III. APPLIED WATER DEMAND AND SUPPLY

This chapter contains a discussion of all the water demands and supplies within the study area. Information was compiled for water demand in the urban, agricultural, environmental, and other categories. Groundwater and Lopez Reservoir, State Water Project, and recycled water provide the area's supply. Water demand/supply totals may not sum because of rounding.

Water demand in the urban, agricultural, environmental, and other categories was derived using the Department's Bulletