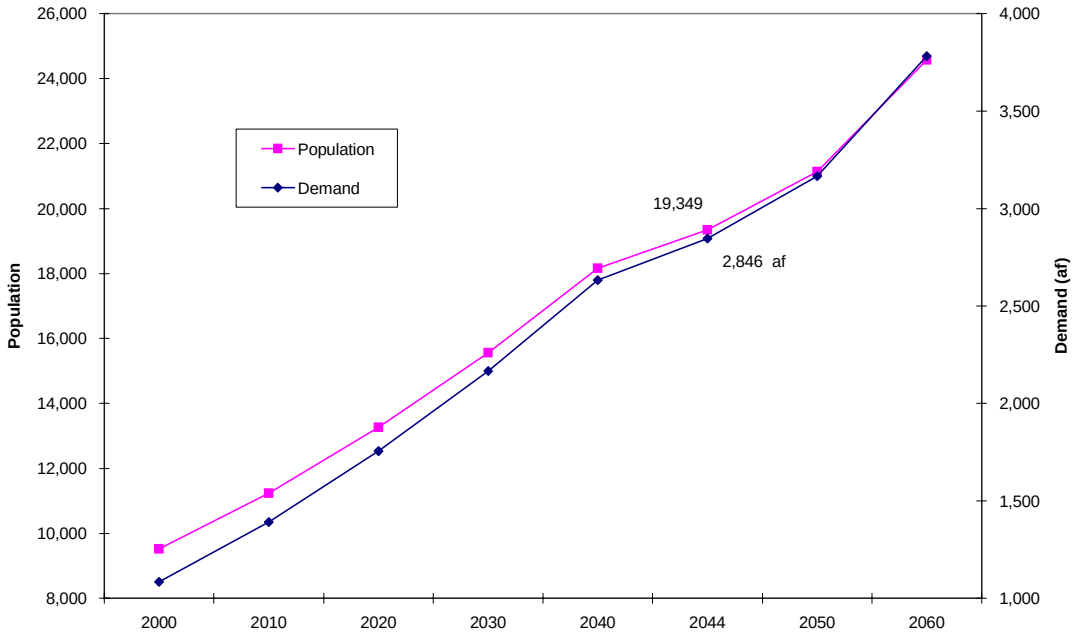


Figure 24: Middle San Juan Watershed Projected Annual Diversions (AF)

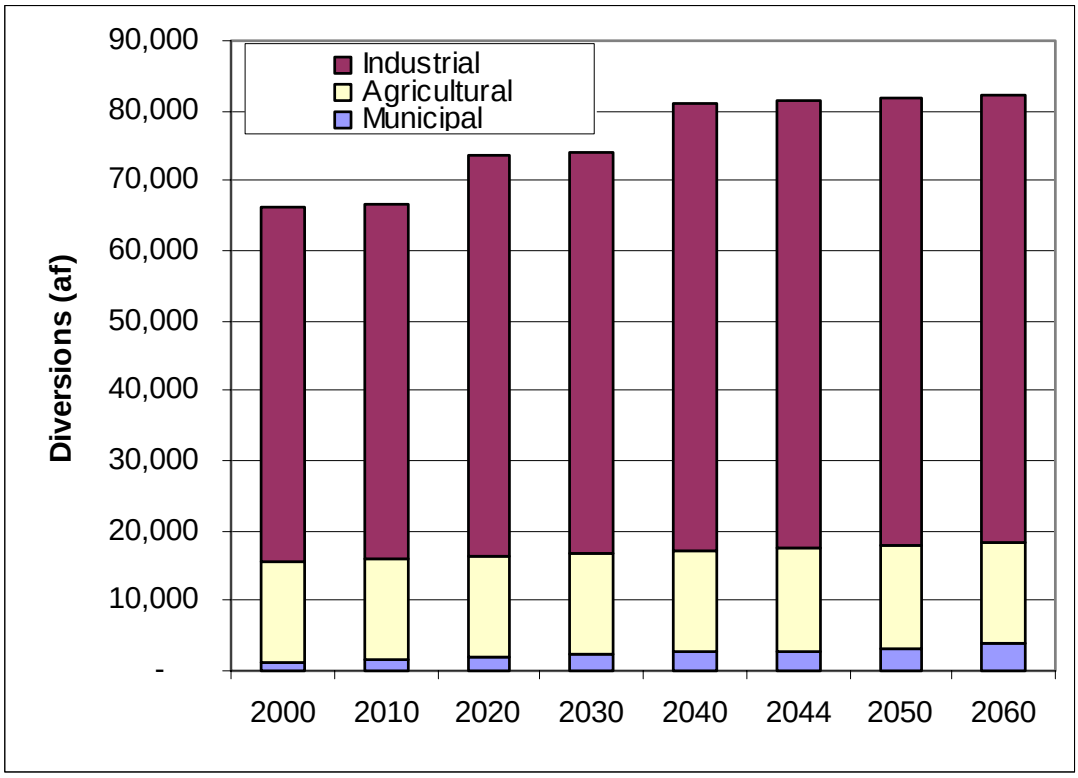


Table 64: Middle San Juan Watershed Projected Annual Diversions (AF)

Year	Population	Municipal	Industrial	Agricultural	Total
2000	9,523	1,085	50,436	14,671	66,192
2010	11,236	1,392	50,436	14,671	66,499
2020	13,267	1,756	57,157	14,671	73,584
2030	15,556	2,166	57,157	14,671	73,994
2040	18,157	2,632	63,878	14,671	81,181
2044	19,349	2,846	63,878	14,671	81,395
2050	21,137	3,166	63,878	14,671	81,715
2060	24,576	3,783	63,878	14,671	82,332

Figure 25: Middle San Juan Watershed Projected Annual Depletions

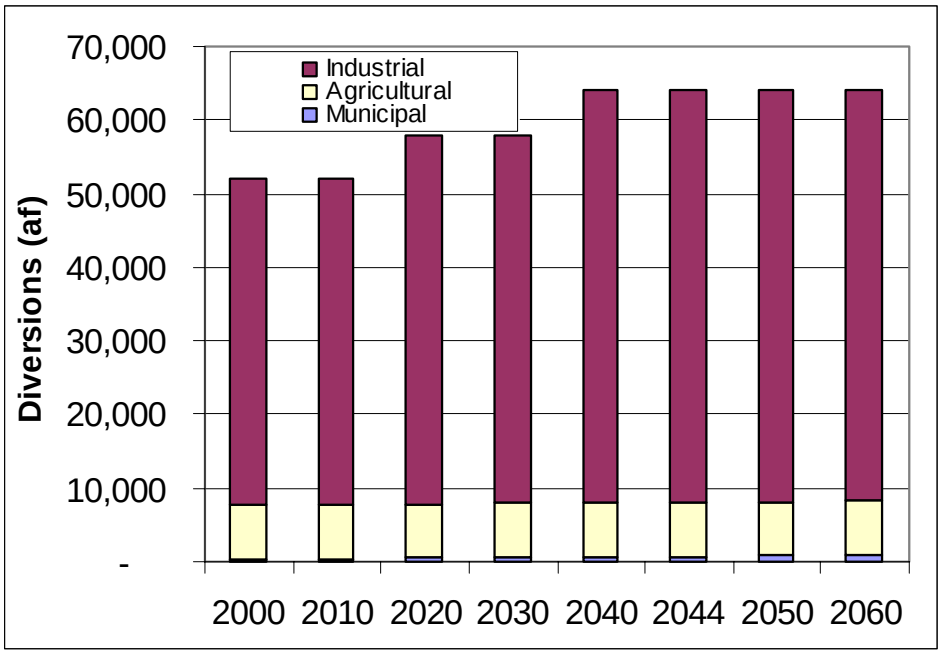


Table 65: Middle San Juan Watershed Projected Annual Depletions (AF)

Year	Population	Municipal	Industrial	Agricultural	Total
2000	9,523	361	44,184	7,336	51,881
2010	11,236	426	44,184	7,336	51,946
2020	13,267	503	50,072	7,336	57,911
2030	15,556	590	50,072	7,336	57,998
2040	18,157	689	55,960	7,336	63,984
2044	19,349	734	55,960	7,336	64,030
2050	21,137	802	55,960	7,336	64,097
2060	24,576	932	55,960	7,336	64,228

Figure 26: Middle San Juan Watershed Monthly Diversions (2044)

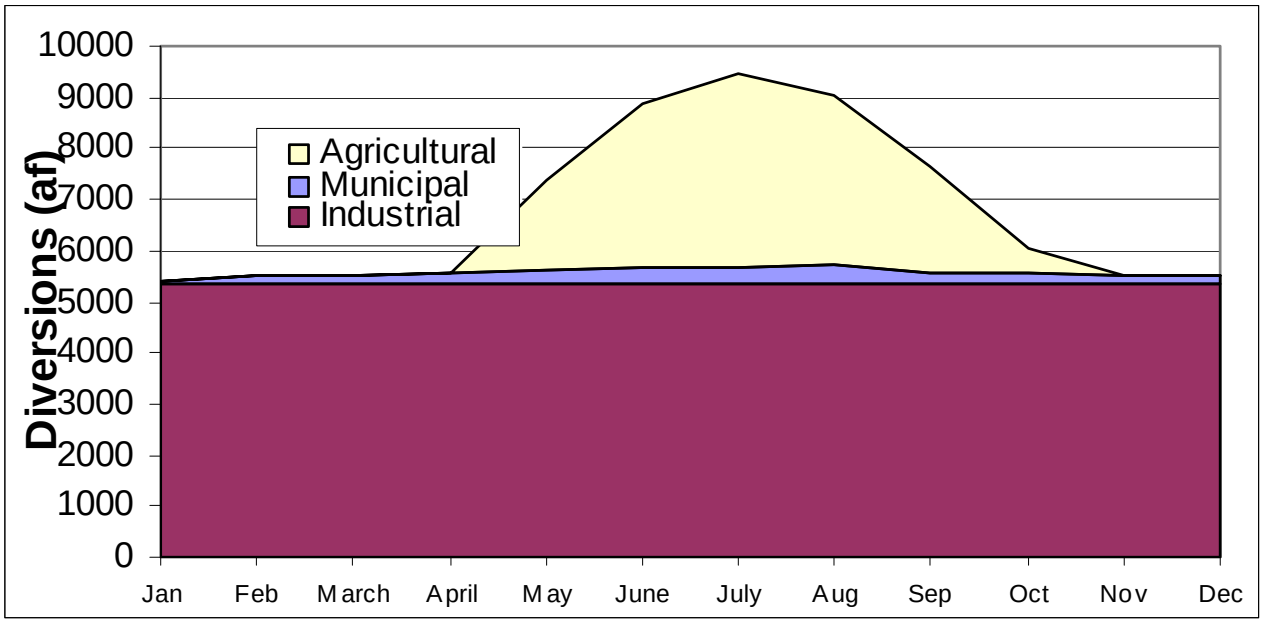


Table 66: Middle San Juan Monthly Diversions in 2044 (AF)

Month	Municipal	Industial	Agricultural	Total
Jan	74	5,323	-	5,397
Feb	168	5,323	-	5,491
March	192	5,323	-	5,515
April	218	5,323	-	5,541
May	289	5,323	1,784	7,396
June	362	5,323	3,212	8,897
July	339	5,323	3,788	9,450
Aug	381	5,323	3,324	9,028
Sep	244	5,323	2,103	7,670
Oct	252	5,323	460	6,035
Nov	168	5,323	-	5,491
Dec	160	5,323	-	5,483
Total	2,846	63,878	14,671	81,395

Projected total demand for the Middle San Juan watershed in 2044 is 81,395 acre-feet with a peak of 9,450 acre-feet in July.

2.7. **Upper San Juan Watershed**

2.7.1. Present uses

The present water uses for the Upper San Juan Watershed were calculated. Both the quantity of water that was diverted for use and the quantity of water that was depleted as a result of the use was estimated.

2.7.1.1. Water diversions by category of use

2.7.1.1.1. Municipal

The quantity of water that was diverted for municipal use within the Upper San Juan Watershed in New Mexico was calculated based on the available information. Diversion records for the year 2000 for the surface water treatment plant that supplies the City of Bloomfield was used to establish an average monthly diversion per capita day requirement. Once the average monthly diversion per capita day requirement was determined, it was applied to the total population within the watershed to determine a total diversion demand for the Upper San Juan Watershed.

The return flow and water usage records for the City of Bloomfield's facilities are provided in Appendix D-1. Table 67 summarizes the monthly deliveries to and from the City of Bloomfield's water treatment plant during the year 2000. The difference between the influent and effluent (deliveries) from the water treatment plant is water used at the water treatment plant for operational purposes (i.e. backwash). The total deliveries to the water treatment plant were 422,553,000 gallons (1,297 acre-feet per year). The total deliveries from the water treatment plant were 408,579,000 gallons (1,254 acre-feet per year). No information was provided concerning the diversion requirement to provide these deliveries. For the purposes of this report it was assumed that the diversion requirements would be similar to the City of Farmington's water treatment plant diversion requirements. Therefore, the deliveries to the City of Bloomfield were assumed to be 84% of the diversions. In addition to meeting the water needs for the City of Bloomfield, the City of Bloomfield sells treated water to El Paso Rio Vista, Transwestern, Giant Refinery, El Paso Blanco Plant, Williams Oilfield, Murph's Lube, residents and commercial users outside of the city limits, and to commercial trucking firms. To determine the diversion requirements for the City of Bloomfield, only the deliveries within the City of Bloomfield were included. Table 68 summarizes the monthly deliveries within the City Limits. The total quantity of water delivered to the City of Bloomfield during the year 2000 was 222,247,000 gallons (682 acre-feet per year) or 53% of the total delivered from the water treatment plant. The total diversion for the City of Bloomfield was calculated to be approximately 264,579,000 gallons (812 acre-feet per year). The calculated monthly diversion requirements to meet the delivery requirements for the City of Bloomfield are presented in Table 69.

Table 67: Monthly Surface Water Influent to and Effluent from the City of Bloomfield's water treatment plant – Year 2000

	Influent	Effluent	WTP Operational Uses
Jan	26,155,000	24,826,000	1,329,000
Feb	23,408,000	22,034,000	1,374,000
Mar	25,020,000	23,418,000	1,602,000
Apr	30,977,000	29,561,000	1,416,000
May	44,169,000	42,714,000	1,455,000
Jun	47,984,000	46,673,000	1,311,000
Jul	48,367,000	47,396,000	971,000
Aug	48,056,000	47,069,000	987,000
Sep	42,868,000	41,958,000	910,000
Oct	34,086,000	33,204,000	882,000
Nov	25,583,000	24,749,000	834,000
Dec	25,880,000	24,977,000	903,000
Total	422,553,000	408,579,000	13,974,000

Table 68: Monthly Surface Water Deliveries to the City of Bloomfield

	Deliveries within the City Limits of Bloomfield
Jan	12,891,000
Feb	12,048,000
Mar	13,999,000
Apr	18,346,000
May	25,412,000
Jun	27,589,000
Jul	24,566,000
Aug	24,884,000
Sep	18,441,000
Oct	15,485,000
Nov	14,539,000
Dec	14,047,000
Total	222,247,000

Table 69: Calculated Diversion for City of Bloomfield

	Deliveries	% Delivery of Diversion	Calculated Diversions
Jan	12,891,000	84%	15,346,000
Feb	12,048,000	84%	14,343,000
Mar	13,999,000	84%	16,665,000
Apr	18,346,000	84%	21,840,000
May	25,412,000	84%	30,252,000
Jun	27,589,000	84%	32,844,000
Jul	24,566,000	84%	29,245,000
Aug	24,884,000	84%	29,624,000
Sep	18,441,000	84%	21,954,000
Oct	15,485,000	84%	18,435,000
Nov	14,539,000	84%	17,308,000
Dec	14,047,000	84%	16,723,000
Total	222,247,000		264,579,000

From the calculated diversions for the City of Bloomfield, a diversion per day can be calculated. The 2000 census population for the City of Bloomfield was 6,417.

Table 70: Calculated Diversion per capita day for the City of Bloomfield

	Calculated Diversions	GPCA Diversion
Jan	15,346,000	77
Feb	14,343,000	77
Mar	16,665,000	84
Apr	21,840,000	113
May	30,252,000	152
Jun	32,844,000	171
Jul	29,245,000	147
Aug	29,624,000	149
Sep	21,954,000	114
Oct	18,435,000	93
Nov	17,308,000	90
Dec	16,723,000	84
Total/Average	264,579,000	113

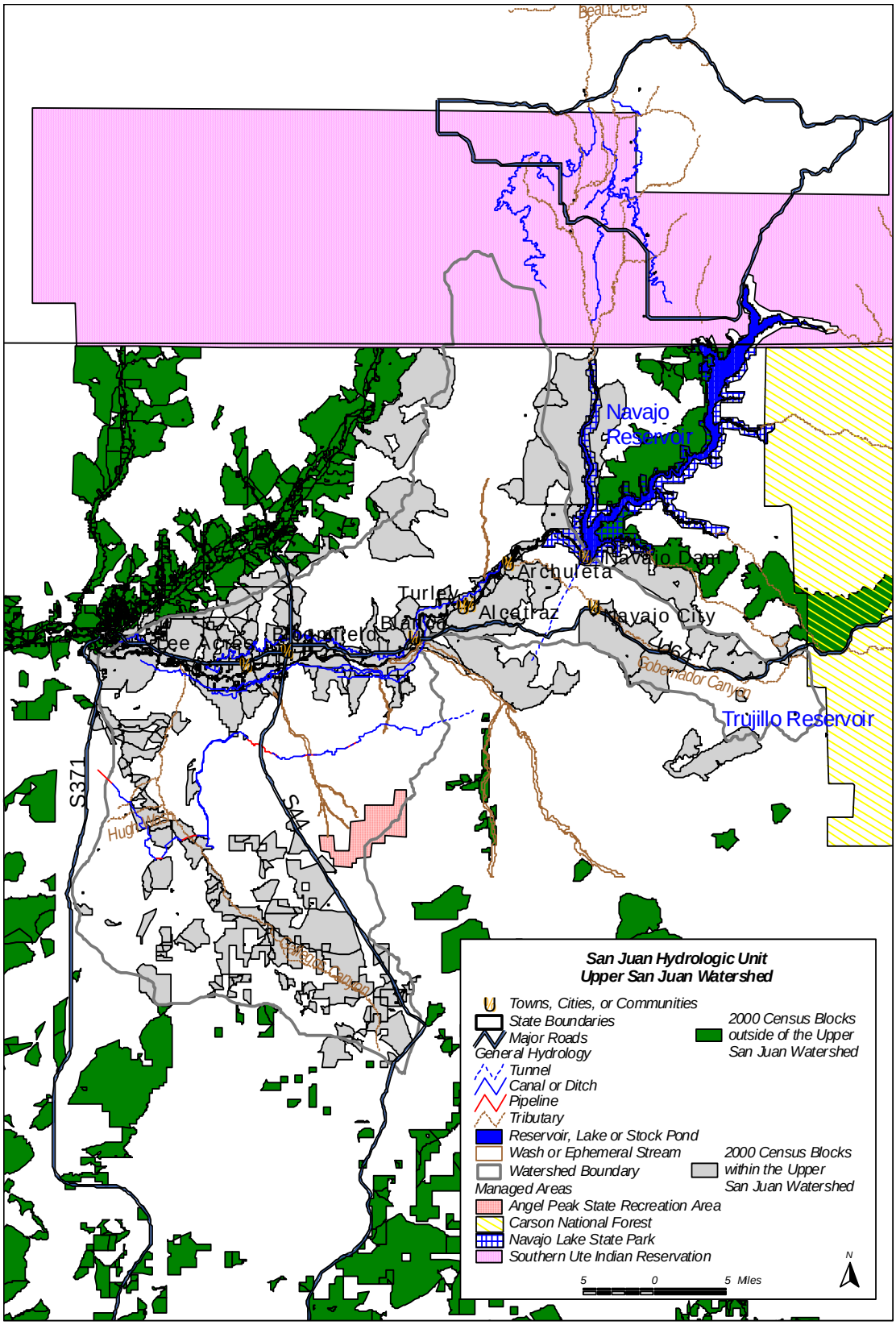
For the purposes of this study, it was assumed that the water use for the City of Bloomfield was fairly representative of the total water use for commercial and residential purposes. To calculate the municipal diversions for the Upper San Juan Watershed, the monthly diversions per capita day calculated in Table 70 was applied to the total population within the watershed. The population for the Upper San Juan Watershed was determined using census blocks from the 2000 Census. There are 2,525 census blocks that cover the Upper San Juan Watershed, of which only 620 contain any population.

Several of the census blocks extended outside of the Upper San Juan Watershed. For these areas, only the population within the Upper San Juan Watershed was included. Figure 27 shows the census blocks that contribute to the population within the Upper San Juan Watershed. The total population for the Upper San Juan Watershed in the year 2000 was 24,216. Using the total population and the information from Table 70, the total diversion demand for the Upper San Juan Watershed was calculated in Table 71.

Table 71: Upper San Juan Watershed Diversions

	GPCA Diversion	Diversions (gallons)	Diversions (acre-feet)
Jan	77	57,803,592	177
Feb	77	54,074,328	166
Mar	84	63,058,464	194
Apr	113	82,092,240	252
May	152	114,105,792	350
Jun	171	124,228,080	381
Jul	147	110,352,312	339
Aug	149	111,853,704	343
Sep	114	82,818,720	254
Oct	93	69,814,728	214
Nov	90	65,383,200	201
Dec	84	63,058,464	194
Average/Total		998,643,624	3,065

Figure 27: Census Blocks within the Upper San Juan Watershed



2.7.1.1.2. Agricultural

Diversion records were not available for the agricultural uses. To estimate the diversions, the following assumptions were required. The diversion requirements were estimated based on the depletions calculated in Table 77. Diversions were calculated as twice the depletion quantity plus 10 percent for incidental losses associated with canal seepage. This calculation assumes that 50% of the water applied to the ground was lost to percolation or direct runoff. The total irrigated acreage and the diversion requirements for agricultural use for the Animas Watershed are presented in Table 72.

Table 72: Agricultural Diversions for the Upper San Juan Watershed

Acres	May	June	July	August	September	October	Total
6,418	3,630	6,587	7,561	6,624	4,277	948	29,627

2.7.1.1.3. Industrial

Industrial diversions within the Upper San Juan Watershed were obtained from the New Mexico Office of the State Engineer records (See Appendix E-1). Most of the industrial diversions within the Upper San Juan Watershed are surface water diversions. The diversions are assumed to be raw water diversions, not treated water diversions. Most of the industries receive treated water from the City of Bloomfield; however, the treated water requirements are assumed to have been included in the commercial and residential water requirement calculations. The diversions provided are total annual values. For the purposes of this study the withdrawals were distributed equally over the entire year. The total industrial withdrawals for the Upper San Juan Watershed are approximately 1,835.46 acre-feet and are distributed monthly in Table 74.

Table 73: Industrial Diversions within the Upper San Juan Watershed

Industry	Diversion (acre-feet)
Conoco Inc. – San Juan GP	319.82
El Paso Natural Gas – Chaco GP	545.20
Giant Refining – San Juan Bloomfield	412.00
El Paso Natural Gas – Blanco Plant	507.44
Williams Fld Srv (Sunterra) -- Kutz	51.00
Total	1,835.46

2.7.1.1.4. Summary of Upper San Juan Watershed Diversions

The total monthly diversions within the Upper San Juan Watershed are summarized in Table 74. The values presented in Table 74 are in acre-feet.

Table 74: Total Monthly Diversions in the Upper San Juan Watershed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Municipal	177	166	194	252	350	381	339	343	254	214	201	194	3,065
Agricultural	0	0	0	0	3,630	6,587	7,561	6,624	4,277	948	0	0	29,627
Industrial	153	153	153	153	153	153	153	153	153	153	153	153	1,836
Total	330	319	347	405	3,803	6,522	7,366	6,518	4,295	1,229	354	347	31,835

2.7.1.2. Water depletions by category of use

2.7.1.2.1. Municipal

Municipal depletions can be calculated based on the quantity of water that is delivered from the water treatment plant and the quantity of water that is returned through the wastewater treatment plant. The City of Bloomfield is somewhat unique in that it receives wastewater from some entities that it does not provide water deliveries to. Table 75 summarizes the total water treatment deliveries and the total return flows for only the entities that the City of Bloomfield provides water. Because many of the communities within the watershed do not have a secondary water system, some of the treated water delivered is used to irrigate lawns and gardens. To account for the return flows from irrigated lawns and gardens, it was assumed that 50% of the depletions above the average winter baseline would be return flows. This assumption was based on the "Return Flow Plan and Crediting Program for San Juan Water Commission, March 1998". The average winter baseline for the City of Bloomfield was calculated as 36 gpcd based on the depletions for November through March shown in Table 75.

Table 75: City of Bloomfield Depletions

	Deliveries	Wastewater Treatment Plant Return Flows	Calculated Depletions	GPCA Depletions
Jan	24,826,000	18,129,700	6,696,300	34
Feb	22,034,000	13,844,100	8,189,900	44
Mar	23,418,000	17,314,100	6,103,900	31
Apr	29,561,000	18,717,200	10,843,800	46
May	42,714,000	16,305,400	26,408,600	84
Jun	46,673,000	20,880,300	25,792,700	85
Jul	47,396,000	20,194,872	27,201,128	86
Aug	47,069,000	19,288,165	27,780,835	88
Sep	41,958,000	18,191,300	23,766,700	80
Oct	33,204,000	16,445,000	16,759,000	60
Nov	24,749,000	17,260,300	7,488,700	39
Dec	24,977,000	18,155,400	6,821,600	34
Total	408,579,000	214,725,837	193,853,163	

Using the total population and the information from Table 75, the total depletions for the Upper San Juan Watershed was calculated in Table 76.

Table 76: Upper San Juan Watershed Depletions

	GPCA Depletions	Depletions (gallons)	Depletions (acre-feet)
Jan	34	25,523,664	78
Feb	44	30,899,616	95
Mar	31	23,271,576	71
Apr	46	33,418,080	103
May	84	63,058,464	194
Jun	85	61,750,800	190
Jul	86	64,559,856	198
Aug	88	66,061,248	203
Sep	80	58,118,400	178
Oct	60	45,041,760	138
Nov	39	28,332,720	87
Dec	34	25,523,664	78
Average/Total		525,560,000	1,613

2.7.1.2.2. Agricultural

Agricultural depletions were calculated using the same approach used by the State of New Mexico. The original Blaney-Criddle method was used to determine the annual consumptive use requirements. The annual consumptive uses were then distributed using monthly crop use percentages that were developed using the Modified Blaney-Criddle method.

The consumptive use coefficients (k) and consumptive use factors (f) were obtained from the "Technical Report 32, Consumptive Use and Water Requirements in New Mexico." The consumptive use coefficients for the Modified Blaney-Criddle method were obtained from the "Irrigation Water Requirements, Soil Conservation Service, September 1970." The monthly consumptive use values for crops in Bloomfield, Farmington, and Shiprock are provided in the "Technical Report 32". The consumptive use values from these three areas were averaged to develop representative consumptive use values for the San Juan Hydrologic Unit.

Irrigated acreage was obtained from the New Mexico Interstate Streams Commission (ISC) in GIS format. The irrigated acreage was then divided by watershed. The acreage was totaled and compared with tabular acreage for the year 2000 provided by the ISC to confirm that all the acreage was accounted for. The irrigated acreage within the Animas Watershed was summarized for each crop type and the consumptive use for each crop was calculated. In addition to the crop consumptive use, incidental losses associated with phreatophytes and evaporation also contribute to consumptive use. It was assumed that incidental losses were approximately 10% of the total crop consumptive use. The results are presented in Table 51.

Table 77: Monthly Agricultural Depletions within the Upper San Juan Watershed

	Acres	May	June	July	August	September	October	Total
Alfalfa	2,569	730	1288	1519	1335	841	192	5,905
Corn	62	9	23	37	34	20	0	123
Vegetables	23	3	8	12	12	7	2	44
Orchard	64	10	29	34	23	12	0	108
Pasture	2,998	719	1277	1534	1340	892	199	5,961
Grain	139	80	158	16	0	0	0	254
Sod	260	62	111	133	116	77	17	516
GPA	303	37	100	152	151	95	21	556
Subtotal	6,418	1,650	2,994	3,437	3,011	1,944	431	13,467
Incidental Losses	642	165	299	344	301	194	43	1,347
Total	7,060	1,815	3,293	3,781	3,312	2,138	474	14,814

2.7.1.2.3. Industrial

Industrial depletions within the Upper San Juan Watershed were obtained from the New Mexico Office of the State Engineer records (See Appendix E-1). Most of the industrial depletions within the Upper San Juan Watershed are surface water depletions. The depletions provided are total annual values. For the purposes of this study the depletions were distributed equally over the entire year. The total industrial depletions in the Upper San Juan Watershed are approximately 1,835 acre-feet (100% of the diversions) and are distributed monthly in Table 78.

2.7.1.2.4. Summary of Upper San Juan Watershed Depletions

The total monthly depletions within the Upper San Juan Watershed are summarized in Table 78. The values presented in Table 78 are in acre-feet.

Table 78: Summary of Depletions in the Upper San Juan Watershed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Municipal	78	95	71	103	194	190	198	203	178	138	87	78	1,613
Agricultural	0	0	0	0	1,815	3,293	3,781	3,312	2,138	474	0	0	14,813
Industrial	153	153	153	153	153	153	153	153	153	153	153	153	1,836
Total	231	248	224	256	2,162	3,636	4,132	3,668	2,469	765	240	231	18,262

2.7.2. Future water uses

2.7.2.1. Zoning / Buildout

The existing land ownership was evaluated within the Upper San Juan Watershed outside of the Southern Ute Indian Reservation. The total acreage of private lands was calculated to ensure that the population density (people per acre) did not exceed a typical population density for buildout. Typical buildout populations are in the range of 4 to 6 people per acre. The total acreage of private lands within the Upper San Juan Watershed was calculated at approximately 91,500 acres. Using the 2060 buildout population of 62,474, the population density within the Upper San Juan Watershed would increase to an

average of approximately 0.7 people per acre. Therefore the availability of land for growth to develop does not limit growth in the Upper San Juan Watershed. This calculation assumes that all of the private lands are available for development. If growth were limited to non-irrigated lands, the population density would still not affect the growth rate.

2.7.2.2. Projected water demands by category of use

Future water use projections are based on the same three categories that were used in current water demand analysis. Those categories are:

- municipal ,
- industrial, and
- agricultural.

There are several assumptions that are the basis for projecting demand for each of these categories through the planning horizon.
Gallons per capita day (GPCD) values for each watershed were applied to population projections to calculate future municipal demands. For the Middle San Juan Watershed, 160 gallons per capita day was applied to the watershed population increase above 2000 population. It is assumed that as growth occurs, future developments will require municipal demands more closely associated with urban usage than with rural usage. Consequently, a higher per capita usage than current per capita usage is used for future projections.
The projected water use for the Upper San Juan watershed is presented in the following tables and graphs. Figure 28 shows population growth and associated municipal diversion demands, and show values for projected diversions.

Figure 29 and Table 79 show values for projected diversions. Table 80 shows values for projected depletions. Table 81 shows monthly diversions for the planning horizon year of 2044.

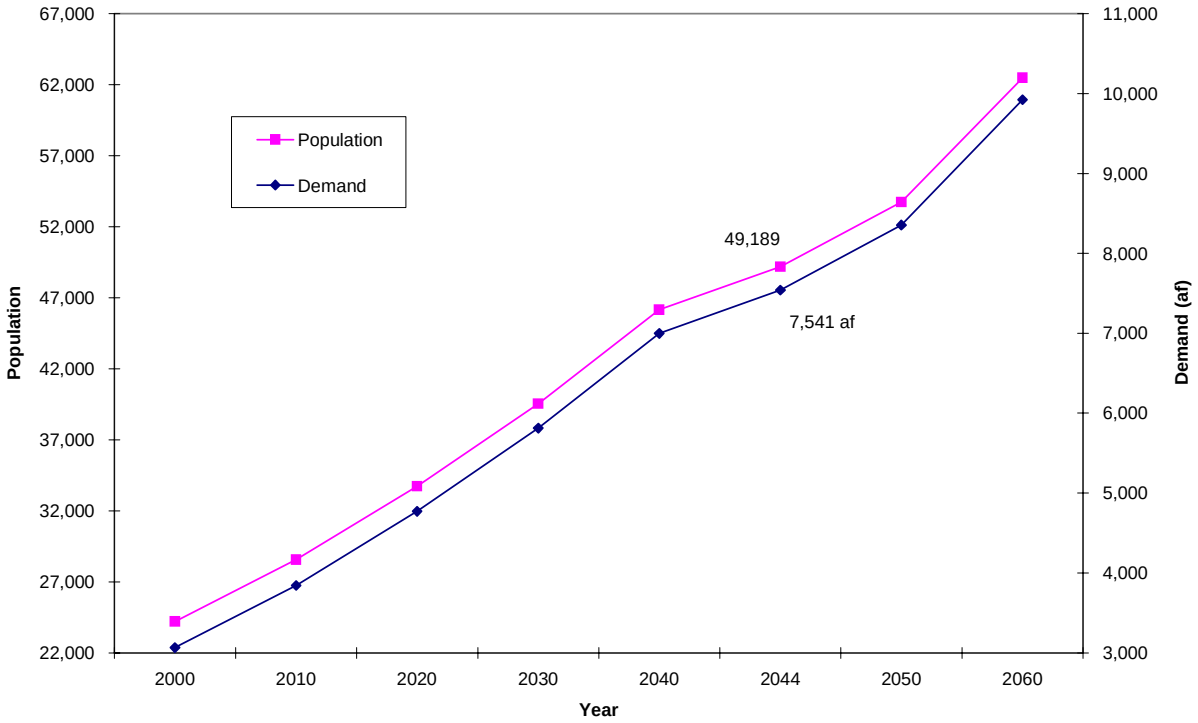


Figure 28: Upper San Juan Population Projections and Municipal Diversions

Figure 29: Upper San Juan Watershed Projected Annual Diversions (AF)

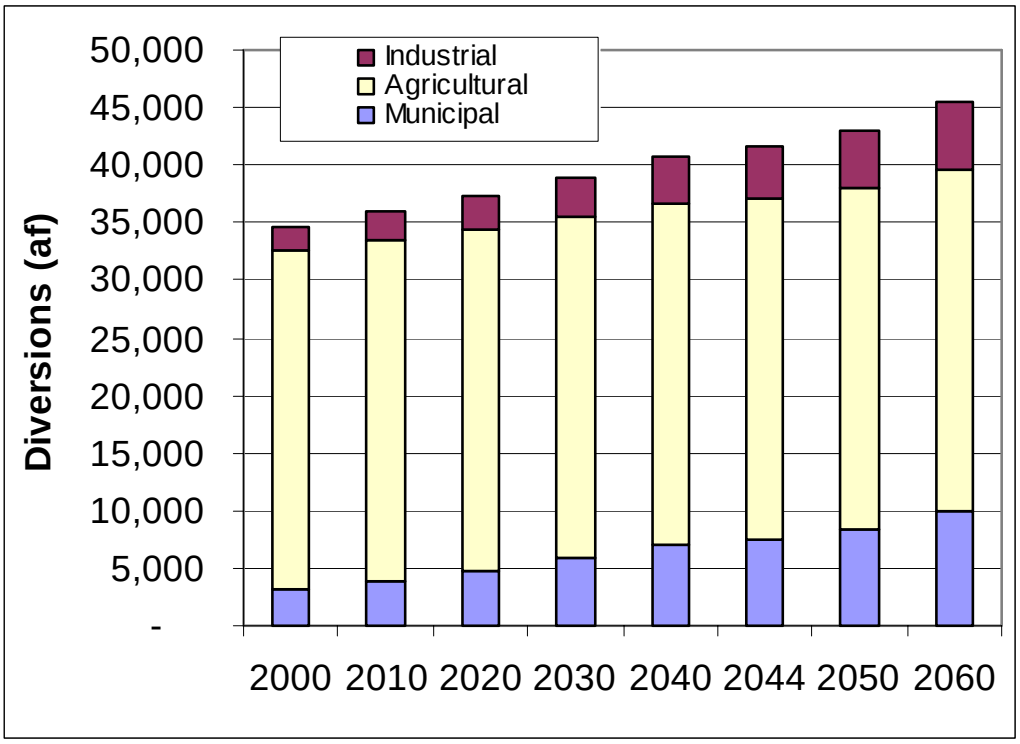


Table 79: Upper San Juan Watershed Projected Annual Diversions (AF)

Year	Population	Municipal	Industrial	Agricultural	Total
2000	24,216	3,065	2,008	29,627	34,700
2010	28,569	3,845	2,410	29,627	35,882
2020	33,731	4,770	2,892	29,627	37,289
2030	39,548	5,813	3,470	29,627	38,910
2040	46,159	6,998	4,164	29,627	40,789
2044	49,189	7,541	4,497	29,627	41,665
2050	53,733	8,355	4,997	29,627	42,979
2060	62,474	9,922	5,996	29,627	45,545

Figure 30: Upper San Juan Watershed Projected Annual Depletions

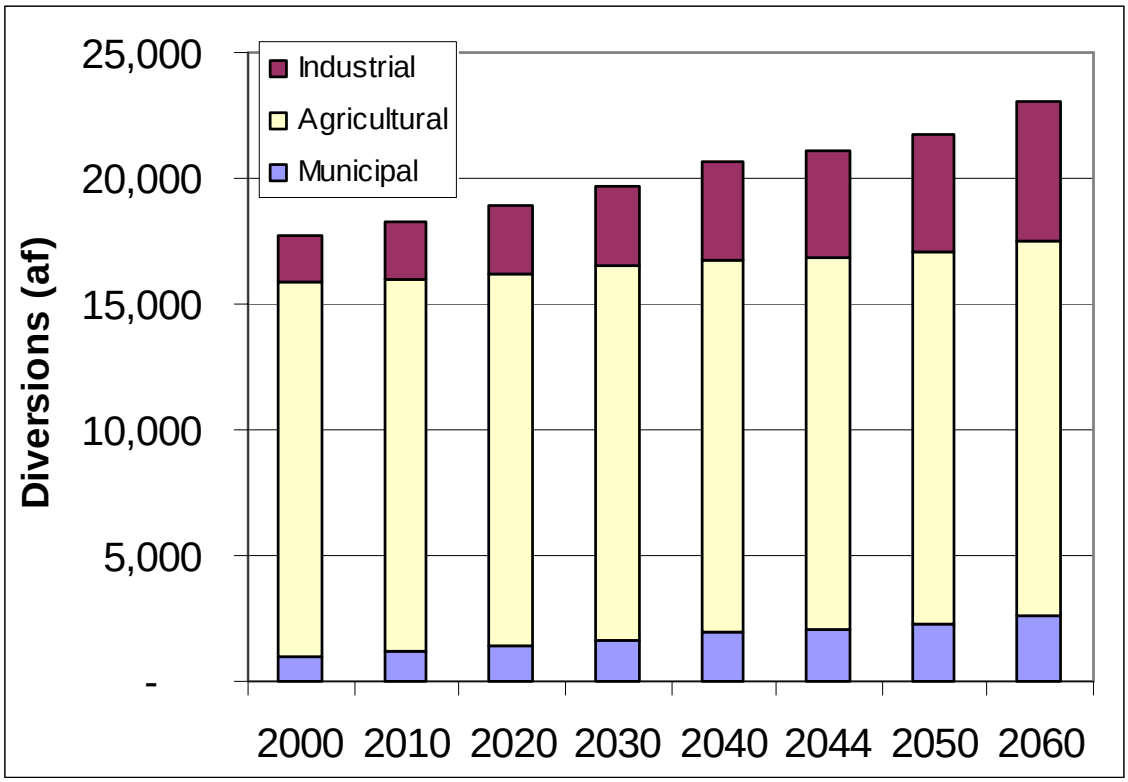


Table 80: Upper San Juan Watershed Projected Annual Depletions (AF)

Year	Population	Municipal	Industrial	Agricultural	Total
2000	24,216	1,021	1,860	14,813	17,694
2010	28,569	1,204	2,232	14,813	18,249
2020	33,731	1,422	2,678	14,813	18,913
2030	39,548	1,667	3,214	14,813	19,694
2040	46,159	1,945	3,857	14,813	20,615
2044	49,189	2,073	4,165	14,813	21,052
2050	53,733	2,265	4,628	14,813	21,706
2060	62,474	2,633	5,554	14,813	23,000

Figure 31: Upper San Juan Watershed Monthly Diversions (2044)

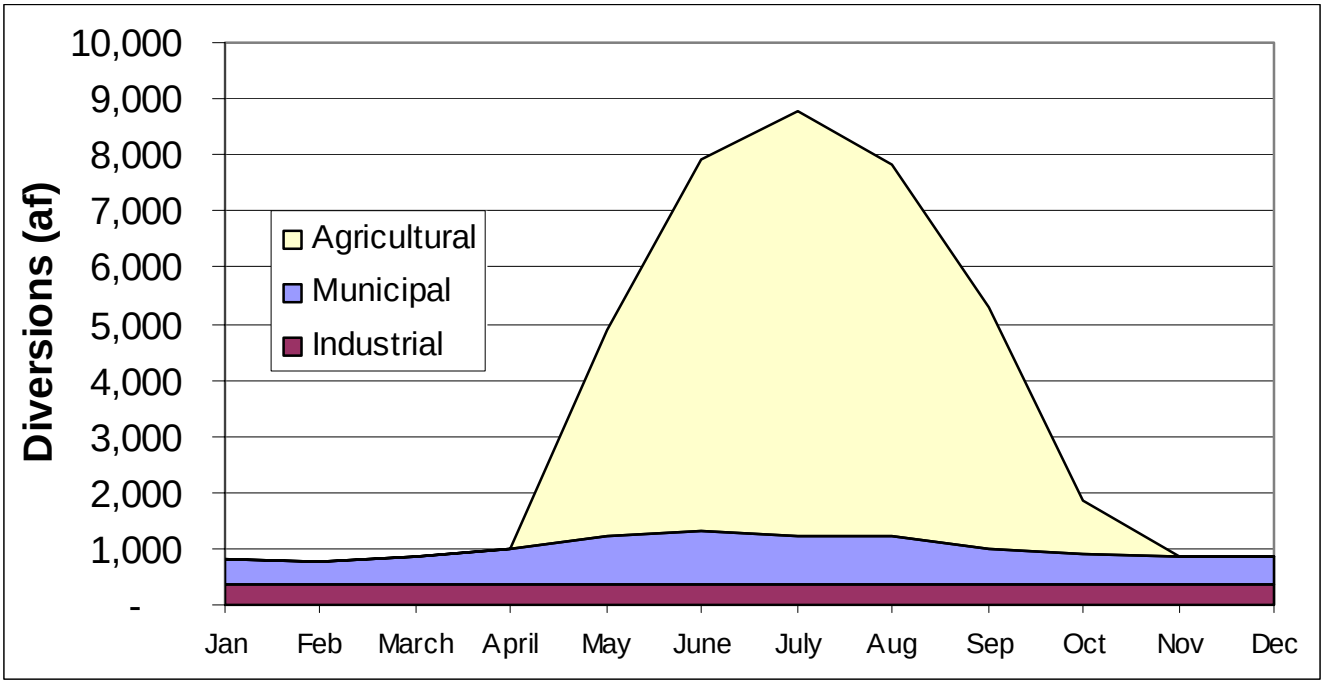


Table 81: Upper San Juan Monthly Diversions in 2044 (AF)

Month	Municipal	Industrial	Agricultural	Total
Jan	435	375	0	810
Feb	408	375	0	783
March	477	375	0	852
April	620	375	0	995
May	861	375	3630	4,866
June	937	375	6587	7,899
July	834	375	7561	8,770
Aug	844	375	6624	7,843
Sep	625	375	4277	5,277
Oct	527	375	948	1,849
Nov	495	375	0	869
Dec	477	375	0	852
Total	7541	4497	29627	41665

Projected total demand for the Upper San Juan watershed in 2044 is 41,665 acre-feet with a peak of 8,770 acre-feet in July.

2.8. **Upper San Juan above Navajo Dam Watershed**

2.8.1. Present uses

The present water uses for the Upper San Juan above Navajo Dam Watershed were calculated. Both the quantity of water that was diverted for use and the quantity of water that was depleted as a result of the use was estimated.

2.8.1.1. Water diversions by category of use

2.8.1.1.1. Municipal

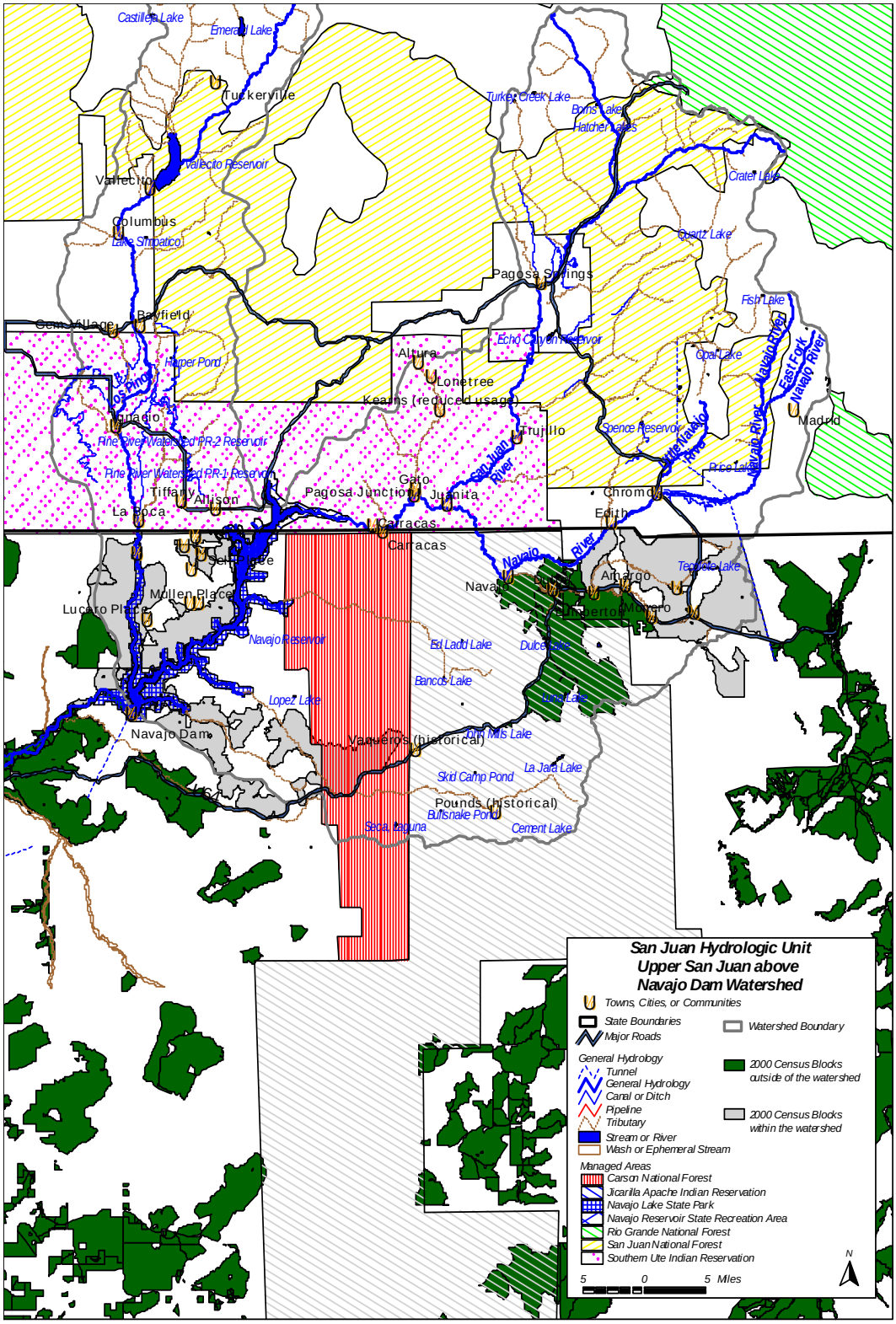
For the Upper San Juan above Navajo Dam Watershed, it was assumed that the water use within this watershed would be most comparable to that of the Lower Valley Water Users Cooperative Association. Therefore, the diversions per capita day for the Lower Valley Water Users Cooperative Association were assumed for the Upper San Juan above Navajo Dam Watershed.

The population for the Upper San Juan above Navajo Dam Watershed was determined using census blocks from the 2000 Census. There are 992 census blocks that cover the Upper San Juan above Navajo Dam Watershed within New Mexico, of which only 120 contain any population. Of the 120 census blocks with population only 46 of them are outside of the Jicarilla Apache Nation. Several of the census blocks extend outside of the Upper San Juan above Navajo Dam Watershed. For these areas, only the population within the Upper San Juan above Navajo Dam Watershed was included. Figure 32 shows the census blocks that contribute to the population within the Upper San Juan above Navajo Dam Watershed. The population for the Upper San Juan above Navajo Dam Watershed identified in Figure 32 for the year 2000 was 512. Using this population, the total diversion demand for the Upper San Juan above Navajo Dam Watershed was calculated in Table 82.

Table 82: Assumed diversions for the Upper San Juan above Navajo Dam Watershed

	GPCA Diversions	Diversions (gallons)	Diversions (acre-feet)
Jan	31	492,032	2
Feb	75	1,113,600	3
Mar	80	1,269,760	4
Apr	94	1,443,840	4
May	122	1,936,384	6
Jun	158	2,426,880	7
Jul	143	2,269,696	7
Aug	160	2,539,520	8
Sep	106	1,628,160	5
Oct	106	1,682,432	5
Nov	73	1,121,280	3
Dec	68	1,079,296	3
Average/Total		19,003,000	57

Figure 32: 2000 Census Blocks within the Upper San Juan above Navajo Dam Watershed



2.8.1.1.2. Agricultural

ISC has identified 200 acres of irrigated lands in the watershed. There is no data on distribution of crops in this area; however, it is predominately pasture ground. Depletions are assumed to be 2 acre-feet per acre and diversions two times depletions plus 10 percent canal losses.

2.8.1.1.3. Industrial

There are no specific diversions for industrial uses. Any industry within the Upper San Juan above Navajo Dam Watershed receives water through municipal water systems and cannot be specifically determined.

2.8.1.1.4. Summary of Upper San Juan above Navajo Dam Watershed Diversions

The total monthly diversions within the Upper San Juan above Navajo Dam Watershed are summarized in Table 83. The values presented in Table 83 are in acre-feet.

Table 83: Total Monthly Diversions in the Upper San Juan above Navajo Dam Watershed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Municipal	2	3	4	4	6	7	7	8	5	5	3	3	57
Agricultural	0	0	0	0	110	198	286	176	110	0	0	0	880
Industrial	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	2	3	4	4	116	205	293	184	115	5	3	3	937

2.8.1.2. Water depletions by category of use

2.8.1.2.1. Municipal

The same assumptions that were used for estimating the diversions within the Upper San Juan above Navajo Dam Watershed were used to estimate the depletions. The results are presented in Table 84.

Table 84: Assumed Depletions for the Upper San Juan above Navajo Dam Watershed

	GPCA Depletions	Depletions (gallons)	Depletions (acre-feet)
Jan	10	158,720	0.5
Feb	25	371,200	1
Mar	26	412,672	1
Apr	31	476,160	1
May	40	634,880	2
Jun	52	798,720	2
Jul	47	745,984	2
Aug	53	841,216	3
Sep	35	537,600	2
Oct	35	555,520	2
Nov	24	368,640	1
Dec	22	349,184	1
Average/Total		6,250,000	18.5

2.8.1.2.2. Agricultural

Depletions on 200 acres at 2 acre-feet per acre are 400 acre feet.

2.8.1.2.3. Industrial

There are no specific depletions for industrial uses outside of the Jicarilla Apache Nation. Any industry within the Upper San Juan above Navajo Dam Watershed receives water through municipal water systems and cannot be specifically determined.

2.8.1.2.4. Summary of Upper San Juan above Navajo Dam Watershed Depletions

The total monthly depletions within the Upper San Juan above Navajo Dam Watershed are summarized in Table 85. The values presented in Table 85 are in acre-feet.

Table 85: Summary of Depletions in the Upper San Juan above Navajo Dam Watershed

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Municipal	0.5	1	1	1	2	2	2	3	2	2	1	1	18.5
Agricultural	0	0	0	0	50	90	130	80	50	0	0	0	400
Industrial	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0.5	1	1	1	52	92	132	83	52	2	1	1	418.5

2.8.2. Future water uses

2.8.2.1. Zoning / Buildout

The existing land ownership was evaluated within the Upper San Juan above Navajo Dam Watershed outside of the Jicarilla Apache Nation and the Southern Ute Indian Reservation. The total acreage of private lands was calculated to ensure that the population density (people per acre) did not exceed a typical population density for buildout. Typical buildout populations are in the range of 4 to 6 people per acre. The total acreage of private lands within the Upper San Juan above Navajo Dam Watershed

was calculated at approximately 113,200 acres. Using the 2060 buildout population of 1,160, the population density within the Upper San Juan above Navajo Dam Watershed would increase to an average of approximately 0.01 people per acre. Therefore the availability of land for growth to develop does not limit growth in the Upper San Juan above Navajo Dam Watershed. This calculation assumes that all of the private lands are available for development. If growth were limited to non-irrigated lands, the population density would still not affect the growth rate.

2.8.2.2. Projected water demands by category of use

Future water use projections are based on the same three categories that were used in current water demand analysis. Those categories are:

- municipal ,
- industrial, and
- agricultural.

There are several assumptions that are the basis for projecting demand for each of these categories through the planning horizon.
Gallons per capita day (GPCD) values for each watershed were applied to population projections to calculate future municipal demands. For the Middle San Juan Watershed, 160 gallons per capita day was applied to the watershed population increase above 2000 population. It is assumed that as growth occurs, future developments will require municipal demands more closely associated with urban usage than with rural usage. Consequently, a higher per capita usage than current per capita usage is used for future projections.

The projected water use for the Upper San Juan above Navajo watershed is presented in the following tables and graphs. Figure 33 shows population growth and associated municipal diversion demands, and show values for projected diversions.

Figure 34 and Table 86 show values for projected diversions.

Year	Population	Municipal	Industrial	Agricultural	Total
2000	522	19	-	400	419
2010	592	22	-	400	422
2020	683	25	-	400	425
2030	784	28	-	400	428
2040	896	33	-	400	433
2044	947	34	-	400	434
2050	1,024	37	-	400	437
2060	1,168	42	-	400	442

Table 87 shows values for projected depletions. Table 88 shows monthly diversions for the planning horizon year of 2044.

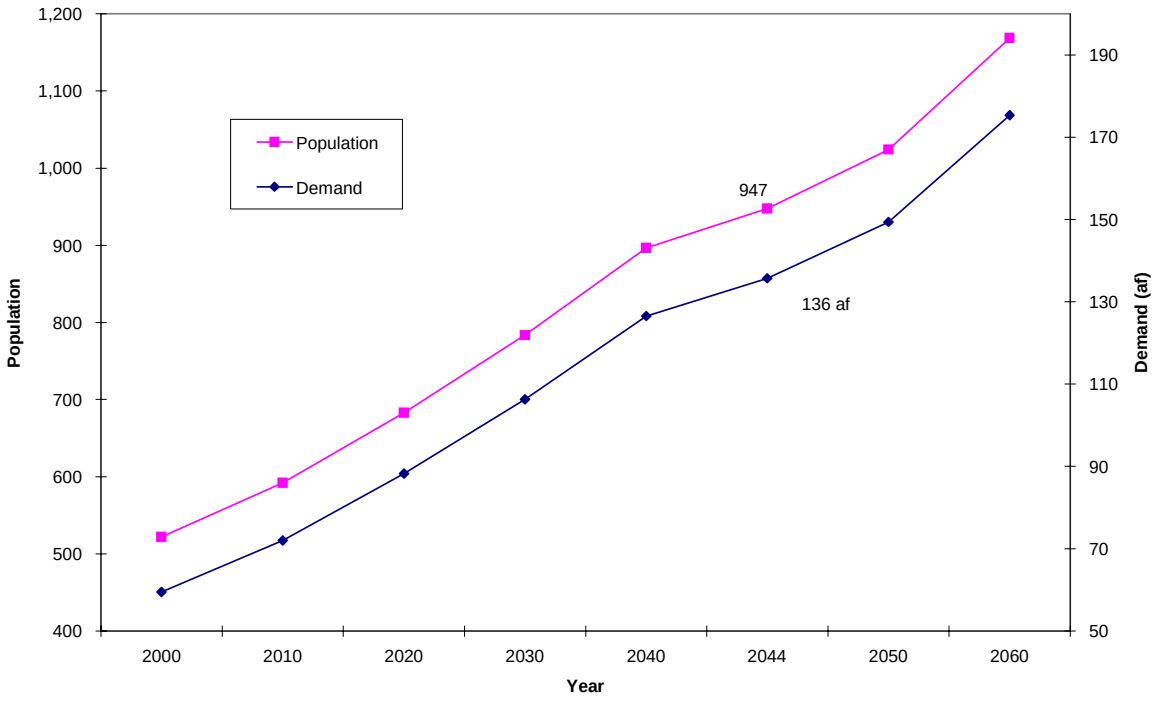


Figure 33: Upper San Juan above Navajo Population Projections and Municipal Diversions

Figure 34: Upper San Juan above Navajo Watershed Projected Annual Diversions (AF)

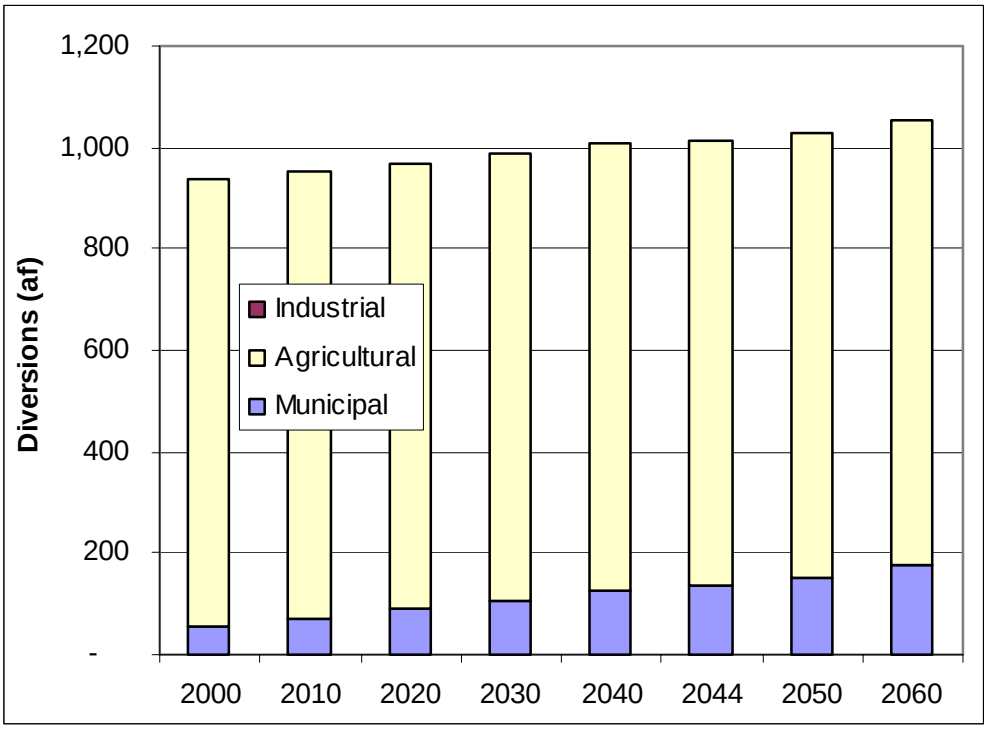
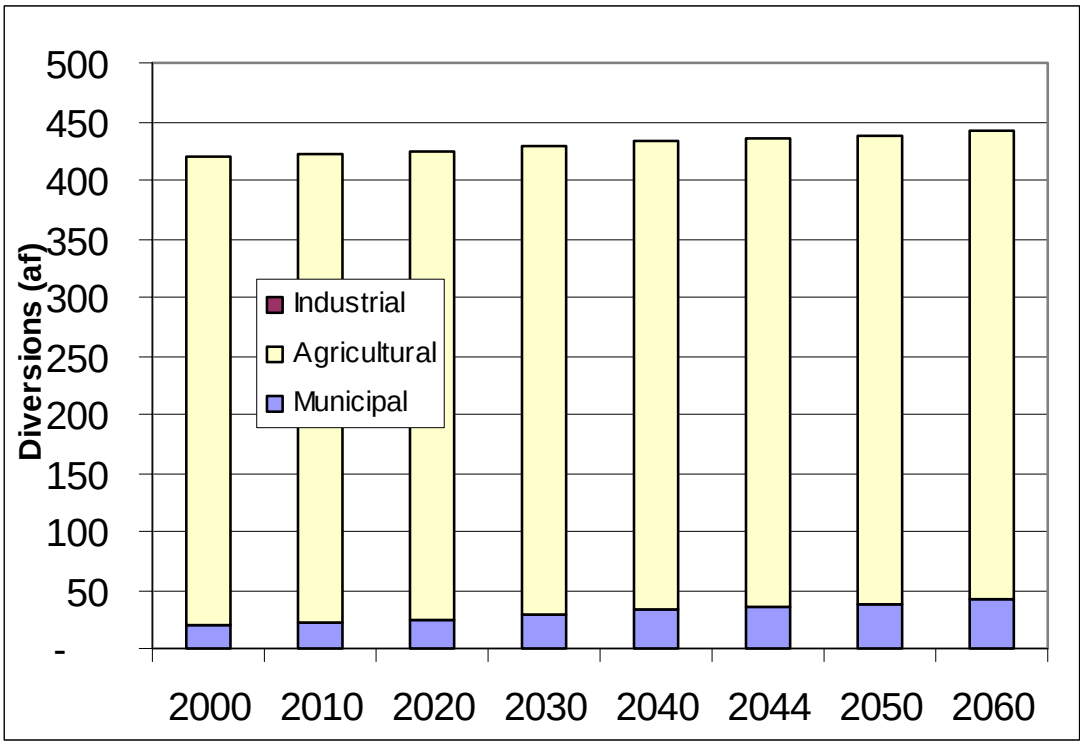


Table 86: Upper San Juan above Navajo Watershed Projected Annual Diversions (AF)

Year	Population	Municipal	Industrial	Agricultural	Total
2000	522	57	-	880	937
2010	592	72	-	880	952
2020	683	88	-	880	968
2030	784	106	-	880	986
2040	896	127	-	880	1,007
2044	947	136	-	880	1,016
2050	1,024	149	-	880	1,029
2060	1,168	175	-	880	1,055

Figure 35: Upper San Juan above Navajo Watershed Projected Annual Depletions



Year	Population	Municipal	Industrial	Agricultural	Total
2000	522	19	-	400	419
2010	592	22	-	400	422
2020	683	25	-	400	425
2030	784	28	-	400	428
2040	896	33	-	400	433
2044	947	34	-	400	434
2050	1,024	37	-	400	437
2060	1,168	42	-	400	442

Table 87: Upper San Juan above Navajo Watershed Projected Annual Depletions (AF)

Figure 36: Upper San Juan above Navajo Watershed Monthly Diversions (2044)

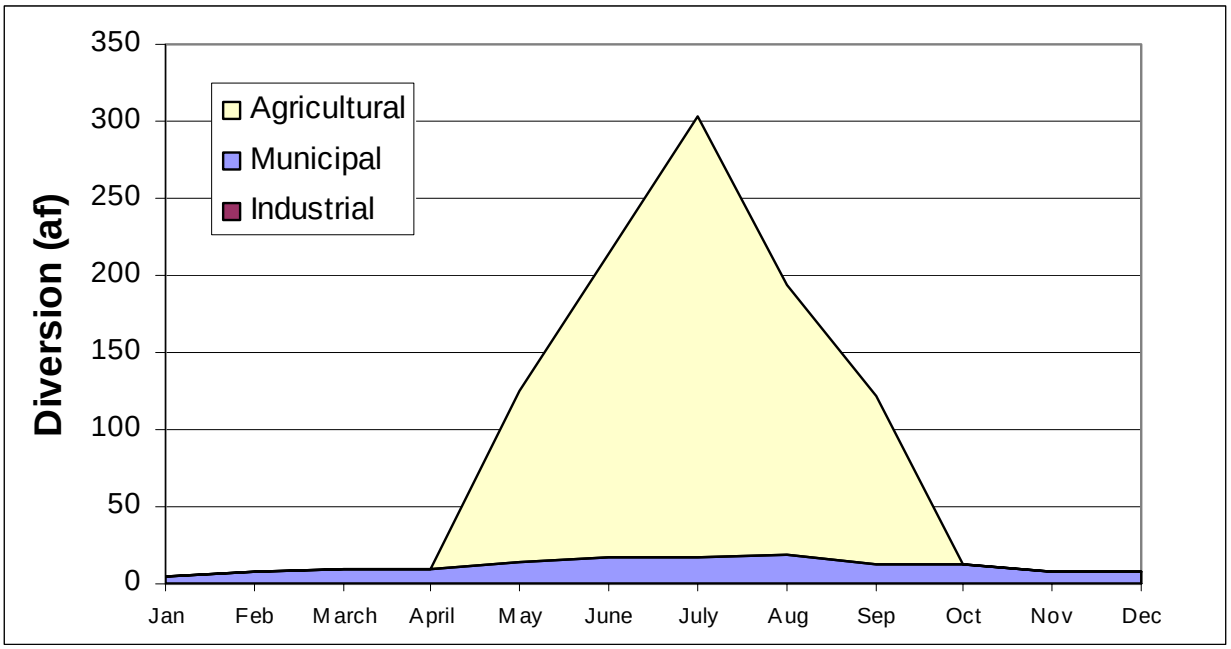


Table 88: Upper San Juan above Navajo Monthly Diversions in 2044 (AF)

Month	Municipal	Industrial	Agricultural	Total
Jan	5	0	0	5
Feb	7	0	0	7
March	10	0	0	10
April	10	0	0	10
May	14	0	110	124
June	17	0	198	215
July	17	0	286	303
Aug	19	0	175	194
Sep	12	0	110	122
Oct	12	0	0	12
Nov	7	0	0	7
Dec	7	0	0	7
Total	137	-	879	1,016

Projected total demand for the Upper San Juan above Navajo watershed in 1,016 is acre-feet with a peak of 303 acre-feet in July.

2.9. **Summary of present water demand**

Table 89: Summary of San Juan Hydrologic Unit Diversions to Meet Existing Demands

Watershed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Animas	717	674	775	1,039	3,783	6,142	6,904	6194	4,275	1,613	727	690	33,533
Blanco Canyon	14.7	19.7	20.7	21.7	153.7	156.7	155.7	157.7	151.7	22.7	19.7	18.7	913
Chaco	82	112	120	129	153	177	169	182	138	140	113	111	1,626
La Plata	38	85	97	110	1,706	2,979	3,343	2,959	1,939	533	86	82	13,957
Middle San Juan	4,231	4,267	4,276	4,286	6,097	7,553	8,120	7,672	6,399	4,759	4,267	4,264	64,858
Upper San Juan	330	319	347	405	3,803	6,522	7,366	6,518	4,295	1,229	354	347	31,835
Upper San Juan above Navajo Dam	2	3	4	4	116	205	293	184	115	5	3	3	937
Total	5,415	5,480	5,640	5,995	15,650	23,443	26,007	23,565	17,122	8,260	5,570	5,516	147,663

Table 90: Summary of San Juan Hydrologic Unit Depletions from the Existing Demands

Watershed	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Animas	178	155	178	262	1,659	2,750	3,122	2,769	1,850	555	138	139	13,755
Blanco Canyon	12.27	14.3	14.3	14.3	80.3	81.3	81.3	82.3	80.3	15.3	13.3	13.3	503
Chaco	66	76	78	81	89	97	94	99	84	85	76	75	1,000
La Plata	8	18	20	23	810	1,436	1,621	1,424	934	229	18	17	6,558
Middle San Juan	3,691	3,703	3,706	3,709	4,610	5,334	5,619	5,392	4,765	3,944	3,703	3,702	51,878
Upper San Juan	231	248	224	256	2,162	3,636	4,132	3,668	2,469	765	240	231	18,262
Upper San Juan above Navajo Dam	0.5	1	1	1	52	92	132	83	52	2	1	1	419
Total	4,187	4,215	4,221	4,346	9,462	13,426	14,801	13,517	10,234	5,595	4,189	4,178	92,371

3.0 Navajo Nation Projected Demands

Analyses of the water supply and demands for the Navajo Nation are not included in this regional plan. The Nation is concurrently completing its own water planning effort that will eventually be included as a referenced document in this final report.

Independent of either its own regional planning effort or this study, the Navajo Nation Department of Water Resources has developed projections of water demands. Information developed by the Nation is presented in this regional plan and used to evaluate the water budgets for the Middle San Juan and Upper San Juan Watersheds. The information provided is contained in two documents:

1. Water Resource Development Strategy for the Navajo Nation, Navajo Nation Department of Water Resources, July 17, 2000
2. Final Draft Technical Memorandum, The Navajo-Gallup Water Supply Project, March 16, 2001

Table 91 shows the projected Navajo Municipal and Industrial (M&I) demands, diversions and depletions as provided in tables of projected demands.

Table 91: Navajo Nation M&I Water Supply/Demands Summary

(acre-feet)

	2010	2020	2030	2040	2050	2060
Upper Colorado Basin Demands	17,798	20,719	24,451	29,219	35,311	43,094
San Juan River Diversions*	18,644	22,727	28,790	36,564	46,622	59,472
ALP Diversions	4,680	4,680	4,680	4,680	4,680	4,680
Total Diversions	23,324	27,407	33,470	41,244	51,302	64,152
Depletions	18,644	22,487	27,834	34,693	43,583	54,939
	79.93%	82.05%	83.16%	84.12%	84.95%	85.64%

* includes transbasin diversions

All of the above diversions and depletions are associated with either the Middle San Juan or the Upper San Juan below Navajo Dam Watersheds.

In addition to the above demands, the Navajo Nation anticipates demands associated with irrigation, in particular the Navajo Indian Irrigation Project (NIIP). The authorized acreage of the NIIP is 110,630. Only 60 percent of this project has been developed and it is anticipated that it will be completed in 2012. The Nation estimates that upon completion the project will divert 360,000 acre-feet and deplete 270,000 acre-feet. Currently, NIIP diverts approximately 114,000 acre-feet annually and depletes approximately 86,000 acre feet.

Small irrigation projects are estimated to require an additional 99,560 acre-feet of diversion. Depletions are not provided, but at the same rate as the NIIP (2.4 acre feet of depletion per ace) depletion would be 47,789 acre-feet.

Livestock demand is provided primarily from shallow groundwater within the Nation. Therefore, it is not considered by this regional planning study.

Industrial uses have been included in the demands for each watershed as provided by the State of New Mexico.

This information from the Navajo Nation will be used in the development of the water budgets for the applicable watersheds.

4.0 Jicarilla Apache Nation Projections

The Jicarilla Apache Nation Office of Water Administration provided its projections of water demands through 2050. This information was provided in a document entitled, "Jicarilla Apache Nation Water Supply Requirements for the Southwest Area of the Reservation, June 2001." Additional demands were provided by personal communication. Following is a summary of the demands projections for the Nation. Demands beyond 2050 and for 2044 were determined using a 1.5 percent growth rate. Table 92 shows the municipal demands based on 160 gpcd, 1.5 percent growth rate and 40 percent depletion.

Table 92: Municipal Demands

Year	On-Reservation Population	Diversion (gallon/day)	Diversion (AF)	Depletion 40%
1990	2,730	436,800	489	196
2000	3,283	525,280	588	235
2010	3,836	613,760	688	275
2020	4,389	702,240	787	315
2030	4,942	790,720	886	354
2040	5,495	879,200	985	394
2044	5,832	933,151	1,045	418
2050	6,048	967,680	1,084	434
2060	7,019	1,123,032	1,258	503

In addition, the Nation estimates an additional 1,500 acre-feet per year of depletion for irrigation/pond evaporation. Starting in 2005, the Nation plans to phase in an additional 6,000 acre-feet of depletion for irrigation and industrial uses.

For this study it will be assumed that the Nation's diversions are twice the value of depletions. Table 93shows the projected total diversions and depletions for the Nation through 2060.

Table 93: Jicarilla Nation Demands Projections

Year	Diversions (AF)	Depletion (AF)
1990	3,489	1,696
2000	3,588	1,735
2010	9,688	4,775
2020	15,787	7,815
2030	15,886	7,854
2040	15,985	7,894
2044	16,045	7,918
2050	16,084	7,934
2060	16,258	8,003

5.0 Summary of Demands

Table 94 shows the combined depletions for the San Juan Hydrologic Unit.

Table 94: Summary of Depletions – San Juan Hydrologic Unit (AF)

Basin	2000	2044	Increased Depletion
Animas	13,755	17,595	3,840
Blanco	501	1,676	1,175
Chaco	1,008	1,531	523
La Plata	6,737	7,235	498
Middle San Juan*	114,380	150,079	35,699
Upper San Juan**	103,694	291,052	187,358
Above Navajo Dam***	2,154	8,352	6,198
Subtotal	**242,229**	**477,520**	
San Juan Chama	**108,000**	**108,000**	-
Res. Evaporation	**28,200**	**28,200**	-
Basin Total	**378,429**	**613,720**	**235,291**
* includes Navajo	62,499	86,049	23,550
** includes Navajo	86,000	270,000	184,000
*** includes Jicarilla	1,735	7,918	6,183

The non-reservation depletions are shown in Table 95

Table 95: Non-reservation Depletions for San Juan Hydrologic Unit (AF)

Non-Reservation Depletions			
Basin	**2000**	**2044**	**Increased Depletion**
Animas	13,755	17,595	3,840
Blanco	501	1,676	1,175
Chaco	1,008	1,531	523
La Plata	6,737	7,235	498
Middle San Juan	51,881	64,030	12,149
Upper San Juan	17,694	21,052	3,358
Above Navajo Dam	419	434	15
Total	**91,995**	**113,553**	**21,558**

Table 96 shows the total diversions for the San Juan Hydrologic Unit.

Table 96: Summary of Diversions for the San Juan Hydrologic Unit (AF)

Basin	2000	2044	Increased Diversion
Animas	33,533	47,430	13,897
Blanco	913	3,426	2,513
Chaco	1,626	4,099	2,473
La Plata	13,957	16,309	2,352
Middle San Juan*	186,588	222,663	36,075
Upper San Juan**	145,835	401,665	255,830
Above Navajo Dam***	4,525	17,051	12,526
Subtotal	**386,977**	**712,643**	
San Juan Chama	**108,000**	**108,000**	-
Res. Evaporation	**28,200**	**28,200**	-
Basin Total	**523,177**	**848,843**	**325,666**
* includes Navajo	119,607	141,268	21,661
** includes Navajo	114,000	360,000	246,000
*** includes Jicarilla	3,588	16,045	12,457

Table 97 shows the non-reservation diversions for the San Juan Hydrologic Unit.

Table 97: Non-reservation Diversions for the San Juan Hydrologic Unit (AF)

	Non-Reservation Diversions		
Basin	2000	2044	Increased Diversions
Animas	33,533	47,430	13,897
Blanco	913	3,426	2,513
Chaco	1,626	4,099	2,473
La Plata	13,957	16,309	2,352
Middle San Juan	66,981	91,385	24,404
Upper San Juan	31,835	41,665	9,830
Above Navajo Dam	937	1,006	69
Total	**149,782**	**205,320**	**55,538**

5.1. 2060 Non-reservation Demands

Although the planning horizon is 2044, information on 2060 is also provided. Table 98 shows the non-reservation depletions and Table 99 shows the diversions for 2060.

Table 98: 2060 Non-reservation Depletions for San Juan Hydrologic Unit (AF)

Basin	2000	2060	Increased Depletion
Animas	13,755	19,640	5,885
Blanco	501	2,740	2,239
Chaco	1,008	1,977	969
La Plata	6,737	7,500	763
Middle San Juan	51,881	64,228	12,347
Upper San Juan	17,694	23,000	5,306
Above Navajo Dam	419	442	23
Total	**91,995**	**119,528**	**27,533**

Table 99: 2060 Non-reservation Diversions for San Juan Hydrologic Unit (AF)

Basin	2000	2060	Increased Diversions
Animas	33,533	54,855	21,322
Blanco	972	5,635	4,663
Chaco	1,628	6,205	4,578
La Plata	13,956	17,561	3,605
Middle San Juan	66,192	82,332	16,140
Upper San Juan	34,700	45,545	10,845
Above Navajo Dam	937	1,055	118
Total	**151,918**	**213,189**	**61,271**

6.0 Water Budget Approach

Water budgets for each watershed within the San Juan Hydrologic Unit (SJHU) were developed to identify future water shortages. To develop the water budgets for the Animas, La Plata, Middle San Juan, and Upper San Juan, the following approach was used.

The components of the water budgets developed for the San Juan Regional Water Plan (SJRWP) are:

1. Inflows into the watershed.
2. Diversions required to meet the demands
3. Demand depletions
4. Return flows from the demands
5. Transbasin diversions
6. River gains or losses.

To accurately identify surpluses and shortages, a monthly water budget was prepared as opposed to an annual water budget. An annual water budget provides a total volume of water available; however, does not provide sufficient information on the timing of the water availability. Because of the variability in the municipal and agricultural demands, the timing of the water availability is critical. If excess water is available when the demands are low, then the excess water is not needed. However if the demands are high and there is not enough water available, then shortages will occur, even if the total annual supply exceeds the total annual demand.

The water budgets were developed to represent drought conditions (90^{th} percentile monthly flows). This means that 90% of the historical months have values greater than the 90^{th} percentile value.

For example, if the 90^{th} percentile monthly flow for January at a given location was 1,000 acre-feet. Nine times out of ten times flows at that location in January would be greater than 1,000 acre-feet. Only one time out of ten would the flow be less than 1,000 acre-feet.

The 90^{th} percentile monthly flows were statistically calculated and were presented in the Draft Water Supply Assessment Report, May 2002. The existing and future diversions and depletions requirements were identified in the Draft Water Demand Assessment Report, August 2002. The transbasin diversions component and the river gains or losses component were identified and calculated as part of the water budget analysis.

6.1. Watershed Inflows

The water budget calculated for each watershed is based on the inflows into each watershed. By basing the water budget on the inflows, the historically measured flows at this location are not influenced by historical growth within the watershed. These flows are influenced by historical growth that has occurred upstream. However, by using the 90^{th} percentile flow for the analysis of surpluses and shortages, the affect of upstream historical growth is minimized.

6.2. Agricultural Demands

Demands for agriculture, municipal, and industrial uses were calculated in the Draft Water Demand Assessment Report, August 2002. Municipal demands were calculated based on actual diversion and water production reports. The industrial uses were provided from

records prepared by the major industries. There were no diversion records available for the agricultural uses. To determine agricultural demands, monthly water consumptive use requirements for the major crops within the SJHU were calculated. Using these demands, it was assumed that the diversion requirement was twice the crop demand. In addition, another 10 percent was added to the diversion amount for incidental losses, such as for phreatophytes. The agricultural demands assume consistent losses and diversion requirements. Since these assumptions cannot be confirmed or denied without actual diversion records, these demands have the most potential for error. These errors will be most significant when accounting for transbasin diversions, as the total amount of water diverted from the basin is no longer available to the basin.

6.3. **Transbasin Diversions**

Transbasin diversions can be defined as water being diverted in one watershed and then transferred from that watershed for use in another watershed. Accounting for transbasin diversions in a water budget is essential to producing accurate results. There are several transbasin diversions that were identified in watersheds within the SJHU. They are presented and described in the watershed section in which they occur.

A transbasin diversion could also remove water entirely from the SJHU. An example is the San Juan-Chama Project that removes water from the Upper San Juan Above Navajo Dam watershed.

6.4. **Calculation of River Gains or Losses**

Gains and losses between two measuring stations are typical for unlined water channels such as rivers or streams. Gains can be from tributary flows into the river or stream. The most common type of gains or losses is subsurface. Water that leaves the river and enters the ground water system is considered a loss. Water that enters the river from the ground water system is considered a gain.

Because the water budgets for the SJHU are developed using statistical flows (90^{th} percentile monthly flows), river gains and losses were estimated. To estimate these gains and losses, gains and losses were calculated for each watershed based on the existing conditions in the year 2000.

Flows in the river leaving the watershed were calculated using the following equation:

watershed inflows – diversions + return flows = calculated watershed outflows

The calculated watershed outflows were compared with the actual measured outflows. The differences were considered to be the gains and losses within the watershed

To calculate gains and losses for the 90^{th} percentile monthly flows, the annual flow for the year 2000 was compared with the sum of the flows for the 90^{th} percentile month flows. The year 2000 is used because the most accurate and comprehensive diversion data is available for this year. The year 2000 gains and losses were prorated to the 90^{th} percentile year. These calculations are presented on the Gain/Loss Calculations for 90% Supply tables for each watershed.

Once the gains and losses for the 90th percentile months were calculated, the water budget for the year 2044 was completed.

7.0 Water Budget Results

7.1. Animas Watershed

Diversions from the Animas River include the municipal, agricultural, and industrial diversions identified in the Draft Water Demand Assessment Report. In addition to the diversions for use within the Animas Watershed, numerous transbasin diversions were also identified. The transbasin diversions include:

1. La Plata Municipal Diversions – Almost all of the municipal demands within the La Plata watershed, except for a few domestic wells, are supplied from the City of Farmington water treatment facilities that divert water from the Animas River. These diversions include both deliveries to the Upper La Plata Water Users Association and deliveries in Farmington that are within the La Plata Watershed.
2. Navajo Tribal Utilities Agency – the NTUA diverts water from the Animas River through the Farmington water treatment facilities for the community of Shiprock.
3. Agricultural Diversions – There are five canals that divert water from the Animas River that irrigate lands outside of the Animas watersheds.

7.1.1. Agricultural Transbasin Diversions

Table 100 presents the agricultural transbasin diversions that were identified within the Animas Watershed.

Table 100: Agricultural Transbasin Diversions within the Animas Watershed

Canal	Watershed Diverted To	Acres Irrigated
Echo Ditch	Upper San Juan	313 acres
Farmers Mutual Ditch	Middle San Juan	2,708 acres
North Farmington Ditch	Middle San Juan	25 acres
Farmington (Allen) Ditch	La Plata	185 acres
Wright Leggett Ditch	La Plata	41 acres

To determine the monthly diversion requirements for these acres, the crop distributions and monthly diversions for the Upper San Juan, Middle San Juan, and the La Plata Watershed identified in the Water Demand Assessment were used. The above acres were assumed to have the same crop distribution as their corresponding watershed. Therefore, a percentage of the total monthly diversions for each of the above watersheds were calculated as being diverted from the Animas Watershed. Table 101 through Table 103 identify the portion of the agricultural diversions within the Upper San Juan, Middle San Juan, and La Plata Watersheds that are diverted from the Animas Watershed. The total transbasin diversions out of the Animas Watershed for agricultural uses are summarized in Table 104.

Table 101: Agricultural Transbasin Diversions to the Upper San Juan Watershed (acre-feet)

	Acres	May	June	July	August	September	October	Total
Diversions from Animas Watershed	313	161	292	335	294	190	42	1,314

Table 102: Agricultural Transbasin Diversions to the Middle San Juan Watershed (acre-feet)

	Acres	May	June	July	August	September	October	Total
Farmer's Mutual Ditch[6]	2,708	1,461	2,631	2,068	1,815	1,722	377	10,074
North Farmington Ditch	25	13	24	29	25	16	3	110
Total Diversions from Animas Watershed	2,733	1,474	2,655	2,097	1,840	1,738	380	10,184

Table 103: Agricultural Transbasin Diversions to the La Plata Watershed (acre-feet)

	Acres	May	June	July	August	September	October	Total
Diversions from Animas Watershed	226	115	206	234	204	134	30	923

Table 104: Summary of Agricultural Transbasin Diversions from the Animas Watershed (acre-feet)

	Acres	May	June	July	August	September	October	Total
Diversions from Animas Watershed	3,272	1,750	3,153	2,666	2,338	2,062	452	12,421

7.1.2. Water Budget Calculations

Table 105 shows the calculations for determining the gains and losses for the 90th percentile monthly flows. All values are from the year 2000. As can be seen, the inflows into the Animas Watershed include the Animas River flows as well as canal diversions that occurred in Colorado that serve lands within the New Mexico portion of the watershed.

[6] Farmer's Mutual Ditch has two diversions, one diversion on the Animas River and one diversion on the San Juan River. In the months of July and August of 2000, 2/3 of the total diversion was diverted from the Animas River. In the other months all of the diversions were from the Animas River.

Table 105: Gain/Loss Calculations for 90% Supply – Animas Watershed

Watershed: Animas
Year: 2000
Upstream Gage: 9363500 ANIMAS RIVER NEAR CEDAR HILL, NM
Downstream Gage: 9364500 ANIMAS RIVER AT FARMINGTON, NM

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Inflows													
ANIMAS RIVER NEAR CEDAR HILL, NM	14,511	12,827	19,123	69,739	146,279	75,332	23,304	19,369	20,826	23,088	21,719	17,792	463,909
Canal Diversions above River Gage	0	0	0	144	1,161	1,260	1,237	1,269	1,028	841	655	0	7,595
Transbasin Diversions													
Total Inflows	**14,511**	**12,827**	**19,123**	**69,883**	**147,440**	**76,592**	**24,541**	**20,638**	**21,854**	**23,929**	**22,374**	**17,792**	**471,504**
Diversions													
Municipal	714	671	772	1,036	1,447	1,704	1,749	1,699	1,344	981	724	687	13,528
Industrial	3	3	3	3	3	3	3	3	3	3	3	3	36
Agricultural	0	0	0	0	2,333	4,435	5,152	4,492	2,928	629	0	0	19,969
Transbasin Diversions - La Plata Watershed Municipal[(1)]	38	85	97	110	148	185	173	194	124	128	86	82	1,450
Transbasin Diversions - Farmington to Shiprock Pipeline	116	108	114	132	161	177	163	131	113	119	115	101	1,551
Transbasin Diversions - Agricultural	0	0	0	0	1,750	3,153	2,666	2,338	2,062	452	0	0	12,421
Total Diversions	**871**	**867**	**986**	**1,281**	**5,842**	**9,657**	**9,906**	**8,857**	**6,574**	**2,312**	**928**	**873**	**48,955**
Depletions													
Municipal	175	152	175	259	434	529	543	520	383	237	135	136	3,678
Industrial	3	3	3	3	3	3	3	3	3	3	3	3	36
Agricultural	0	0	0	0	1,110	2,017	2,341	2,043	1,331	286	0	0	9,128
Transbasin Diversions - La Plata Watershed Municipal[(1)]	38	85	97	110	148	185	173	194	124	128	86	82	1,450
Transbasin Diversions - Farmington to Shiprock Pipeline	116	108	114	132	161	177	163	131	113	119	115	101	1,551
Transbasin Diversions - Agricultural	0	0	0	0	1,750	3,153	2,666	2,338	2,062	452	0	0	12,421
Total Depletions	**332**	**348**	**389**	**504**	**3,606**	**6,064**	**5,889**	**5,229**	**4,016**	**1,225**	**339**	**322**	**28,264**
Return Flows													
Municipal	539	519	597	777	1,013	1,175	1,206	1,179	961	744	589	551	9,850
Industrial	0	0	0	0	0	0	0	0	0	0	0	0	0
Agricultural	0	0	0	0	1,223	2,418	2,811	2,449	1,597	343	0	0	10,841
Transbasin Diversions - La Plata Municipal	0	0	0	0	0	0	0	0	0	0	0	0	0
Transbasin Diversions - Farmington to Shiprock Pipeline	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Return Flows	**539**	**519**	**597**	**777**	**2,236**	**3,593**	**4,017**	**3,628**	**2,558**	**1,087**	**589**	**551**	**20,691**
Calculated Outflows	14,179	12,479	18,734	69,379	143,834	70,528	18,652	15,409	17,838	22,704	22,035	17,470	443,240
ANIMAS RIVER AT FARMINGTON, NM	15,741	13,690	19,184	63,788	140,007	67,537	10,760	8,731	12,079	20,170	24,580	18,320	414,587
Gains / Losses	1,562	1,211	450	-5,591	-3,827	-2,991	-7,892	-6,678	-5,759	-2,534	2,545	850	-28,653
Probability of Annual Flows (Inflows)	90.0%												
Watershed Inflows (90.0% Probability)	410,000	324,613	97.7%										
Monthly Inflows for the 90.0% Probability Months	11,793	10,530	14,253	26,431	84,607	74,713	28,161	17,352	16,388	15,347	12,740	12,298	324,613
	90.00%	Changes monthly percentage probability to calculate a annual 97.7% probability											
Year 2000 Inflows Rank	72.0%												
Ratio of 90.0% Probability Inflow Month's sum to Year 2000 Inflows		70.0%											
Calculated Gains/Losses for 90.0% Probability Months	**1,093**	**847**	**315**	**-3,912**	**-2,678**	**-2,093**	**-5,522**	**-4,673**	**-4,029**	**-1,773**	**1,781**	**595**	**-20,049**

[(1)] - La Plata Watershed Municipal includes municipal demands from the City of Farmington that are within the La Plata Watershed.

Depletions within the Animas Watershed include the municipal, industrial, and agricultural depletions within the Animas Watershed that were identified in the Water Demand Assessment as well as all of the transbasin diversions.

Return flows within the Animas Watershed were calculated as the difference between diversions and depletions for municipal, industrial, and agricultural uses.

Table 106 presents the year 2044 water budget. The 2044 demands are used with the 90th percentile monthly supply. The results indicate that in the year 2044 there are no shortages in a 90th percentile month. Even if all of the return flows from the watershed are not included, there are still no shortages. The supply without return flows are shown because only a portion of the return flows in the watershed could be recaptured for use within the same watershed.

Although this budget shows sufficient water to meet projected future demands, it does not identify whether there are adequate water rights to divert this quantity of water. Since agricultural demands are assumed as being the same in 2044 as 2000, there would be no opportunity to acquire additional agricultural water rights to meet future municipal and industrial demands.

Table 106: Year 2044 Water Budget for the Animas Watershed

Watershed: Animas
Year: 2044

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Monthly Inflows for the 90.0% Probability Months	11,793	10,530	14,253	26,431	84,607	74,713	28,161	17,352	16,388	15,347	12,740	12,298	324,613
Canal Diversions above River Gage (1996)[1]	0	0	0	452	1,543	1,943	1,920	1,414	1,803	1,126	0	0	10,201
Transbasin Diversions													
Total Inflows	**11,793**	**10,530**	**14,253**	**26,883**	**86,150**	**76,656**	**30,081**	**18,766**	**18,191**	**16,473**	**12,740**	**12,298**	**334,814**
Diversions													
Municipal	1,445	1,358	1,563	2,097	2,929	3,449	3,540	3,439	2,720	1,986	1,465	1,390	27,381
Industrial	7	7	7	7	7	7	7	7	7	7	7	7	84
Agricultural	0	0	0	0	2,333	4,435	5,152	4,492	2,928	629	0	0	19,969
Transbasin Diversions - La Plata Watershed Municipal	100	223	254	289	388	483	454	509	325	336	226	215	3,802
Transbasin Diversions - Farmington to Shiprock Pipeline	569	529	558	648	788	865	800	643	556	584	564	495	7,600
Transbasin Diversions - Agricultural	0	0	0	0	1,750	3,153	2,666	2,338	2,062	452	0	0	12,421
Total Diversions	**2,120**	**2,117**	**2,383**	**3,041**	**8,195**	**12,392**	**12,619**	**11,428**	**8,598**	**3,994**	**2,262**	**2,108**	**71,257**
Depletions													
Municipal	354	308	354	524	878	1,071	1,099	1,052	775	480	273	275	7,444
Industrial	7	7	7	7	7	7	7	7	7	7	7	7	81
Agricultural	0	0	0	0	1,222	2,218	2,576	2,246	1,464	315	0	0	10,040
Transbasin Diversions - La Plata Watershed Municipal	100	223	254	289	388	483	454	509	325	336	226	215	3,802
Transbasin Diversions - Farmington to Shiprock Pipeline	569	529	558	648	788	865	800	643	556	584	564	495	7,600
Transbasin Diversions - Agricultural	0	0	0	0	1,750	3,153	2,666	2,338	2,062	452	0	0	12,421
Total Depletions	**1,029**	**1,067**	**1,174**	**1,468**	**5,033**	**7,796**	**7,602**	**6,795**	**5,189**	**2,173**	**1,070**	**993**	**41,388**
Return Flows													
Municipal	1,091	1,050	1,209	1,573	2,051	2,378	2,441	2,387	1,945	1,506	1,192	1,115	19,937
Industrial	0	0	0	0	0	0	0	0	0	0	0	0	3
Agricultural	0	0	0	0	1,111	2,218	2,576	2,246	1,464	315	0	0	9,929
Transbasin Diversions - La Plata Watershed Municipal	0	0	0	0	0	0	0	0	0	0	0	0	0
Transbasin Diversions - Farmington to Shiprock Pipeline	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Return Flows	**1,091**	**1,051**	**1,209**	**1,573**	**3,162**	**4,596**	**5,017**	**4,633**	**3,409**	**1,821**	**1,192**	**1,115**	**29,869**
Calculated Gains/Losses for 90.0% Probability Months	**1,093**	**847**	**315**	**-3,912**	**-2,678**	**-2,093**	**-5,522**	**-4,673**	**-4,029**	**-1,773**	**1,781**	**595**	
Surplus / Shortages	11,857	10,310	13,394	21,503	78,439	66,767	16,957	7,298	8,973	12,527	13,451	11,900	
Surplus / Shortages w/o Return Flows	10,766	9,260	12,185	19,930	75,277	62,171	11,940	2,665	5,564	10,706	12,259	10,785	

(1) Available historical canal flows for the Twin Rocks and Ralstron Ditches were reviewed. The canal flows for the year that had annual flows in the river most similar to the sum of the 90th percentile months was used.

7.2. **Blanco Canyon Watershed**

Monthly analysis of the Blanco Canyon Watershed is not necessary because:

1. The total annual demand (diversion) in 2044 is only 3,425, acre-feet.
2. The majority of all future demands are associated with municipal demands associated with lawns and gardens for large lots.
3. Surface water supplies are far from the center of population in the watershed.

The 90th percentile annual surface water supply in the Blanco Canyon Watershed is approximately 5,000 acre-feet. However, the only measurement is near the confluence with the San Juan River and the majority of the existing and future population growth is at the head waters of the watershed, near Lindrith. Consequently, existing surface water supplies will not be reasonable sources of water for meeting future demands. Demands must be met from groundwater source.

Blanco Canyon Watershed has groundwater resources with potable water quality that could potentially meet 2044 demands. Refer to the Water Supply Assessment (Volume III of this Regional Water Plan), Section 1.2.1.5.

7.3. **Chaco Watershed (outside Navajo Nation)**

The surface water supply for the Chaco Watershed is simply not a reliable source of water. Only three of the 90th percentile months have any water available. Consequently, 2044 demands will not be met with Chaco Watershed water supplies.

This watershed will consequently need to meet demands from either groundwater supplies or importation of surface water supplies.

7.4. **La Plata Watershed**

Demands in the La Plata Watershed include the municipal, agricultural, and industrial demands identified in the Water Demand Assessment. In addition to the diversions within the La Plata Watershed to meet these demands, transbasin diversions were also identified. The transbasin diversions include:

1. La Plata Municipal Diversions – Almost all of the municipal demands within the La Plata watershed, except for a few domestic wells, are supplied from the City of Farmington water treatment facilities that divert water from the Animas River. Therefore, the diversions to meet the La Plata Municipal requirements are not provided from the La Plata River water supply. As a result, transbasin inflows to the La Plata Watershed are added to the La Plata water supply to meet these demands. Most of the return flows from municipal uses are treated at the Farmington wastewater treatment plant. The outfall from the wastewater treatment plant is into the San Juan River just upstream of the San Juan River at Farmington flow metering gage; therefore, there are no return flows from municipal uses in the La Plata Watershed that can be reused within the La Plata Watershed.
2. Agricultural Diversions – There are two canals that divert water from the Animas River into the La Plata Watershed.

7.4.1. Agricultural Transbasin Diversions

Table 107 presents the agricultural transbasin diversions that were identified within the La Plata Watershed. The transbasin diversions provide an additional water supply in the La Plata Watershed. There are no agricultural transbasin diversions out of the La Plata Watershed.

Table 107: Agricultural Transbasin Diversions into the La Plata Watershed

Canal	Watershed Diverted From	Acres Irrigated
Farmington (Allen) Ditch	Animas	185 acres
Wright Leggett Ditch	Animas	41 acres

To determine the monthly diversion requirements for these acres, the crop distributions and monthly diversions for the La Plata Watershed identified in the Draft Water Demand Assessment Report were used. The above acres were assumed to have the same crop distribution as their corresponding watershed. Therefore, a percentage of the total monthly diversions for the La Plata Watershed was calculated as being diverted from the Animas Watershed. Table 108 identifies the portion of the agricultural diversions within the La Plata Watersheds that was diverted from the Animas Watershed.

Table 108: Agricultural Transbasin Diversions to the La Plata Watershed (acre-feet)

	Acres	May	June	July	August	September	October	Total
Diversions from Animas Watershed	226	115	206	234	204	134	30	923

7.4.2. Water Budget Calculations

Table 109 shows the calculations for determining the gains and losses for the 90th percentile monthly flows. All values are from the year 2000. As can be seen, the inflows into the La Plata Watershed include the La Plata River flows as well as canal diversions that occurred in Colorado that serve lands within the New Mexico portion of the La Plata Watershed, and the municipal and agricultural transbasin diversion into the La Plata Watershed from the Animas Watershed.

Table 109: Gain/Loss Calculations for 90% Supply – La Plata Watershed

Watershed: La Plata
Year: 2000
Upstream Gage: 9366500 LA PLATA RIVER AT COLORADO-NEW MEXICO STATE LINE
Downstream Gage: 9367500 LA PLATA RIVER NEAR FARMINGTON, NM

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
LA PLATA RIVER AT COLORADO-NEW MEXICO STATE LINE	799	863	1,955	4,856	3,751	1,315	216	237	252	334	358	515	15,451
Canal Diversions above River Gage	108	0	2	82	313	159	72	2	0	24	164	205	1,130
Transbasin Diversions - Municipal	38	85	97	110	148	185	173	194	124	128	86	82	1,450
Transbasin Diversions - Agricultural	0	0	0	0	115	206	234	204	134	30	0	0	923
Total Inflows	**945**	**948**	**2,054**	**5,048**	**4,327**	**1,865**	**695**	**637**	**510**	**516**	**608**	**802**	**18,954**
Diversions													
Municipal - Supplied from Animas Watershed	38	85	97	110	148	185	173	194	124	128	86	82	1,450
Industrial	0	0	0	0	0	0	0	0	0	0	0	0	0
Agricultural	0	0	0	0	1,558	2,794	3,170	2,765	1,815	405	0	0	12,507
Transbasin Diversions	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Diversions	**0**	**0**	**0**	**0**	**1,558**	**2,794**	**3,170**	**2,765**	**1,815**	**405**	**0**	**0**	**13,957**
Depletions													
Municipal	8	18	20	23	31	39	36	41	26	27	18	17	304
Industrial	0	0	0	0	0	0	0	0	0	0	0	0	0
Agricultural	0	0	0	0	779	1,397	1,585	1,383	908	203	0	0	6,254
Transbasin Diversions													
Total Depletions	**8**	**18**	**20**	**23**	**810**	**1,436**	**1,621**	**1,424**	**934**	**230**	**18**	**17**	**6,558**
Return Flows													
Municipal	30	67	77	87	117	146	137	153	98	101	68	65	1,146
Industrial	0	0	0	0	0	0	0	0	0	0	0	0	0
Agricultural	0	0	0	0	779	1,397	1,585	1,383	908	203	0	0	6,254
Transbasin Diversions - Municipal to Upper San	(30)	(67)	(77)	(87)	(117)	(146)	(137)	(153)	(98)	(101)	(68)	(65)	(1,146)
Total Return Flows	**0**	**0**	**0**	**0**	**779**	**1,397**	**1,585**	**1,383**	**908**	**203**	**0**	**0**	**6,254**
Calculated Outflows	945	948	2,054	5,048	3,548	468	-890	-746	-398	313	608	802	11,250
LA PLATA RIVER NEAR FARMINGTON, NM	953	1,001	2,054	3,112	396	73	49	25	55	266	173	388	8,545
Gains / Losses	8	53	0	-1,936	-3,152	-395	939	771	453	-47	-435	-414	-4,155

Probability of Annual Flows (Inflows)	90.0%												
Watershed Inflows (90.0% Probability)	8,600	5,963	98.6%										
Monthly Inflows for the 90.0% Probability Months	212	306	461	831	2,445	912	110	84	72	115	201	214	5,963
	90.00%	Changes monthly percentage probability to calculate a annual 98.6% probability											
Year 2000 Inflows Rank	55.6%												
Ratio of 90.0% Probability Inflow Month's sum to Year 2000 Inflows		38.6%											
Calculated Gains/Losses for 90.0% Probability Months	**3**	**20**	**0**	**-747**	**-1,216**	**-153**	**363**	**297**	**175**	**-18**	**-168**	**-160**	**-1,604**

Depletions within the La Plata Watershed include the municipal, industrial, and agricultural depletions within the La Plata Watershed that were identified in the Water Demand Assessment.

Return flows within the La Plata Watershed were calculated from the diversions and depletions for municipal, industrial, and agricultural uses. Note that the municipal return flows are removed from the La Plata Watershed. They are included in the Middle San Juan water budgets.

Table 110 presents the year 2044 water budget. The results indicate that in the year 2044 there are shortages in many of the 90th percentile months. Even if all of the return flows from the watershed are included, there are still shortages. The return flows were removed from the supply because only a portion could be recaptured for use within the La Plata Watershed.

Table 110: Year 2044 Water Budget for the La Plata Watershed

Watershed: La Plata
Year: 2044

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Monthly Inflows for the 90.0% Probability Months	212	306	461	831	2,445	912	110	84	72	115	201	214	5,963
Canal Diversions above River Gage (1981)[(1)]	0	0	239	215	158	156	104	41	0	14	0	0	926
Transbasin Diversions - Municipal	100	223	254	289	388	483	454	509	325	336	226	215	3,802
Transbasin Diversions - Agricultural	0	0	0	0	115	206	234	204	134	30	0	0	923
Total Inflows	**312**	**529**	**954**	**1,335**	**2,991**	**1,551**	**668**	**634**	**398**	**465**	**427**	**429**	**10,691**
Diversions													
Municipal - Supplied from Animas Watershed	100	223	254	289	388	483	454	509	325	336	226	215	3,802
Industrial	0	0	0	0	0	0	0	0	0	0	0	0	0
Agricultural	0	0	0	0	1,558	2,794	3,170	2,765	1,815	405	0	0	12,507
Transbasin Diversions													
Total Diversions	**0**	**0**	**0**	**0**	**1,558**	**2,794**	**3,170**	**2,765**	**1,815**	**405**	**0**	**0**	**16,309**
Depletions													
Municipal	21	47	52	60	81	102	94	108	68	71	47	45	798
Industrial	0	0	0	0	0	0	0	0	0	0	0	0	0
Agricultural	0	0	0	0	779	1,397	1,585	1,383	908	203	0	0	6,254
Transbasin Diversions													
Total Depletions	**21**	**47**	**52**	**60**	**860**	**1,499**	**1,679**	**1,490**	**976**	**273**	**47**	**45**	**7,051**
Return Flows													
Municipal	79	176	202	228	307	381	359	401	257	265	178	171	3,005
Industrial	0	0	0	0	0	0	0	0	0	0	0	0	0
Agricultural	0	0	0	0	779	1,397	1,585	1,383	908	203	0	0	6,254
Transbasin Diversions - Municipal to Upper San Juan	(79)	(176)	(202)	(228)	(307)	(381)	(359)	(401)	(257)	(265)	(178)	(171)	(3,005)
Total Return Flows	**0**	**0**	**0**	**0**	**779**	**1,397**	**1,585**	**1,383**	**908**	**203**	**0**	**0**	**6,254**
Calculated Gains/Losses for 90.0% Probability Months	**3**	**20**	**0**	**-747**	**-1,216**	**-153**	**363**	**297**	**175**	**-18**	**-168**	**-160**	
Surplus / Shortages	315	549	954	588	996	1	-554	-452	-335	244	259	269	636
Surplus / Shortages w/o Return Flows	315	549	954	588	217	-1,396	-2,139	-1,834	-1,242	42	259	269	-5,618

(1) Available historical canal flows for the Enterprise and Pioneer Ditches were reviewed. The canal flows for the year that had annual flows in the river most similar to the sum of the 90th percentil months was used.

7.5. **Middle San Juan Watershed**

Demands in the Middle San Juan Watershed include the municipal, agricultural, and industrial demands identified in the Water Demand Assessment. In addition to the diversions within the Middle San Juan Watershed to meet these demands, transbasin diversions were also identified. The transbasin diversions include:

1. Agricultural Diversions – There are two canals that divert water from the Animas River into the Middle San Juan Watershed described in Section 7.5.1.

7.5.1. Agricultural Transbasin Diversions

Table 111 presents the agricultural transbasin diversions that were identified within the Middle San Juan Watershed. The transbasin diversions are into the Middle San Juan Watershed. There are no agricultural transbasin diversions out of the Middle San Juan Watershed.

Table 111: Agricultural Transbasin Diversions into the Middle San Juan Watershed

Canal	Watershed Diverted From	Acres Irrigated
Farmer's Mutual Ditch	Animas	2,708 acres
North Farmington Ditch	Animas	25 acres

To determine the monthly diversion requirements for these acres, the crop distributions and monthly diversions for the Middle San Juan Watershed identified in the Water Demand Assessment were used. The above acres were assumed to have the same crop distribution as their corresponding watershed. Therefore, a percentage of the total monthly diversions for the Middle San Juan Watershed were calculated as being diverted from the Animas Watershed. Table 112 identifies the portion of the agricultural diversions within the Middle San Juan Watershed that was diverted from the Animas Watershed.

Table 112: Agricultural Transbasin Diversions to the Middle San Juan Watershed (acre-feet)

	Acres	May	June	July	August	September	October	Total
Farmer's Mutual Ditch[7]	2,708	1,461	2,631	2,068	1,815	1,722	377	10,074
North Farmington Ditch	25	13	24	29	25	16	3	110
Total Diversions from Animas Watershed	**2,733**	**1,474**	**2,655**	**2,097**	**1,840**	**1,738**	**380**	**10,184**

[7] Farmer's Mutual Ditch has two diversions, one diversion on the Animas River and one diversion on the San Juan River. In the months of July and August of 2000, 2/3 of the total diversion was diverted from the Animas River. In the other months all of the diversions were from the Animas River.

7.5.2. Water Budget Calculations

Table 113 shows the calculations for determining the gains and losses for the 90th percentile monthly flows. All values are from the year 2000. As can be seen, the inflows into the Middle San Juan Watershed include the San Juan River flows as well as agricultural transbasin diversion into the Middle San Juan Watershed from the Animas Watershed.

Table 113: Gain/Loss Calculations for 90% Supply – Middle San Juan Watershed

Watershed: Middle San Juan
Year: 2000
Upstream Gage: 9365000 SAN JUAN RIVER AT FARMINGTON, NM
Downstream Gage: 9368000 SAN JUAN RIVER AT SHIPROCK, NM

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
SAN JUAN RIVER AT FARMINGTON, NM	51,219	46,649	52,941	85,210	146,771	122,340	35,847	53,556	53,018	63,332	54,506	53,064	818,453
Transbasin Diversions - Agricultural from Animas Watershed	0	0	0	0	1,474	2,655	2,097	1,840	1,738	380	0	0	10,184
Total Inflows	**51,219**	**46,649**	**52,941**	**85,210**	**148,245**	**124,995**	**37,944**	**55,396**	**54,756**	**63,712**	**54,506**	**53,064**	**828,637**
Diversions													
Municipal	28	64	73	83	110	138	129	145	93	96	64	61	1,084
Industrial	4,203	4,203	4,203	4,203	4,203	4,203	4,203	4,203	4,203	4,203	4,203	4,203	50,436
Agricultural	0	0	0	0	1,784	3,212	3,788	3,324	2,103	406	0	0	14,617
Transbasin Diversions													0
Total Diversions	**4,231**	**4,267**	**4,276**	**4,286**	**6,097**	**7,553**	**8,120**	**7,672**	**6,399**	**4,705**	**4,267**	**4,264**	**66,137**
Depletions													
Municipal	9	21	24	27	36	46	43	48	31	32	21	20	358
Industrial	3,682	3,682	3,682	3,682	3,682	3,682	3,682	3,682	3,682	3,682	3,682	3,682	44,184
Agricultural	0	0	0	0	892	1,606	1,894	1,662	1,052	203	0	0	7,309
Transbasin Diversions													0
Total Depletions	**3,691**	**3,703**	**3,706**	**3,709**	**4,610**	**5,334**	**5,619**	**5,392**	**4,765**	**3,917**	**3,703**	**3,702**	**51,851**
Return Flows													
Municipal	19	43	49	56	74	92	86	97	62	64	43	41	726
Industrial	521	521	521	521	521	521	521	521	521	521	521	521	6,252
Agricultural	0	0	0	0	892	1,606	1,894	1,662	1,052	203	0	0	7,309
Transbasin Diversions													0
Total Return Flows	**540**	**564**	**570**	**577**	**1,487**	**2,219**	**2,501**	**2,280**	**1,635**	**788**	**564**	**562**	**14,287**
Calculated Outflows	47,528	42,946	49,235	81,501	143,635	119,661	32,325	50,004	49,992	59,795	50,803	49,362	776,787
SAN JUAN RIVER AT SHIPROCK, NM	51,281	46,189	57,860	98,301	142,098	119,663	20,045	37,016	38,618	58,844	56,648	51,896	778,459
Gains / Losses	3,753	3,243	8,625	16,800	-1,537	2	-12,280	-12,988	-11,374	-951	5,845	2,534	1,673

Probability of Annual Flows (Inflows)	90.0%												
Watershed Inflows (90.0% Probability)	738,200	535,088	99.6%										
Monthly Inflows for the 90.0% Probability Months	27,313	28,113	40,938	44,628	109,337	113,570	30,793	29,785	25,884	29,772	29,062	25,893	535,088
	90.00%	Changes monthly percentage probability to calculate a annual 99.6% probability											
Year 2000 Inflows Rank	85.7%												
Ratio of 90.0% Probability Inflow Month's sum to Year 2000 Inflows		65.4%											
Calculated Gains/Losses for 90.0% Probability Months	**2,454**	**2,120**	**5,639**	**10,983**	**-1,005**	**1**	**-8,028**	**-8,491**	**-7,436**	**-622**	**3,821**	**1,657**	**1,093**

Depletions within the Middle San Juan Watershed include the municipal, industrial, and agricultural depletions within the Middle San Juan Watershed that were identified in the Water Demand Assessment.

Return flows within the Middle San Juan Watershed were calculated from the diversions and depletions for municipal, industrial, and agricultural uses.

Table 114 presents the year 2044 water budget. The available water supply for the Middle San Juan Watershed was reduced by the depletions from the incremental growth that is projected to occur in the Upper San Juan Watershed and the Animas Watershed. The flows entering the Middle San Juan Watershed are from the Upper San Juan Watershed and the Animas Watershed. Therefore, future flows within the Middle San Juan Watershed will be reduced by the amount of water depleted to meet the increased demands in these watersheds.

The results indicate that in the year 2044 there are shortages in many of the 90th percentile months. Even if all of the return flows from the watershed are included, there are still shortages. The supply without return flows are shown because only a portion of the return flows in the watershed could be recaptured for use within the same watershed.

However, all shortages during a 90th percentile year can be met with the use of storage in Navajo Dam to meet the incremental NIIP increase diversions. The only way to assess the long-term impact on the supply from Navajo Reservoir resulting from the completion of NIIP would be the completion of a multi-year operation study of the reservoir. This on-going model development is being accomplished by U.S. Bureau of Reclamation and model development is beyond the scope of this study.

Table 114: Year 2044 Water Budget for the Middle San Juan Watershed

Watershed: Middle San Juan
Year: 2044

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Monthly Inflows for the 90.0% Probability Months	27,313	28,113	40,938	44,628	109,337	113,570	30,793	29,785	25,884	29,772	29,062	25,893	535,088
Transbasin Diversions - Agricultural	0	0	0	0	1,474	2,655	2,097	1,840	1,738	380	0	0	10,184
Upper San Juan Incremental Depletions[(1)]	(336)	(301)	(3,516)	(13,437)	(25,376)	(38,636)	(42,068)	(35,264)	(21,887)	(7,503)	(356)	(336)	(189,016)
Animas Incremental Depletions	(697)	(719)	(785)	(963)	(1,428)	(1,733)	(1,712)	(1,566)	(1,173)	(947)	(731)	(670)	(13,124)
Total Inflows	**26,280**	**27,093**	**36,637**	**30,228**	**84,008**	**75,856**	**-10,891**	**-5,205**	**4,563**	**21,702**	**27,975**	**24,887**	**343,132**
Diversions													
Municipal	74	168	192	218	289	362	339	381	244	252	168	160	2,846
Industrial	5,323	5,323	5,323	5,323	5,323	5,323	5,323	5,323	5,323	5,323	5,323	5,323	63,878
Agricultural	0	0	0	0	1,784	3,212	3,788	3,324	2,103	460	0	0	14,671
Transbasin Diversions													
Total Diversions	**5,397**	**5,491**	**5,515**	**5,541**	**7,396**	**8,897**	**9,450**	**9,028**	**7,670**	**6,035**	**5,491**	**5,483**	**81,395**
Depletions													
Municipal	24	55	63	71	94	121	113	126	81	84	55	52	939
Industrial	4,657	4,657	4,657	4,657	4,657	4,657	4,657	4,657	4,657	4,657	4,657	4,657	55,884
Agricultural	0	0	0	0	892	1,606	1,894	1,662	1,052	230	0	0	7,336
Transbasin Diversions													
Total Depletions	**4,681**	**4,712**	**4,720**	**4,728**	**5,643**	**6,384**	**6,664**	**6,445**	**5,790**	**4,971**	**4,712**	**4,709**	**64,158**
Return Flows													
Municipal	50	113	129	147	194	242	226	255	163	168	113	108	1,907
Industrial	666	666	666	666	666	666	666	666	666	666	666	666	7,994
Agricultural	0	0	0	0	892	1,606	1,894	1,662	1,052	230	0	0	7,336
Transbasin Diversions													
Total Return Flows	**716**	**779**	**795**	**813**	**1,753**	**2,514**	**2,786**	**2,583**	**1,881**	**1,064**	**779**	**774**	**17,236**
Calculated Gains/Losses for 90.0% Probability Months	**2,454**	**2,120**	**5,639**	**10,983**	**-1,005**	**1**	**-8,028**	**-8,491**	**-7,436**	**-622**	**3,821**	**1,657**	**1,093**
Surplus / Shortages	24,054	24,501	37,556	36,483	77,359	69,473	-25,582	-20,141	-8,663	16,109	27,084	21,834	278,974
Surplus / Shortages w/o Return Flows	23,337	23,722	36,761	35,670	75,607	66,959	-28,368	-22,724	-10,544	15,044	26,305	21,061	261,737
Surplus with incr. NIIP met from storage w/o return flows	23,337	23,722	39,893	48,734	100,477	105,097	13,188	12,022	10,862	22,124	26,312	21,061	445,737
Min Month Shortage	16,216	16,601	29,640	28,549	68,486	59,838	-35,489	-29,845	-17,665	7,923	19,184	13,940	
Min Month Shortage w/o Incremental NIIP	16,216	16,601	32,772	41,613	93,356	97,976	6,067	4,901	3,741	15,003	19,191	13,940	

(1) Incremental Depletions from the Upper San Juan Watershed include increased municipal, industrial and NIIP depletions

7.6. **Upper San Juan Watershed**

Diversions from the San Juan River in the Upper San Juan Watershed include the municipal, agricultural, and industrial diversions identified in the Water Demand Assessment. In addition to the diversions for use within the Upper San Juan Watershed, one transbasin diversion was also identified. The transbasin diversion is an agricultural diversion from the Animas River into the Upper San Juan Watershed. Table 115 summarized the irrigated acres that are serviced by the transbasin diversion.

Table 115: Agricultural Transbasin Diversion into the Upper San Juan Watershed

Canal	Watershed Diverted From	Acres Irrigated
Echo Ditch	Animas	313 acres

To determine the monthly diversion requirements for these acres, the crop distributions and monthly diversions for the Upper San Juan Watershed identified in the Draft Water Demand Assessment Report were used. The above acres were assumed to have the same crop distribution as the rest of the Upper San Juan Watershed. Therefore, a percentage of the total monthly diversions for the watershed was calculated as being diverted from the Animas Watershed. Table 116 identifies the amount of the agricultural diversions within the Upper San Juan Watershed that are diverted from the Animas Watershed.

Table 116: Agricultural Transbasin Diversions to the Upper San Juan Watershed (acre-feet)

	Acres	May	June	July	August	September	October	Total
Diversions from Animas Watershed	313	161	292	335	294	190	42	1,314

7.6.1. Water Budget Calculations

Table 117 shows the calculations for determining the gains and losses for the 90th percentile monthly flows. All values are from the year 2000. As can be seen, the inflows into the Upper San Juan Watershed include the San Juan River flows as well as the transbasin diversion from the Animas Watershed.

Table 117: Gain/Loss Calculations for 90% Supply – Upper San Juan Watershed

Watershed: Upper San Juan
Year: 2000
Upstream Gage: 9355500 SAN JUAN RIVER NEAR ARCHULETA, NM
Downstream Gage: 9365000 SAN JUAN RIVER AT FARMINGTON, NM MINUS ANIMAS RIVER AT FARMINGTON, NM

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
SAN JUAN RIVER NEAR ARCHULETA, NM	30,621	28,760	31,174	28,979	33,757	90,268	36,647	52,264	42,307	40,028	31,121	32,097	478,023
Transbasin Diversions - Agricultural	0	0	0	0	161	292	335	294	190	42	0	0	1,314
Total Inflows	**30,621**	**28,760**	**31,174**	**28,979**	**33,918**	**90,560**	**36,982**	**52,558**	**42,497**	**40,070**	**31,121**	**32,097**	**479,337**
Diversions													
Municipal	177	166	194	252	350	381	339	343	254	214	201	194	3,065
Industrial	153	153	153	153	153	153	153	153	153	153	153	153	1,836
Agricultural	0	0	0	0	3,630	6,587	7,561	6,624	4,277	948	0	0	29,627
Transbasin Diversions													0
Total Diversions	**330**	**319**	**347**	**405**	**4,133**	**7,121**	**8,053**	**7,120**	**4,684**	**1,315**	**354**	**347**	**34,528**
Depletions													
Municipal	78	95	71	103	194	190	198	203	178	138	87	78	1,613
Industrial	153	153	153	153	153	153	153	153	153	153	153	153	1,836
Agricultural	0	0	0	0	1,815	3,294	3,781	3,312	2,139	474	0	0	14,814
Transbasin Diversions													0
Total Depletions	**231**	**248**	**224**	**256**	**2,162**	**3,637**	**4,132**	**3,668**	**2,470**	**765**	**240**	**231**	**18,263**
Return Flows													
Municipal	99	71	123	149	156	191	141	140	76	76	114	116	1,452
Industrial	0	0	0	0	0	0	0	0	0	0	0	0	0
Agricultural	0	0	0	0	1,815	3,294	3,781	3,312	2,139	474	0	0	14,814
Transbasin Diversions													0
Total Return Flows	**99**	**71**	**123**	**149**	**1,971**	**3,485**	**3,922**	**3,452**	**2,215**	**550**	**114**	**116**	**16,266**
Calculated Outflows	30,390	28,512	30,950	28,723	31,756	86,924	32,851	48,890	40,028	39,305	30,881	31,866	461,075
SAN JUAN RIVER AT FARMINGTON, NM MINUS ANIMAS RIVER AT FARMINGTON, NM	51,219	46,649	52,941	85,210	146,771	122,340	35,847	53,556	53,018	63,332	54,506	53,064	818,453
ANIMAS RIVER AT FARMINGTON, NM	15,741	13,690	19,184	63,788	140,007	67,537	10,760	8,731	12,079	20,170	24,580	18,320	414,587
Gains / Losses	5,088	4,447	2,807	-7,301	-24,992	-32,121	-7,764	-4,065	912	3,857	-955	2,878	-57,209
Probability of Annual Flows (Inflows)	90.0%												
Watershed Inflows (90.0% Probability)	417,270	257,536	99.7%										
Monthly Inflows for the 90.0% Probability Months	12,230	14,346	18,957	26,729	30,516	28,217	25,106	29,065	20,356	21,761	16,578	13,675	257,536
	90.00%	Changes monthly percentage probability to calculate a annual 99.7% probability											
Year 2000 Inflows Rank	73.5%												
Ratio of 90.0% Probability Inflow Month's sum to Year 2000 Inflows		53.9%											
Calculated Gains/Losses for 90.0% Probability Months	**2,741**	**2,396**	**1,512**	**-3,933**	**-13,464**	**-17,305**	**-4,183**	**-2,190**	**491**	**2,078**	**-515**	**1,551**	**-30,821**

Depletions within the Upper San Juan Watershed include the municipal, industrial, and agricultural depletions that were identified in the Water Demand Assessment. There are no transbasin diversions out of the Upper San Juan Watershed. The existing NIIP diversions have been included in the data of the San Juan Gage at Archuleta. However, under the 2044 conditions, the incremental increased diversions associated with the completion of the NIIP will result in additional depletions in the Upper San Juan Watershed.

Return flows within the Upper San Juan Watershed were calculated as the difference between diversions and depletions for municipal, industrial, and agricultural uses.

Table 118 presents the year 2044 water budget. The 2044 demands are used with the 90th percentile monthly supply. The results indicate that in the year 2044 there are shortages in a 90th percentile month. Even if all of the return flows from the watershed are included, there are still monthly shortages. The supply without return flows are shown because only a portion of the return flows in the watershed could be recaptured for use within the same watershed.

However, all shortages during a 90th percentile year can be met with the use of storage in Navajo Dam to meet the incremental NIIP increase diversions. The only way to assess the long-term impact on the supply from Navajo Reservoir resulting from the completion of NIIP would be the completion of a multi-year operation study of the reservoir. This on-going model development is being accomplished by U.S. Bureau of Reclamation and model development is beyond the scope of this study. Nevertheless, the result of this study of the Upper San Juan is that:

- During all 90th percentile months, 2044 demands below the Archuleta gage are met if the incremental NIIP future diversions are met with storage releases greater than historical 90th percentile months. This means that the historical releases during the drought months were not sufficient to satisfy future NIIP demands but they could be met with storage releases. This is because Navajo Dam is a multi-year storage facility that is able to release more water during drought periods than have been historically released.
- The surplus in June, without incremental NIIP, is only 2,600 acre-feet, which is not significant when compared with the accuracy of gage measurements. Consequently, actual shortages could occur in this 90th percentile month. This is because the accuracy of gage readings and the assumptions used for agricultural diversions could more than account for 2,600 acre-feet per month when the total inflow is over 29,000 acre-feet per month. River gage readings are typically assumed to be only accurate within plus or minus 10 percent.

Table 118: Year 2044 Water Budget for the Upper San Juan Watershed

Watershed: Upper San Juan
Year: 2044

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Monthly Inflows for the 90.0% Probability Months	12,230	14,346	18,957	26,729	30,516	28,217	25,106	29,065	20,356	21,761	16,578	13,675	257,536
Canal Diversions above River Gage	-	-	-	-	-	-	-	-	-	-	-	-	0
Transbasin Diversions - Agricultural	0	0	0	0	161	292	335	294	190	42	0	0	1,314
Total Inflows	**12,230**	**14,346**	**18,957**	**26,729**	**30,677**	**28,509**	**25,441**	**29,359**	**20,546**	**21,803**	**16,578**	**13,675**	**258,850**
Diversions													
Municipal	435	408	477	620	861	937	834	844	625	527	495	477	7,541
Industrial	375	375	375	375	375	375	375	375	375	375	375	375	4,497
Agricultural	0	0	0	0	3,630	6,587	7,561	6,624	4,277	948	0	0	29,627
Incremental NIIP	0	0	4,187	17,467	33,251	50,988	55,560	46,454	28,618	9,465	10	0	246,000
Total Diversions	**810**	**783**	**5,039**	**18,461**	**38,117**	**58,888**	**64,330**	**54,297**	**33,895**	**11,314**	**879**	**852**	**287,665**
Depletions													
Municipal	192	175	234	253	477	467	487	499	438	340	214	192	3,969
Industrial	375	375	375	375	375	375	375	375	375	375	375	375	4,497
Agricultural	0	0	0	0	1,815	3,293	3,781	3,312	2,138	474	0	0	14,813
Incremental NIIP	0	0	3,132	13,065	24,871	38,138	41,557	34,746	21,406	7,080	7	0	184,000
Total Depletions	**567**	**549**	**3,740**	**13,693**	**27,538**	**42,273**	**46,200**	**38,932**	**24,356**	**8,268**	**596**	**567**	**207,279**
Return Flows													
Municipal	244	234	244	367	384	470	347	344	187	187	280	285	3,573
Industrial	0	0	0	0	0	0	0	0	0	0	0	0	0
Agricultural	0	0	0	0	1,815	3,294	3,781	3,312	2,139	474	0	0	14,814
Incremental NIIP													
Total Return Flows	**244**	**234**	**244**	**367**	**2,199**	**3,763**	**4,127**	**3,656**	**2,325**	**661**	**280**	**285**	**18,386**
Calculated Gains/Losses for 90.0% Probability Months	**2,741**	**2,396**	**1,512**	**-3,933**	**-13,464**	**-17,305**	**-4,183**	**-2,190**	**491**	**2,078**	**-515**	**1,551**	
Surplus / Shortages	14,404	16,193	15,674	4,701	-18,705	-43,920	-38,944	-23,471	-10,533	13,228	15,465	14,659	-10,429
Surplus / Shortages w/o Return Flows	14,161	15,959	15,430	4,335	-20,904	-47,684	-43,072	-27,128	-12,858	12,567	15,184	14,374	-28,815
Supply with incr. NIIP met from storage w/o return flows	14,161	15,959	19,617	21,801	12,347	3,305	12,488	19,326	15,760	22,032	15,194	14,374	217,185
Min Month Shortage	7,397	9,195	8,666	-2,429	-27,668	-54,448	-49,836	-33,892	-19,622	5,803	8,420	7,610	
Min Month Shortage w/o Incremental NIIP	7,397	9,195	12,853	15,037	5,583	-3,459	5,724	12,562	8,996	15,268	8,430	7,610	

7.7. **Upper San Juan Above Navajo Dam**

Demands in the Upper San Juan Above Navajo Dam are almost entirely associated with the Jicarilla Apache Nation. The Nation anticipates annual diversions of 7,918 acre-feet per year in 2044 and the remainder of the basin will have only 1,016acre-feet demands. The non-Jicarilla demands are not associated with any population centers.

The Above Navajo Dam Watershed water supply defined in the Water Supply Assessment was based on the supply at the Edith gage. During the 90th percentile months there is more than sufficient supply to meet the 2044 demands.

7.7.1. San Juan-Chama Project impact on water supply

The San Juan-Chama Project diverts above the Edith gage and historical diversions have been accounted for in that gage's readings. However, increased San Juan Chama Project diversions above historical diversions would have an impact on the available supply at the Edith gage and more importantly on the inflow to Navajo Reservoir.

However, this study evaluates the firm water supply (90th percentile) and compares it with projected future demands. During drought conditions, the San Juan-Chama Project diversions are severely limited by required bypass flows and by the water available at the diversions. For example, in 2002, the project was able to divert only 6,311 acre-feet during a time of greatest need. Consequently, the impact on the 90th percentile water supply for the Above Navajo Dam watershed will not be any greater than that historically experienced from San Juan Chama diversions.

However, the San Juan Chama Project will be able to divert up to 270,000 acre-feet in any one year with a 10-year maximum of 1,350,000 acre-feet[8]. This will result in less inflow to Navajo Reservoir than has been historically experienced. This decreased inflow will likely have no impact on the 90th percentile months on the Upper San Juan and the Middle San Juan Basins unless Navajo Reservoir empties as a result of the increased San Juan-Chama Project. This is unlikely since without a model of the reservoir's operation under future demand conditions, this assumption cannot be confirmed.

[8] Refer to Legal Issues section of the Water Supply Assessment Report

8.0 Summary and Conclusions of Water Budget Analyses

There is sufficient physical water in the 90th percentile months in the **Animas Watershed** to met 2044 projected demands. However, the lack of diversion records for agricultural uses brings into question the reliability of this conclusion. Furthermore, the presence of physical water does not ensure that sufficient water rights are in place to adequately provide the needed supply.

The **Blanco Canyon Watershed** demands cannot be met from available surface water supplies. However, the demands are relatively low and there should be sufficient groundwater resources to meet future demands.

Surface water supplies for the **Chaco Watershed** (outside the Navajo Nation) are not reliable. Chaco demands will need to be met from groundwater or transbasin importation.

Municipal demands in the **La Plata Watershed** have historically been met from the Animas Watershed. This needs to continue into the future because there is insufficient supply in the La Plata Watershed to meet just the agricultural demands during the critical summer months.

The **Middle San Juan Watershed** would experience significant shortages in the future if the upstream NIIP depletions had to be met from the 90th percentile monthly flows. However, if those upstream depletions are fully met from Navajo Reservoir releases, the Middle San Juan experiences no shortages in 2044.

The demands are met in all 90th percentile months in the **Upper San Juan Watershed** provided that future increased NIIP depletions are satisfied with Navajo Reservoir storage. However, the surplus is very small in relation to the magnitude of flow (3,305 af out of 29,000 acre-feet of demands). Therefore, shortages could occur in at least one of the 90th percentile months.

The Jicarilla Apache Nation has nearly all the demands in the **Upper San Juan above Navajo Dam Watershed.** There is sufficient water in the 90th percentile months to meet all of the Nations projected demands in the watershed, including 6,000 acre-feet of new agricultural depletions. The San Juan-Chama project would have no effect on this conclusion because of its limited diversion capability during drought periods such as the 90th percentile months.

9.0 Bibliography

Blaney, Harry F. and Hanson, Eldon G. Consumptive Use and Water Requirements in New Mexico. Technical Report 32. New Mexico State Engineer. Santa Fe, NM.

Bureau of the Census. 1970 Census of Population. January 1973 issue.

Bureau of the Census. 1980 Census of Population. June 1983 issue.

Bureau of the Census. 1960 Census of Population. June 1963 issue.

Navajo Nation Department of Water Resources, Water Resource Development Strategy for the Navajo nation, July 17, 2000

Navajo Nation Department of Water Resources, Final Draft Technical Memorandum – The Navajo-Gallup Water Supply Project, March 16, 2001

Irrigation Water Requirements Technical Release No. 21. United States Department of Agriculture Soil Conservation Service Engineering Division. September 1970.

http://fisher.lib.virginia.edu/census/. United States Historical Census Data Browser Inter-University Consortium for Political and Social Research (ICPSR).

http://www.unm.edu/~bber/. Bureau of Business and Economic Research (BBER), University of New Mexico.

San Juan Water Commission, Return Flow Plan and Crediting Program, March, 1998.

http://www.census.gov/main/www/cen2000.html. United States Census 2000. United States Census Bureau.

http://wrri.nmsu.edu/wrdis/wateruse/basion 90/uc.html. Wilson, Brian C., P.E., 1992, "Water Use by Categories in New Mexico Counties and River Basins, and Irrigated Acreage in 1990", New Mexico State Engineer Office, Technical Report 47, Santa Fe, New Mexico, pp 94.

http://www.geographynetwork.com/data/tiger2000/. Census block data.

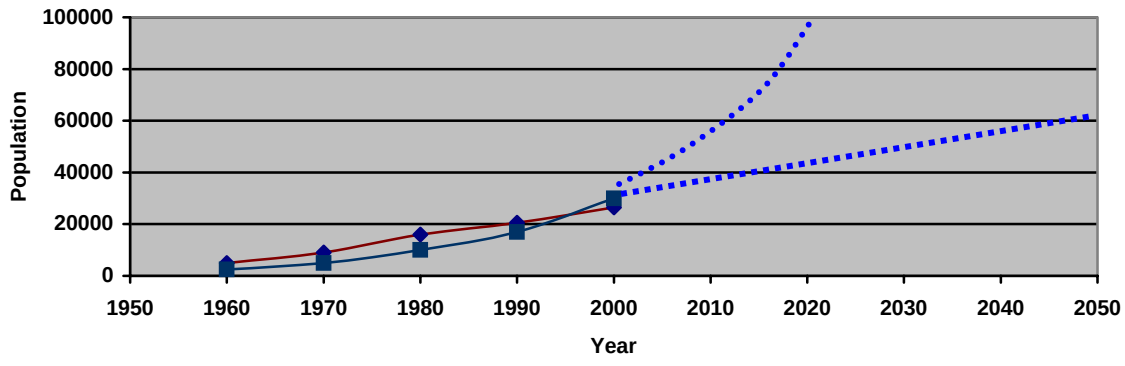
http://www.epa.gov/surf and was modified to the study watershed boundaries. Geographic watershed boundaries

10.0 Demands Appendices

Appendix A – Linear Regression Methods

The Least Squares Method seeks to find a trend line that minimizes the sum of the squares of the distances on a chart among the observed values (historic population, in this case).
The regression models discussed below are based on formulas that attempt to define a trend line that best fits the observed data. This line may be straight line or various types of curved lines (see Figure 1).

Figure 1: Examples Linear Regression



For more detail on these statistical approaches, see the free online textbook at http://www.statsoft.com/textbook/stathome.html.

Appendix A-1 Simple Linear Regression

If the historic data generally falls around a straight line, then a linear regression equation is appropriate:

$$Y = mX + b$$

Where m is the slope of the line, b is the Y intercept, and X is the known variable (historic population).
The slope[9] of the line is determined from the following formula:

$$m = \frac{n\sum x_i y_i - (\sum x_i)(\sum y_i)}{n\sum x_i^2 - (\sum x_i)^2}$$

And the y intercept[10] by this formula:

$$b = \frac{\sum y_i}{n} - m\frac{\sum x_i}{n}$$

[9] MS Excel provides a linear regression slope directly in the SLOPE function, as well as in a value in the LINEST. Excel also provides for new y values given historical x series, y series, and a new x in the Trend function.
[10] MS Excel provides the y intercept in the INTERCEPT function, as well as a component of the LINEST function

One of the methods for determining how well the regression formula applies to the data is by use of a correlation coefficient[11]. For a linear regression that formula is:

$$r = \frac{\sum (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\left[\sum (x_i - \bar{x})^2\right] \cdot \left[\sum (y_i - \bar{y})^2\right]}}$$

Where all x and y values are the original data values. If the data is not related to the resultant line r=0, if the data perfectly falls on the line r=1. Sometimes the values of r are given as r^2, a historical convenience from when square roots were difficult to perform[12].

Appendix A-2 Power Regression

If the data falls along a line that generally looks like:

$$Y=a*b^X$$

The natural logarithm of both sides of the equation is taken to transform the equation to:

$$\ln(Y)=\ln(a)+\ln(b)*X$$

whose coefficients can be determined using the linear forms above and exponentiated back into the original form[13]. The goodness value is calculated on the ln(y) and x.

Appendix A-3 Exponential

If the data falls along a line that generally looks like:

$$Y=a*X^b$$

The natural logarithm of both sides of the equation can be taken to transform the equation to:

$$\ln(Y) = \ln(a) + b*\ln(X)$$

whose coefficients can be determined using the linear forms above and exponentiated back into the original form. The goodness value is calculated on the ln(y) and ln(x).

Appendix A-4 Logarithmic

If the data falls along a line that generally looks like:

$$Y=b+m*\ln(X)$$

whose coefficients can be determined using the linear forms above. The goodness value is calculated on the Y and ln(X).

Appendix A-5 Opinions of Extrapolations (Out year Projections)

The key interest in population prediction is mathematically known as extrapolation. Unfortunately, extrapolating data in the short term is always a risk. The longer the "X" gap between the highest value and the new value, the more susceptible to significant variation will be the predicted value from the observed value. This is one reason why, whenever census data is available, the predictions are adjusted for the census counts,

[11] MS Excel provides r as the PEARSON function and r^2 as the RSQ function, as well as a component of the LINEST function.
[12] MS Excel still displays r^2 on charts with trend lines and equations displayed.
[13] MS Excel provides both LOGEST function for all the components of the regression and a GROWTH function if the user wants only the new y values. Both require historical x series, y series, and a new x.

since these counts have, historically, represented generally accepted observed values. In the SHJU, between 30 and 50 years of consistent data (data which follows one of the above patterns) is available for each county. Predictions of 60 years or more become less reliable because Parsons did not have access within the timeframe and budget limitations to collect data for 1940 or earlier decades.

Appendix B – Animas Watershed

Appendix B-1 Monthly Diversions and Return Flows for the City of Aztec for the year 2000

CITY OF AZTEC

RECORD OF DIVERSIONS FROM AND RETURN FLOWS TO THE ANIMAS RIVER FOR WATER USED IN THE AZTEC MUNICIPAL WATER SYSTEM

DATE OF READING: JANUARY 31,2000

	THIS MONTH	LAST MONTH	DIV IN GALLONS	DIV IN ACRE-FEET
1. ANIMAS RIVER METER READING	1,140,904,000	1,109,774,000	31,130,000	95.53
2. LOWER ANIMAS DITCH METER READING	17,179,000	17,179,000	0	0.00
3. ANIMAS RIVER DIVERSION (1.-2. above)	1,123,725,000	1,092,595,000	31,130,000	95.53
4. AZTEC DITCH METER READING	2,949,102,000	2,942,265,000	6,837,000	20.98 ***
5. SEWAGE TREATMENT PLANT EFFLUENT METER READING	967,583,000	948,814,000	18,869,000	57.91
6. FLORA VISTA WATER USERS METER READING	69,858,000	66,700,000	2,958,000	9.19
7. SOUTHSIDE WATER USERS METER READING	159,635,000	150,177,000	2,458,000	7.54

*** THE PIPE WAS NOT COVERED SO THE READING IS NOT ACCURATE.

Certification:

I hereby certify that the above readings and amounts of water diverted from and returned to the Animas River were measured by the City of Aztec Water Department personnel, under my direction or advice, and the same have been examined by me and to the best of my knowledge are true and correct.

Gary Lynch Pres.

---This beginning reading has changed because the meter runs even when there is no water in the pipe.

Summary information of this year's annual diversions

Total Diversion this month	16.52	acre-feet
Total Return Flow this month	57.91	acre-feet
% Return Flow this month	50%	
Total Diversion to date	16.52	acre-feet
Total Return Flow to date	57.91	acre-feet
% Return Flow to date	50%	
Total sold Flora Vista this month	9.19	acre-feet
Total sold Flora Vista to date	9.19	acre-feet
Total sold Southside this month	7.54	acre-feet
Total sold Southside to date	7.54	acre-feet

CITY OF AZTEC

RECORD OF DIVERSIONS FROM AND RETURN FLOWS TO
THE ANIMAS RIVER FOR
WATER USED IN THE AZTEC MUNICIPAL WATER SYSTEM

DATE OF READING: FEBRUARY 29,2000

	THIS MONTH	LAST MONTH	DIV IN GALLONS	DIV IN ACRE-FEET
1. ANIMAS RIVER METER READING	1,171,261,000	1,140,904,000	30,357,000	93.16
2. LOWER ANIMAS DITCH METER READING	17,179,000	17,179,000	0	0.00
3. ANIMAS RIVER DIVERSION (1.-2. above)	1,154,082,000	1,123,725,000	30,357,000	93.16
4. AZTEC DITCH METER READING	2,949,102,000	2,949,102,000	0	0.00 ***
5. SEWAGE TREATMENT PLANT EFFLUENT METER READING	884,713,000	867,683,000	17,030,000	52.26
6. FLORA VISTA WATER USERS METER READING	71,799,000	69,696,000	2,103,000	6.45
7. SOUTHSIDE WATER USERS METER READING	160,505,000	158,635,000	1,970,000	6.05

*** THE PIPE WAS NOT COVERED SO THE READING IS NOT ACCURATE.

Certification:

I hereby certify that the above readings and amounts of water diverted from and returned to the Animas River were measured by the City of Aztec Water Department personnel ,under my direction or advice, and the same have been examined by me and to the best of my knowledge are true and correct.

[signature]

***The beginning reading has changed because the meter runs even when there is no water in the pipe.

Summary information of this year's annual diversions

Total Diversion this month	93.16	acre-feet
Total Return Flow this month	52.26	acre-feet
% Return Flow this month	56%	
Total Diversion to date	209.68	acre-feet
Total Return Flow to date	110.17	acre-feet
% Return Flow to date	53%	
Total sold Flora Vista this month	6.45	acre-feet
Total sold Flora Vista to date	15.69	acre-feet
Total sold Southside this month	6.05	acre-feet
Total sold Southside to date	13.59	acre-feet

CITY OF AZTEC

RECORD OF DIVERSIONS FROM AND RETURN FLOWS TO
THE ANIMAS RIVER FOR
WATER USED IN THE AZTEC MUNICIPAL WATER SYSTEM

DATE OF READING: MARCH 31,2000

	THIS MONTH	LAST MONTH	DIV IN GALLONS	DIV IN ACRE-FEET
1. ANIMAS RIVER METER READING	1,195,194,000	1,171,261,000	23,933,000	73.45
2. LOWER ANIMAS DITCH METER READING	17,179,000	17,179,000	0	0.00
3. ANIMAS RIVER DIVERSION (1.-2. above)	1,178,015,000	1,154,082,000	23,933,000	73.45
4. AZTEC DITCH METER READING	2,970,747,000	2,949,102,000	21,645,000	66.43 ***
5. SEWAGE TREATMENT PLANT EFFLUENT METER READING	903,261,000	884,713,000	18,548,000	56.92
6. FLORA VISTA WATER USERS METER READING	73,431,000	71,799,000	1,632,000	5.01
7. SOUTHSIDE WATER USERS METER READING	162,993,000	160,605,000	2,388,000	7.33

*** THE PIPE WAS NOT COVERED SO THE READING IS NOT ACCURATE.

Certification:

I hereby certify that the above readings and amounts of water diverted from and returned to the Animas River were measured by the City of Aztec Water Department personnel under my direction or advice, and the same have been examined by me and to the best of my knowledge are true and correct.

_____

***The beginning reading has changed because the meter runs even when there is no water in the pipe.

Summary information of this year's annual diversions

Total Diversion this month	139.87	acre-feet
Total Return Flow this month	56.92	acre-feet
% Return Flow this month	41%	
Total Diversion to date	349.53	acre-feet
Total Return Flow to date	167.09	acre-feet
% Return Flow to date	48%	
Total sold Flora Vista this month	5.01	acre-feet
Total sold Flora Vista to date	20.66	acre-feet
Total sold Southside this month	7.33	acre-feet
Total sold Southside to date	20.92	acre-feet

CITY OF AZTEC

RECORD OF DIVERSIONS FROM AND RETURN FLOWS TO THE ANIMAS RIVER FOR WATER USED IN THE AZTEC MUNICIPAL WATER SYSTEM

DATE OF READING: APRIL 30,2000

	THIS MONTH	LAST MONTH	DIV IN GALLONS	DIV IN ACRE-FEET
1. ANIMAS RIVER METER READING	1,250,189,000	1,195,194,000	54,995,000	168.77
2. LOWER ANIMAS DITCH METER READING	17,179,000	17,179,000	0	0.00
3. ANIMAS RIVER DIVERSION (1.-2. above)	1,233,010,000	1,178,015,000	54,995,000	168.77
4. AZTEC DITCH METER READING	2,970,747,000	2,970,747,000	0	0.00
5. SEWAGE TREATMENT PLANT EFFLUENT METER READING	921,364,000	903,261,000	18,103,000	55.56
6 FLORA VISTA WATER USERS METER READING	74,295,000	73,431,000	864,000	2.65
7. SOUTHSIDE WATER USERS METER READING	165,597,000	162,993,000	2,604,000	7.99

Certification:

I hereby certify that the above readings and amounts of water diverted from and returned to the Animas River were measured by the City of Aztec Water Department personnel ,under my direction or advice, and the same have been examined by me and to the best of my knowledge are true and correct.

Gary Spitzer

***The meter is being repaired at this time.

Summary information of this year's annual diversions

Total Diversion this month	168.77	acre-feet
Total Return Flow this month	55.56	acre-feet
% Return Flow this month	33%	
Total Diversion to date	518.33	acre-feet
Total Return Flow to date	222.65	acre-feet
% Return Flow to date	43%	
Total sold Flora Vista this month	2.65	acre-feet
Total sold Flora Vista to date	23.31	acre-feet
Total sold Southside this month	7.99	acre-feet
Total sold Southside to date	28.91	acre-feet

CITY OF AZTEC

RECORD OF DIVERSIONS FROM AND RETURN FLOWS TO
THE ANIMAS RIVER FOR
WATER USED IN THE AZTEC MUNICIPAL WATER SYSTEM

DATE OF READING: MAY 31,2000

	THIS MONTH	LAST MONTH	DIV IN GALLONS	DIV IN ACRE-FEET
1. ANIMAS RIVER METER READING	1,291,639,000	1,250,189,000	41,450,000	127.21
2. LOWER ANIMAS DITCH METER READING	17,179,000	17,179,000	0	0.00
3. ANIMAS RIVER DIVERSION (1.-2. above)	1,274,460,000	1,233,010,000	41,450,000	127.21
4. AZTEC DITCH METER READING	2,986,213,000	2,970,747,000	15,466,000 * 703 = 10,873,000	47.46 ***
5. SEWAGE TREATMENT PLANT EFFLUENT METER READING	939,968,000	921,364,000	18,602,000	57.09
6. FLORA VISTA WATER USERS METER READING	74,310,000	74,295,000	15,000	0.05
7. SOUTHSIDE WATER USERS METER READING	168,710,000	165,597,000	3,113,000	9.55

Certification:

I hereby certify that the above readings and amounts of water diverted from and returned to the Animas River were measured by the City of Aztec Water Department personnel ,under my direction or advice, and the same have been examined by me and to the best of my knowledge are true and correct.

Summary information of this year's annual diversions

Total Diversion this month	174.67	acre-feet
Total Return Flow this month	57.09	acre-feet
% Return Flow this month	33%	
Total Diversion to date	692.99	acre-feet
Total Return Flow to date	279.74	acre-feet
% Return Flow to date	40%	
Total sold Flora Vista this month	0.05	acre-feet
Total sold Flora Vista to date	23.35	acre-feet
Total sold Southside this month	9.55	acre-feet
Total sold Southside to date	38.66	acre-feet

CITY OF AZTEC

RECORD OF DIVERSIONS FROM AND RETURN FLOWS TO THE ANIMAS RIVER FOR WATER USED IN THE AZTEC MUNICIPAL WATER SYSTEM

DATE OF READING: JUNE 30,2000

	THIS MONTH	LAST MONTH	DIV IN GALLONS	DIV IN ACRE-FEET
1. ANIMAS RIVER METER READING	1,303,397,000	1,291,639,000	11,758,000	36.08
2. LOWER ANIMAS DITCH METER READING	17,179,000	17,179,000	0	0.00
3. ANIMAS RIVER DIVERSION (1.-2. above)	1,286,218,000	1,274,460,000	11,758,000	36.08
4. AZTEC DITCH METER READING	3,081,343,000	2,988,213,000	75,130,000	230.57 ***
		75,139,000 x .703 =		52,816.00
5. SEWAGE TREATMENT PLANT EFFLUENT METER READING	958,370,000	939,966,000	18,404,000	56.48
6. FLORA VISTA WATER USERS METER READING	74,310,000	74,310,000	0	0.00
7. SOUTHSIDE WATER USERS METER READING	172,202,000	168,710,000	3,492,000	10.72

Certification:

I hereby certify that the above readings and amounts of water diverted from and returned to the Animas River were measured by the City of Aztec Water Department personnel ,under my direction or advice, and the same have been examined by me and to the best of my knowledge are true and correct.

_____

***The meter reading is not accurate because the pipe was not covered this month.

Summary information of this year's annual diversions

Total Diversion this month	268.65	acre-feet
Total Return Flow this month	56.48	acre-feet
% Return Flow this month	21%	
Total Diversion to date	959.64	acre-feet
Total Return Flow to date	336.22	acre-feet
% Return Flow to date	35%	
Total sold Flora Vista this month	0.00	acre-feet
Total sold Flora Vista to date	23.35	acre-feet
Total sold Southside this month	10.72	acre-feet
Total sold Southside to date	49.18	acre-feet

CITY OF AZTEC

RECORD OF DIVERSIONS FROM AND RETURN FLOWS TO
THE ANIMAS RIVER FOR
WATER USED IN THE AZTEC MUNICIPAL WATER SYSTEM

DATE OF READING: JULY 31,2000

	THIS MONTH	LAST MONTH	DIV IN GALLONS	DIV IN ACRE-FEET
1. ANIMAS RIVER METER READING	1,306,691,000	1,303,397,000	3,134,000	9.62
2. LOWER ANIMAS DITCH METER READING	17,179,000	17,179,000	0	0.00
3. ANIMAS RIVER DIVERSION (1.-2. above)	1,289,352,000	1,286,218,000	3,134,000	9.62
4. AZTEC DITCH METER READING	3,142,460,000	3,061,343,000	81,117,000	248.94 —
			Y.T.D.: 97,021,000	
5. SEWAGE TREATMENT PLANT EFFLUENT METER READING	977,780,000	958,370,000	19,410,000	59.57
6. FLORA VISTA WATER USERS METER READING	74,310,000	74,310,000	0	0.00
7. SOUTHSIDE WATER USERS METER READING	175,321,000	172,202,000	3,119,000	9.57

Certification:

I hereby certify that the above readings and amounts of water diverted from and returned to the Animas River were measured by the City of Aztec Water Department personnel ,under my direction or advice, and the same have been examined by me and to the best of my knowledge are true and correct.

Gary Spitzkeisen

—The meter reading is not accurate because the pipe was not covered this month.

Summary information of this year's annual diversions

Total Diversion this month	258.50	acre-feet
Total Return Flow this month	59.57	acre-feet
% Return Flow this month	23%	
Total Diversion to date	1,218.20	acre-feet
Total Return Flow to date	395.78	acre-feet
% Return Flow to date	32%	
Total sold Flora Vista this month	0.00	acre-feet
Total sold Flora Vista to date	23.35	acre-feet
Total sold Southside this month	9.57	acre-feet
Total sold Southside to date	58.75	acre-feet

CITY OF AZTEC

RECORD OF DIVERSIONS FROM AND RETURN FLOWS TO THE ANIMAS RIVER FOR WATER USED IN THE AZTEC MUNICIPAL WATER SYSTEM

DATE OF READING: AUGUST 31,2000

	THIS MONTH	LAST MONTH	DIV IN GALLONS	DIV IN ACRE-FEET
1. ANIMAS RIVER METER READING	1,308,531,000	1,308,531,000	0	0.00
2. LOWER ANIMAS DITCH METER READING	17,179,000	17,179,000	0	0.00
3. ANIMAS RIVER DIVERSION (1.-2. above)	1,289,352,000	1,289,352,000	0	0.00
4. AZTEC DITCH METER READING	3,214,213,000	3,142,460,000	71,753,000	220.20 ***
			x.703 = 50,442,000	
5. SEWAGE TREATMENT PLANT EFFLUENT METER READING	998,016,000	977,780,000	20,236,000	62.10
6. FLORA VISTA WATER USERS METER READING	74,310,000	74,310,000	0	0.00
7. SOUTHSIDE WATER USERS METER READING	178,699,000	175,321,000	3,378,000	10.37

Certification:

I hereby certify that the above readings and amounts of water diverted from and returned to the Animas River were measured by the City of Aztec Water Department personnel ,under my direction or advice, and the same have been examined by me and to the best of my knowledge are true and correct.

Signature

***The meter reading is not accurate because the pipe was not covered this month.

Summary information of this year's annual diversions

Total Diversion this month	220.20	acre-feet
Total Return Flow this month	62.10	acre-feet
% Return Flow this month	28%	
Total Diversion to date	1,438.40	acre-feet
Total Return Flow to date	457.88	acre-feet
% Return Flow to date	32%	
Total sold Flora Vista this month	0.00	acre-feet
Total sold Flora Vista to date	23.35	acre-feet
Total sold Southside this month	10.37	acre-feet
Total sold Southside to date	69.12	acre-feet

CITY OF AZTEC

RECORD OF DIVERSIONS FROM AND RETURN FLOWS TO THE ANIMAS RIVER FOR WATER USED IN THE AZTEC MUNICIPAL WATER SYSTEM

DATE OF READING: SEPTEMBER 30,2000

	THIS MONTH	LAST MONTH	DIV IN GALLONS	DIV IN ACRE-FEET
1. ANIMAS RIVER METER READING	1,309,411,000	1,306,531,000	2,880,000	8.84
2. LOWER ANIMAS DITCH METER READING	17,179,000	17,179,000	0	0.00
3. ANIMAS RIVER DIVERSION (1.-2. above)	1,292,232,000	1,289,352,000	2,880,000	8.84
4. AZTEC DITCH METER READING	3,276,261,000	3,214,213,000	62,048,000	190.42 ***
			62,048,000 x .703 =	43,618,000
5. SEWAGE TREATMENT PLANT EFFLUENT METER READING	1,018,331,000	998,016,000	20,315,000	62.34
6. FLORA VISTA WATER USERS METER READING	74,310,000	74,310,000	0	0.00
7. SOUTHSIDE WATER USERS METER READING	181,915,000	178,699,000	3,216,000	9.87

Certification:

I hereby certify that the above readings and amounts of water diverted from and returned to the Animas River were measured by the City of Aztec Water Department personnel ,under my direction or advice, and the same have been examined by me and to the best of my knowledge are true and correct.

_____

***The meter reading is not accurate because the pipe was not covered this month.

Summary information of this year's annual diversions

Total Diversion this month	199.26	acre-feet
Total Return Flow this month	62.34	acre-feet
% Return Flow this month	31%	
Total Diversion to date	1,637.68	acre-feet
Total Return Flow to date	520.23	acre-feet
% Return Flow to date	32%	
Total sold Flora Vista this month	0.00	acre-feet
Total sold Flora Vista to date	23.35	acre-feet
Total sold Southside this month	9.87	acre-feet
Total sold Southside to date	78.99	acre-feet

CITY OF AZTEC

RECORD OF DIVERSIONS FROM AND RETURN FLOWS TO THE ANIMAS RIVER FOR WATER USED IN THE AZTEC MUNICIPAL WATER SYSTEM

DATE OF READING: OCTOBER 31,2000

	THIS MONTH	LAST MONTH	DIV IN GALLONS	DIV IN ACRE-FEET
1. ANIMAS RIVER METER READING	1,309,411,000	1,309,411,000	0	0.00
2. LOWER ANIMAS DITCH METER READING	17,179,000	17,179,000	0	0.00
3. ANIMAS RIVER DIVERSION (1.-2. above)	1,292,232,000	1,292,232,000	0	0.00
4. AZTEC DITCH METER READING	2,333,448,000 ~~3,354,079,000~~	3,276,281,000	57,167,000 88,715,000	272.26
5. SEWAGE TREATMENT PLANT EFFLUENT METER READING	1,039,400,000	1,018,331,000	21,069,000	64.66
6. FLORA VISTA WATER USERS METER READING	74,310,000	74,310,000	0	0.00
7. SOUTHSIDE WATER USERS METER READING	183,800,000	181,915,000	1,885,000	5.78

57,167,000 - 709 = 40,202,401

Certification:

I hereby certify that the above readings and amounts of water diverted from and returned to the Animas River were measured by the City of Aztec Water Department personnel ,under my direction or advice, and the same have been examined by me and to the best of my knowledge are true and correct.

Gary Steinkelmeyer

—The meter reading is not accurate because the pipe was not covered this month.

Summary information of this year's annual diversions

Total Diversion this month	272.26	acre-feet
Total Return Flow this month	64.66	acre-feet
% Return Flow this month	24%	
Total Diversion to date	1,909.92	acre-feet
Total Return Flow to date	584.89	acre-feet
% Return Flow to date	31%	
Total sold Flora Vista this month	0.00	acre-feet
Total sold Flora Vista to date	23.35	acre-feet
Total sold Southside this month	5.78	acre-feet
Total sold Southside to date	84.77	acre-feet

CITY OF AZTEC

RECORD OF DIVERSIONS FROM AND RETURN FLOWS TO THE ANIMAS RIVER FOR WATER USED IN THE AZTEC MUNICIPAL WATER SYSTEM

DATE OF READING: NOVEMBER 30,2000

	THIS MONTH	LAST MONTH	DIV IN GALLONS	DIV IN ACRE-FEET
1. ANIMAS RIVER METER READING	1,309,411,000	1,309,411,000	0	0.00
2. LOWER ANIMAS DITCH METER READING	17,179,000	17,179,000	0	0.00
3. ANIMAS RIVER DIVERSION (1 -2. above)	1,292,232,000	1,292,232,000	0	0.00
4. AZTEC DITCH METER READING	3,391,667,000	3,333,418,000 ~~3,364,076,680~~	58,249,000 28,721,000	52.00
5. SEWAGE TREATMENT PLANT EFFLUENT METER READING	1,058,804,000	1,039,400,000	19,404,000	59.55
6. FLORA VISTA WATER USERS METER READING	74,310,000	74,310,000	0	0.00
7. SOUTHSIDE WATER USERS METER READING	166,220,000	163,800,000	2,420,000	7.43

58,249,000 x .703 = 40,949,000

Certification:

I hereby certify that the above readings and amounts of water diverted from and returned to the Animas River were measured by the City of Aztec Water Department personnel ,under my direction or advice, and the same have been examined by me and to the best of my knowledge are true and correct.

_____

**The meter reading is not accurate because the pipe was not covered this month.

Summary information of this year's annual diversions

Total Diversion this month	52.00	acre-feet
Total Return Flow this month	59.55	acre-feet
% Return Flow this month	73%	
Total Diversion to date	1,991.92	acre-feet
Total Return Flow to date	644.44	acre-feet
% Return Flow to date	32%	
Total sold Flora Vista this month	0.00	acre-feet
Total sold Flora Vista to date	23.36	acre-feet
Total sold Southside this month	7.43	acre-feet
Total sold Southside to date	92.20	acre-feet

CITY OF AZTEC

RECORD OF DIVERSIONS FROM AND RETURN FLOWS TO THE ANIMAS RIVER FOR WATER USED IN THE AZTEC MUNICIPAL WATER SYSTEM

DATE OF READING: DECEMBER 31,2000

	THIS MONTH	LAST MONTH	DIV IN GALLONS	DIV IN ACRE-FEET
1. ANIMAS RIVER METER READING	1,309,411,000	1,309,411,000	0	0.00
2. LOWER ANIMAS DITCH METER READING	17,179,000	17,179,000	0	0.00
3. ANIMAS RIVER DIVERSION (1.-2. above)	1,292,232,000	1,292,232,000	0	0.00
4. AZTEC DITCH METER READING	3,431,542,000	3,391,897,000	39,645,000	122.28 ***
			1.703 : 28,011,000	
5. SEWAGE TREATMENT PLANT EFFLUENT METER READING	1,077,995,000	1,058,804,000	19,191,000	58.90
6. FLORA VISTA WATER USERS METER READING	74,310,000	74,310,000	0	0.00
7. SOUTHSIDE WATER USERS METER READING	168,827,000	166,220,000	2,607,000	8.00

Certification:

I hereby certify that the above readings and amounts of water diverted from and returned to the Animas River were measured by the City of Aztec Water Department personnel under my direction or advice, and the same have been examined by me and to the best of my knowledge are true and correct.

Gary Strickler

***The meter reading is not accurate because the pipe was not covered this month.

Summary information of this year's annual diversions

Total Diversion this month	122.28	acre-feet
Total Return Flow this month	58.90	acre-feet
% Return Flow this month	48%	
Total Diversion to date	2,114.20	acre-feet
Total Return Flow to date	703.33	acre-feet
% Return Flow to date	33%	
Total sold Flora Vista this month	0.00	acre-feet
Total sold Flora Vista to date	23.35	acre-feet
Total sold Southside this month	8.00	acre-feet
Total sold Southside to date	100.20	acre-feet

Appendix B-2 Monthly Deliveries from the City of Aztec's Water Treatment Plant for the year 2000

Appendix B-3 Monthly Diversions to the City of Farmington's Water Treatment Plant for the year 2000

	Animas Pump St #1		Animas Pump St #2		Farmers Ditch		Total Diversion [1]		Effluent		Total Influent		Total Private	
Month	Acre-ft	Gallons	Acre-ft	Gallons	Acre-ft	Gallons	Acre-ft	Gallons	Acre-ft	Gallons	Acre-ft	Gallons	Acre-ft	Gallons
January	-	-	-	-	-	-	-	-	400.95	130,650,000	708.23	230,780,000	16.49	5,372,400
February	-	-	-	-	350.82	114,317,000	350.82	114,317,000	393.52	128,230,000	669.75	218,240,000	1.42	463,200
March	-	-	290.53	94,669,000	896.86	292,245,000	1,187.39	386,914,000	443.94	144,660,000	750.77	244,640,000	27.53	8,970,500
April	-	-	771.51	251,400,000	945.43	308,070,000	1,716.94	559,470,000	471.16	153,530,000	984.43	320,780,000	65.86	21,460,600
May	-	-	720.99	234,935,000	913.83	297,774,000	1,634.82	532,709,000	488.75	159,260,000	1,366.55	445,295,000	59.71	19,457,600
June	-	-	775.64	252,744,000	729.11	237,583,000	1,504.75	490,327,000	498.88	162,560,000	1,589.92	518,080,000	112.17	36,550,200
July	-	-	787.44	256,588,000	625.09	203,687,000	1,412.52	460,275,000	520.94	169,750,000	1,637.24	533,500,000	113.75	37,066,100
August	-	-	866.98	282,509,000	724.81	236,181,000	1,591.79	518,690,000	529.75	172,620,000	1,556.78	507,280,000	96.38	31,405,300
September	42.96	14,000,000	770.27	250,996,000	1,525.86	497,207,000	2,339.10	762,203,000	497.19	162,010,000	1,230.62	401,000,000	67.00	21,833,500
October	16.20	5,280,000	468.20	152,563,000	1,670.99	544,496,000	2,155.39	702,339,000	488.69	159,240,000	928.39	302,520,000	29.75	9,693,300
November	-	-	-	-	773.46	252,033,000	773.46	252,033,000	432.86	141,050,000	692.34	225,600,000	10.83	3,529,400
December	-	-	606.07	197,488,000	-	-	606.07	197,488,000	423.96	138,150,000	666.56	217,200,000	8.58	2,794,300
Total	59.16	19,280,000	6,057.63	1,973,892,000	9,156.26	2,983,593,000	15,273.05	4,976,765,000	5,590.59	1,821,710,000	12,781.58	4,164,915,000	609.47	198,596,400

Appendix C – Middle San Juan Watershed

Appendix C-1 Monthly Diversions from the Lower Valley Water Users Cooperative Association for the year 2000

LOWER VALLEY WATER USERS'
COOPERATIVE ASSOCIATION
P.O. BOX 193
KIRTLAND, NEW MEXICO 87417
(505) 598-5585

WATER DIVERSION FOR 2000

MONTH	ACRE FT
JANUARY	27.74
FEBRUARY	63.72
MARCH	72.54
APRIL	82.71
MAY	110.29
JUNE	138.09
JULY	129.23
AUGUST	145.31
SEPTEMBER	92.83
OCTOBER	96.09
NOVEMBER	63.99
DECEMBER	61.37
TOTAL	1083.91

Appendix D – Upper San Juan Watershed

Appendix D-1 Monthly Diversions and Return Flows for the City of Bloomfield for the year 2000

FROM: SJH

File No. 2600

City of Bloomfield
Return Flow and Water Usage
In Monthly Meter Readings

January 2000

	Beg. Reading	End Reading	Monthly Reading	Ac. ft.	Gal. YTD	Ac.ft. YTD
Metered Influent	204,542,000	230,697,000	26,155,000	80	26,155,000	80
Less Total Backwash			1,329,000	4	1,329,000	4
Total Plant Effluent			24,826,000	76	24,826,000	76
Metered Water In City Limits			12,691,000	40	12,691,000	40
Metered Water Outside City Limits						
El Paso(Rio Vista)	573,000	581,000	8,000	0	8,000	0
Transwestern	339,000	341,000	2,000	0	2,000	0
Giant Refinery	39,653,000	39,728,000	75,000	0	75,000	0
El Paso(Blanco Plant)	5,098,000	5,273,000	175,000	1	175,000	1
Williams Oilfield(Milagro)	38,868,000	40,479,000	1,611,000	5	1,611,000	5
Murphi's Lube	1,776,000	1,793,000	17,000	0	17,000	0
Outside Residential			5,712,000	18	5,712,000	18
Outside Commercial			0	0	0	0
Commercial Trucking Firms	37,880,400	39,378,830	1,498,430	5	1,498,430	5
Total Water Sold			21,989,430	67	21,989,430	67
Water in Storage			0			
Sub Total			21,989,430	67	21,989,430	67
Less Water Losses			2,836,570	9	2,836,570	9
Total Water			24,826,000	76	24,826,000	76
Wastewater Flow Readings						
Metered Effluent	1,213,062,700	1,233,646,200	20,583,500	63	20,583,500	63
Less El Paso Discharge	74,406,900	75,458,700	1,051,800	3	1,051,800	3
Less Conoco Discharge	25,815,100	27,197,100	1,382,000	4	1,382,000	4
Total Wastewater			16,129,700	56	16,129,700	53

File No. 2800

City of Bloomfield
Return Flow and Water Usage
In Monthly Meter Readings

February 2000

	Beg. Reading	End Reading	Monthly Reading	Ac. ft.	Gal. YTD	Ac.ft. YTD
Metered Influent	230,697,000	254,105,000	23,408,000	72	49,563,000	152
Less Total Backwash			1,374,000	4	2,703,000	8
Total Plant Effluent			22,034,000	68	46,860,000	144
Metered Water In City Limits			12,048,000	37	24,939,000	77
Metered Water Outside City Limits						
El Paso(Rio Vista)	581,000	589,000	8,000	0	16,000	0
Transwestern	341,000	345,000	4,000	0	8,000	0
Giant Refinery	39,728,000	39,800,000	72,000	0	147,000	0
El Paso(Blanco Plant)	5,273,000	5,315,000	42,000	0	217,000	1
Williams Oilfield(Milagro)	40,479,000	41,927,000	1,448,000	4	3,059,000	9
Murph's Lube	1,793,000	1,801,000	8,000	0	25,000	0
Outside Residential			5,035,000	15	10,747,000	33
Outside Commercial			0	0	0	0
Commercial Trucking Firms	37,880,400	41,002,720	3,122,320	10	4,620,750	14
Total Water Sold			21,787,320	67	43,776,750	134
Water in Storage			0			
Sub Total			21,787,320	67	43,776,750	134
Less Water Losses			246,680	1	3,083,250	9
Total Water			22,034,000	68	46,860,000	144
Wastewater Flow Readings						
Metered Effluent	1,233,646,200	1,249,611,700	15,965,500	49	36,529,000	112
Less El Paso Discharge	75,458,700	76,346,100	887,400	3	1,939,200	6
Less Conoco Discharge	27,197,100	28,431,100	1,234,000	4	2,616,000	8
Total Wastewater			13,844,100	42	31,973,800	98

File No. 2600

City of Bloomfield
Return Flow and Water Usage
In Monthly Meter Readings

March 2000

	Beg. Reading	End Reading	Monthly Reading	Ac. ft.	Gal. YTD	Ac.ft. YTD
Metered Influent	254,105,000	279,125,000	25,020,000	77	74,583,000	229
Less Total Backwash			1,602,000	5	4,305,000	13
Total Plant Effluent			23,418,000	72	70,278,000	216
Metered Water In City Limits			13,999,000	43	38,936,000	120
Metered Water Outside City Limits						
El Paso(Rio Vista)	589,000	597,000	8,000	0	24,000	0
Transwestern	345,000	358,000	13,000	0	19,000	0
Giant Refinary	39,800,000	39,870,000	70,000	0	217,000	1
El Paso(Blanco Plant)	5,315,000	5,352,000	37,000	0	254,000	1
Williams Oilfield(Milagro)	41,927,000	43,183,000	1,256,000	4	4,315,000	13
Murph's Lube	1,801,000	1,835,000	34,000	0	59,000	0
Outside Residential			5,029,000	15	15,776,000	48
Outside Commercial			0	0	0	0
Commercial Trucking Firms	41,002,720	42,463,090	1,460,370	4	6,081,120	19
Total Water Sold			21,906,370	67	65,683,120	202
Water in Storage			0			
Sub Total			21,906,370	67	65,683,120	202
Less Water Losses			1,511,630	5	4,594,880	14
Total Water			23,418,000	72	70,278,000	216
Wastewater Flow Readings						
Metered Effluent	1,249,611,700	1,269,124,300	19,512,600	60	58,041,600	172
Less El Paso Discharge	76,346,100	77,304,000	957,900	3	2,897,100	9
Less Conoco Discharge	28,431,100	29,671,700	1,240,600	4	3,856,600	12
Total Wastewater			17,314,100	53	49,287,900	151

File No. 2800

City of Bloomfield
Return Flow and Water Usage
In Monthly Meter Readings

April 2000

	Beg. Reading	End Reading	Monthly Reading	Ac. ft.	Gal. YTD	Ac.ft. YTD
Metered Influent	279,125,000	310,102,000	30,977,000	95	105,560,000	324
Less Total Backwash			1,416,000	4	5,721,000	18
Total Plant Effluent			29,561,000	91	99,839,000	306
Metered Water In City Limits			18,346,000	56	57,284,000	176
Metered Water Outside City Limits						
El Paso(Rio Vista)	597,000	604,000	7,000	0	31,000	0
Transwestern	358,000	364,000	6,000	0	25,000	0
Giant Refinary	39,670,000	39,803,000	33,000	0	250,000	1
El Paso(Blanco Plant)	5,352,000	5,403,000	51,000	0	305,000	1
Williams Oilfield(Milagro)	43,183,000	44,727,000	1,544,000	5	5,859,000	18
Murph's Lube	1,835,000	1,846,000	11,000	0	70,000	0
Outside Residential			6,403,000	20	22,179,000	68
Outside Commercial			0	0	0	0
Commercial Trucking Firms	42,463,090	44,450,830	1,987,740	6	6,068,880	25
Total Water Sold			28,388,740	87	94,071,880	289
Water In Storage			0			
Sub Total			28,388,740	87	94,071,880	289
Less Water Losses			1,172,260	4	5,767,140	18
Total Water			29,561,000	91	99,839,000	306
Wastewater Flow Readings						
Metered Effluent	1,287,377,500	1,308,041,500	20,664,000	63	76,705,600	235
Less El Paso Discharge	77,304,000	78,258,100	954,100	3	3,851,200	12
Less Conoco Discharge	29,671,700	30,664,400	992,700	3	4,849,300	15
Total Wastewater			18,717,200	57	68,005,100	209

File No. 2600

City of Bloomfield
Return Flow and Water Usage
In Monthly Meter Readings

May 2000

	Beg. Reading	End Reading	Monthly Reading	Ac. ft.	Gal. YTD	Ac.ft. YTD
Metered Influent	310,102,000	354,271,000	44,169,000	136	149,729,000	460
Less Total Backwash			1,455,000	4	7,176,000	22
Total Plant Effluent			42,714,000	131	142,553,000	438
Metered Water In City Limits			25,412,000	78	82,696,000	254
Metered Water Outside City Limits						
El Paso(Rio Vista)	604,000	609,000	5,000	0	36,000	0
Transwestern	364,000	368,000	4,000	0	28,000	0
Giant Refinery	39,903,000	39,951,000	48,000	0	298,000	1
El Paso(Blanco Plant)	5,403,000	5,457,000	54,000	0	359,000	1
Williams Oilfield(Milagro)	44,727,000	46,480,000	1,753,000	5	7,812,000	23
Murph's Lube	1,846,000	1,853,000	7,000	0	77,000	0
Outside Residential			9,227,000	28	31,406,000	96
Outside Commercial			0	0	0	0
Commercial Trucking Firms	44,450,830	47,563,210	3,112,380	10	11,181,240	34
Total Water Sold			39,622,380	122	133,694,240	410
Water in Storage			0			
Sub Total			39,622,380	122	133,694,240	410
Less Water Losses			3,091,620	9	8,858,760	27
Total Water			42,714,000	131	142,553,000	438
Wastewater Flow Readings						
Metered Effluent	1,308,041,500	1,326,958,500	18,917,000	58	95,622,600	293
Less El Paso Discharge	343,600	1,664,300	1,320,700	4	5,171,900	16
Less Conoco Discharge	30,664,400	31,955,300	1,290,900	4	6,140,200	19
Total Wastewater			16,305,400	50	84,310,500	259

File No. 2800

City of Bloomfield
Return Flow and Water Usage
In Monthly Meter Readings

June 2000

	Beg. Reading	End Reading	Monthly Reading	Ac. ft.	Gal. YTD	Ac.ft. YTD
Metered Influent	354,271,000	402,255,000	47,984,000	147	197,713,000	607
Less Total Backwash			1,311,000	4	8,487,000	26
Total Plant Effluent			46,673,000	143	189,226,000	581
Metered Water In City Limits			27,569,000	85	110,285,000	338
Metered Water Outside City Limits						
El Paso(Rio Vista)	609,000	615,000	6,000	0	42,000	0
Transwestern	368,000	371,000	3,000	0	32,000	0
Giant Refinery	39,951,000	40,038,000	87,000	0	365,000	1
El Paso(Blanco Plant)	5,457,000	5,510,000	53,000	0	412,000	1
Williams Oilfield(Milagro)	46,480,000	46,215,000	1,735,000	5	9,347,000	29
Murph's Lube	1,853,000	1,861,000	8,000	0	65,000	0
Outside Residential			9,735,000	30	41,141,000	126
Outside Commercial			0	0	0	0
Commercial Trucking Firms	47,563,210	49,368,730	1,805,520	6	12,986,760	40
Total Water Sold			41,021,520	126	174,715,760	536
Water In Storage			0			
Sub Total			41,021,520	126	174,715,760	536
Less Water Losses			5,651,480	17	14,510,240	45
Total Water			46,673,000	143	189,226,000	581
Wastewater Flow Readings						
Metered Effluent	1,326,958,500	1,348,671,300	21,712,800	67	117,335,400	360
Less El Paso Discharge	1,664,300	2,496,800	832,500	3	6,004,400	18
Less Conoco Discharge	31,955,300	31,955,300	0	0	6,140,200	19
Total Wastewater			20,880,300	64	105,190,800	323

File No. 2800

City of Bloomfield
Return Flow and Water Usage
In Monthly Meter Readings

July 2000

	Beg. Reading	End Reading	Monthly Reading	Ac. ft.	Gal. YTD	Ac.ft. YTD
Metered Influent	520,497,000	568,864,000	48,367,000	148	246,080,000	755
Less Total Backwash			969,000	3	9,456,000	29
Total Plant Effluent			47,398,000	145	236,624,000	726
Metered Water in City Limits			24,566,000	75	134,851,000	414
Metered Water Outside City Limits						
El Paso(Rio Vista)	615,000	619,000	4,000	0	46,000	0
Transwestern	371,000	374,000	3,000	0	35,000	0
Giant Refinary	40,038,000	40,143,000	105,000	0	490,000	2
El Paso(Blanco Plant)	5,510,000	5,590,000	80,000	0	492,000	2
Williams Oilfield(Milagro)	48,215,000	49,939,000	1,724,000	5	11,071,000	34
Murph's Lube	1,881,000	1,889,000	8,000	0	93,000	0
Outside Residential			9,711,000	30	50,852,000	156
Outside Commercial			0	0	0	0
Commercial Trucking Firms	49,368,730	50,324,278	955,548	3	13,942,308	43
Total Water Sold			37,156,548	114	211,872,308	650
Water in Storage			0			
Sub Total			37,156,548	114	211,872,308	650
Less Water Losses			10,241,452	31	24,751,692	76
Total Water			47,398,000	145	236,624,000	726
Wastewater Flow Readings						
Metered Effluent	1,348,871,300	1,370,507,500	21,636,200	67	139,171,600	427
Less El Paso Discharge	2,496,800	4,138,128	1,641,328	5	7,645,728	23
Less Conoco Discharge	31,955,300	31,955,300	0	0	6,140,200	19
Total Wastewater			20,194,872	62	125,385,672	385

File No. 2800

City of Bloomfield
Return Flow and Water Usage
In Monthly Meter Readings

August 2000

	Beg. Reading	End Reading	Monthly Reading	Ac. ft.	Gal. YTD	Ac.ft. YTD
Metered Influent	568,864,000	616,920,000	48,056,000	147	294,136,000	903
Less Total Backwash			987,000	3	10,443,000	32
Total Plant Effluent			47,069,000	144	283,693,000	871
Metered Water In City Limits			24,684,000	76	159,735,000	490
Metered Water Outside City Limits						
El Paso(Rio Vista)	619,000	625,000	6,000	0	52,000	0
Transwestern	374,000	376,000	2,000	0	37,000	0
Giant Refinary	40,143,000	40,296,000	153,000	0	843,000	2
El Paso(Blanco Plant)	5,590,000	5,691,000	101,000	0	593,000	2
Williams Oilfield(Milagro)	49,939,000	51,824,000	1,885,000	6	12,958,000	40
Murph's Lube	1,869,000	1,878,000	9,000	0	102,000	0
Outside Residential			8,424,000	26	59,276,000	182
Outside Commercial			0	0	0	0
Commercial Trucking Firms	50,324,278	52,939,638	2,615,360	8	18,557,668	51
Total Water Sold			38,079,360	117	249,951,668	767
Water In Storage			0			
Sub Total			38,079,360	117	249,951,668	767
Less Water Losses			8,989,640	28	33,741,332	104
Total Water			47,069,000	144	283,693,000	871
Wastewater Flow Readings						
Metered Effluent	1,370,507,500	1,391,649,000	21,141,500	65	160,313,100	492
Less El Paso Discharge	0	1,853,335	1,853,335	6	9,499,063	29
Less Conoco Discharge	31,955,300	31,955,300	0	0	6,140,200	19
Total Wastewater			19,288,165	59	144,673,837	444

File No. 2800

City of Bloomfield
Return Flow and Water Usage
In Monthly Meter Readings

September 2000

	Beg. Reading	End Reading	Monthly Reading	Ac. ft.	Gal. YTD	Ac.ft. YTD
Metered Influent	616,920,000	659,788,000	42,868,000	132	337,004,000	1,034
Less Total Backwash			912,000	3	11,355,000	35
Total Plant Effluent			41,956,000	129	325,649,000	999
Metered Water In City Limits			18,441,000	57	176,176,000	547
Metered Water Outside City Limits						
El Paso(Rio Vista)	625,000	631,000	6,000	0	58,000	0
Transwestern	376,000	379,000	3,000	0	40,000	0
Giant Refinary	40,296,000	40,441,000	145,000	0	788,000	2
El Paso(Blanco Plant)	5,691,000	5,795,000	104,000	0	697,000	2
Williams Oilfield(Milagro)	51,824,000	53,119,000	1,295,000	4	14,251,000	44
Murph's Lube	1,878,000	1,885,000	7,000	0	109,000	0
Outside Residential			6,185,000	19	65,461,000	201
Outside Commercial			0	0	0	0
Commercial Trucking Firms	0	1,502,130	1,502,130	5	18,059,798	55
Total Water Sold			27,688,130	85	277,639,798	852
Water in Storage			0			
Sub Total			27,688,130	85	277,639,798	852
Less Water Losses			14,267,870	44	48,009,202	147
Total Water			41,956,000	129	325,649,000	999
Wastewater Flow Readings						
Metered Effluent	1,391,649,000	1,411,768,300	20,119,300	62	180,432,400	554
Less El Paso Discharge	677,000	2,605,000	1,928,000	6	11,427,063	35
Less Conoco Discharge	31,955,300	31,955,300	0	0	6,140,200	19
Total Wastewater			18,191,300	56	162,865,137	500

File No. 2800

City of Bloomfield
Return Flow and Water Usage
In Monthly Meter Readings

October 2000

	Beg. Reading	End Reading	Monthly Reading	Ac. ft.	Gal. YTD	Ac.ft. YTD
Metered Influent	659,788,000	693,874,000	34,086,000	105	371,090,000	1,139
Less Total Backwash			882,000	3	12,237,000	38
Total Plant Effluent			33,204,000	102	358,853,000	1,101
Metered Water In City Limits			15,485,000	48	193,661,000	594
Metered Water Outside City Limits						
El Paso(Rio Vista)	631,000	638,000	7,000	0	85,000	0
Transwestern	379,000	382,000	3,000	0	43,000	0
Giant Refinery	40,441,000	40,581,000	140,000	0	926,000	3
El Paso(Blanco Plant)	5,795,000	5,913,000	118,000	0	815,000	3
Williams Oilfield(Milagro)	53,119,000	54,305,000	1,186,000	4	15,437,000	47
Murph's Lube	1,885,000	1,903,000	18,000	0	127,000	0
Outside Residential			5,503,000	17	70,984,000	218
Outside Commercial			0	0	0	0
Commercial Trucking Firms	0	1,015,760	1,015,760	3	19,075,558	59
Total Water Sold			23,475,760	72	301,115,558	924
Water In Storage			0			
Sub Total			23,475,760	72	301,115,558	924
Less Water Losses			9,728,240	30	57,737,442	177
Total Water			33,204,000	102	358,853,000	1,101
Wastewater Flow Readings						
Metered Effluent	1,411,768,300	1,429,604,300	17,836,000	55	198,268,400	609
Less El Paso Discharge	2,605,000	3,996,000	1,391,000	4	12,818,063	39
Less Conoco Discharge	31,955,300	31,955,300	0	0	6,140,200	19

File No. 2600

City of Bloomfield
Return Flow and Water Usage
In Monthly Meter Readings

November 2000

	Beg. Reading	End Reading	Monthly Reading	Ac. ft.	Gal. YTD	Ac.ft. YTD
Metered Influent	693,874,000	719,457,000	25,583,000	79	396,673,000	1,217
Less Total Backwash			834,000	3	13,071,000	40
Total Plant Effluent			24,749,000	76	383,602,000	1,177
Metered Water In City Limits			14,539,000	45	208,200,000	639
Metered Water Outside City Limits						
El Paso(Rio Vista)	638,000	648,000	10,000	0	75,000	0
Transwestern	382,000	385,000	3,000	0	46,000	0
Giant Refinary	40,581,000	40,721,000	140,000	0	1,068,000	3
El Paso(Blanco Plant)	5,913,000	5,976,000	63,000	0	876,000	3
Williams Oilfield(Milagro)	54,305,000	55,916,000	1,611,000	5	17,048,000	52
Murph's Lube	1,903,000	1,924,000	21,000	0	148,000	0
Outside Residential			5,554,000	17	76,518,000	235
Outside Commercial			0	0	0	0
Commercial Trucking Firms	0	1,562,640	1,562,640	5	20,638,198	63
Total Water Sold			23,503,640	72	324,619,198	996
Water In Storage			0			
Sub Total			23,503,640	72	324,619,198	996
Less Water Losses			1,245,360	4	58,982,802	181
Total Water			24,749,000	76	383,602,000	1,177
Wastewater Flow Readings						
Metered Effluent	1,429,604,300	1,448,119,600	18,515,300	57	216,763,700	665
Less El Paso Discharge	3,996,000	5,251,000	1,255,000	4	14,073,063	43
Less Conoco Discharge	31,955,300	31,955,300	0	0	6,140,200	19

File No. 2800

City of Bloomfield
Return Flow and Water Usage
In Monthly Meter Readings

December 2000

	Beg. Reading	End Reading	Monthly Reading	Ac. ft.	Gal. YTD	Ac.ft. YTD
Metered Influent	719,457,000	745,337,000	25,880,000	79	422,553,000	1,297
Lese Total Backwash			903,000	3	13,974,000	43
Total Plant Effluent			24,977,000	77	408,579,000	1,254
Metered Water In City Limits			14,047,000	43	222,247,000	682
Metered Water Outside City Limits						
El Paso(Rio Vista)	648,000	656,000	8,000	0	83,000	0
Transwestern	385,000	387,000	2,000	0	48,000	0
Giant Refinery	40,721,000	40,774,000	53,000	0	1,121,000	3
El Paso(Blanco Plant)	5,976,000	6,036,000	62,000	0	940,000	3
Williams Oilfield(Milagro)	55,916,000	57,592,000	1,676,000	5	18,724,000	57
Murph's Lube	1,924,000	1,936,000	12,000	0	160,000	0
Outside Residential			5,813,000	18	82,331,000	253
Outside Commercial			0	0	0	0
Commercial Trucking Firms	0	1,366,770	1,388,770	4	22,024,968	68
Total Water Sold			23,059,770	71	347,678,968	1,067
Water in Storage			0			
Sub Total			23,059,770	71	347,678,968	1,067
Less Water Losses			1,917,230	6	60,900,032	187
Total Water			24,977,000	77	408,579,000	1,254
Wastewater Flow Readings						
Metered Effluent	1,448,119,600	1,467,543,000	19,423,400	60	236,207,100	725
Less El Paso Discharge	5,251,000	6,519,000	1,268,000	4	15,341,083	47
Less Conoco Discharge	31,955,300	31,955,300	0	0	6,140,200	19

Appendix E New Mexico Office of the State Engineer Withdrawals and Depletions Summary – Year 2000

Appendix E-1 Industrial

Industrial (self-supplied). Withdrawals and depletions in acre-feet, in New Mexico counties, 2000. Data compiled by J. T. Romero, New Mexico Office of the State Engineer.

FC	SBC	CN	RVB	DRB	GWB	HU	USER	TWN	RNG	SEC	QSC	WTC	MSW	MGW	WSW	WGW	DFSW	DFGW	DSW	DGW
RG-46829		43	RG		RG	13020203	Thriftway--pol recovery	13N	04E	2	0				0.00	0.00	0.00	0.10	0.00	0.00
													River Basin Subtotals		0.00	3611.81			0.00	738.43
													County Totals		0.00	3611.81			0.00	738.43
SJ-1111	GP	45	UC		SJ	0	Conoco Inc.			0	0			Y	0.00	5.80	0.00	1.00	0.00	5.80
SJ-2146	GP	45	UC		SJ	0	Conoco Inc. (90dat)			0	0			N	0.00	3.80	0.00	1.00	0.00	3.80
01675	GP	45	UC		SJ	14080101	Conoco Inc.--San Juan GP	29N	11W	14	0		Y		300.86	0.00	1.00	0.00	300.86	0.00
SJ-1255		45	UC		SJ	0	Dugan Production Co.			0	0			Y	0.00	0.30	0.00	1.00	0.00	0.30
	PIP	45	UC		SJ	14080101	El Paso NG--Angel Pk			0	0			Y	0.00	0.00	0.00	1.00	0.00	0.00
	PIP	45	UC		SJ	0	El Paso NG--Ballard Plant			0	0			Y	0.00	0.00	0.00	1.00	0.00	0.00
	GP	45	UC		SJ	14080101	El Paso NG--Blanco Plant	29N	11W	14	0		Y		507.44	0.00	1.00	0.00	507.44	0.00
	GP	45	UC		SJ	14080101	El Paso NG--Chaco GP	26N	12W	16	0		Y		545.20	0.00	1.00	0.00	545.20	0.00
	GP	45	UC		SJ	14080101	El Paso NG--San Juan GP(95Dat)			0	0		N		18.96	0.00	1.00	0.00	18.96	0.00
	PIP	45	UC		SJ	0	El Paso NG--White Rock			0	0			Y	0.00	0.00	0.00	1.00	0.00	0.00
3385	REF	45	UC		SJ	14080101	Giant Refining--San Juan Bloomfield			0	0		Y		412.00	0.00	1.00	0.00	412.00	0.00
SJ-1624		45	UC		SJ	0	HRI Inc.			0	0			Y	0.00	0.00	0.00	0.50	0.00	0.00
03480	GP	45	UC		SJ	14080104	Meridian Oil			0	0		Y		36.00	0.00	1.00	1.00	36.00	0.00
RG-26911		45	UC		SJ		PNM Gas Services--Star Lake Plant							Y	0.00	0.24	0.00	1.00	0.00	0.24
	PIP	45	UC		SJ	14080106	TX-NM Pipeline--Bisti			0	0				0.00	0.00	0.00	1.00	0.00	0.00
03024	GP	45	UC		SJ	14080101	Williams Fld Srv (Sunterra)--Kutz	29N	12W	0	0		Y		51.00	0.00	1.00	0.00	51.00	0.00

Key: FC=file code; SBC=subcategory; CN=county number; RVB=river basin; DRB=drainage basin; GWB=groundwater basin; HU=hydrologic unit; TWN=township; RNG=range; SEC=section; QSC=quarter section; WTC=water transfer code; MSW=surface water withdrawals are measured (y/n); MGW=groundwater withdrawals are measured (y/n); WSW=withdrawal, surface water; WGW=withdrawal, ground water; DFSW=depletion factor, surface water; DFGW=depletion factor, ground water; DSW=depletion, surface water; DGW=depletion, ground water.

Industrial (self-supplied). Withdrawals and depletions in acre-feet, in New Mexico counties, 2000. Data compiled by J. T. Romero, New Mexico Office of the State Engineer.

FC	SBC	CN	RVB	DRB	GWB	HU	USER	TWN	RNG	SEC	QSC	WTC	MSW	MGW	WSW	WGW	DFSW	DFGW	DSW	DGW
														River Basin Subtotals	1871.46	10.14			1871.46	10.14
														County Totals	1871.46	10.14			1871.46	10.14
RG-38860		49	RG		RG	13020201	Ballas, V.-S.F. Brewing Co. (95dat)	13N	09E	3				Y	0.00	0.59	0.00	1.00	0.00	0.59
RG-7767-C		49	RG		RG	13020201	Colony Materials--concrete batching	16N	08E	10	0			Y	0.00	20.46	0.00	1.00	0.00	20.46
RG-26696		49	RG		RG	13020201	Santa Fe Bronze			0	0			Y	0.00	0.16	0.00	1.00	0.00	0.16
RG-33539		49	RG		RG	13020201	Steve Solton Industrial			0	0			N	0.00	0.50	0.00	1.00	0.00	0.50
RG-50233		49	RG		RG	13020201	Weston Studio Foundry (90dat)			0	0			N	0.00	0.31	0.00	1.00	0.00	0.31
														River Basin Subtotals	0.00	22.02			0.00	22.02
														County Totals	0.00	22.02			0.00	22.02
RG-49372		51	RG		RG		Gas Company of NM							Y	0.00	0.10	0.00	1.00	0.00	0.10
														River Basin Subtotals	0.00	0.10			0.00	0.10
														County Totals	0.00	0.10			0.00	0.10
RG-25399		53	RG		RG		Dicaper Corp--fine waste disposal							Y	0.00	1.86	0.00	1.00	0.00	1.86
														River Basin Subtotals	0.00	1.86			0.00	1.86
														County Totals	0.00	1.86			0.00	1.86
RG-22305		55	RG		RG	13020101	Medina, R.--concrete batching plant	25N	13E	0	0			Y	0.00	2.52	0.00	1.00	0.00	2.52
RG-38633		55	RG		RG	13020101	Qwest	26N	13E	7	0			Y	0.00	0.02	0.00	1.00	0.00	0.02
														River Basin Subtotals	0.00	2.54			0.00	2.54

Key: FC=file code; SBC=subcategory; CN=county number; RVB=river basin; DRB=drainage basin; GWB=groundwater basin; HU=hydrologic unit; TWN=township; RNG=range; SEC=section; QSC=quarter section; WTC=water transfer code; MSW=surface water withdrawals are measured (y/n); MGW=groundwater withdrawals are measured (y/n); WSW=withdrawal, surface water; WGW=withdrawal, ground water; DFSW=depletion factor, surface water; DFGW=depletion factor, ground water; DSW=depletion, surface water; DGW=depletion, ground water.

Appendix E-2 Power

Thursday, March 28, 2002

Power (self-supplied). Withdrawals and depletions in acre-feet, in New Mexico counties, 2000. Data compiled by J. T. Romero, New Mexico Office of the State Engineer.

FC	SBC	CN	RVB	DRB	GWB	HU	USER	TWN	RNG	SEC	QSC	WTC	MSW	MGW	WSW	WGW	DFSW	DFGW	DSW	DGW
B-18;43-49; et al.	PO	31	RG		BLU	13020207	Tri-State-Plains Elec--Escalante	11N	10W	8	0			Y	0.00	3703.31	0.00	1.00	0.00	3703.31
							River Basin Subtotals								0.00	3703.31			0.00	3703.31
							County Totals								0.00	3703.31			0.00	3703.31
P-2771-A-A		41	TG		POR	12050002	PNM--Blackwater Sta	01N	36E	21				Y	0.00	16.96	0.00	1.00	0.00	16.96
							River Basin Subtotals								0.00	16.96			0.00	16.96
							County Totals								0.00	16.96			0.00	16.96
02838		45	UC		SJ	14080105	BHP-Utah Minerals Intl	29N	15W	7	0		Y		28480.30	0.00	0.78	0.00	22214.63	0.00
		45	UC		SJ	14080105	PNM--Farmington hydro plant (95dat)			0	0		N		14.08	0.00	1.00	0.00	14.08	0.00
03258		45	UC		SJ	14080105	PNM--San Juan Gen Sta--Waterflow	29N	15W	3	0		Y		16200.00	0.00	1.00	0.00	16200.00	0.00
02838		45	UC		SJ	14080105	PNM--San Juan Gen Sta--Waterflow	29N	15W	3			Y		5755.50	0.00	1.00	0.00	5755.50	0.00
							River Basin Subtotals								50449.88	0.00			44184.21	0.00
							County Totals								50449.88	0.00			44184.21	0.00
							State Totals								50449.88	12708.05			44184.21	12410.43

Key: FC=file code; SBC=subcategory; CN=county number; RVB=river basin; DRB=drainage basin; GWB=groundwater basin; HU=hydrologic unit; TWN=township; RNG=range; SEC=section; QSC=quarter section; WTC=water transfer code; MSW=surface water withdrawals are measured (y/n); MGW=groundwater withdrawals are measured (y/n); WSW=withdrawal, surface water; WGW=withdrawal, ground water; DFSW=depletion factor, surface water; DFGW=depletion factor, ground water; DSW=depletion, surface water; DGW=depletion, ground water.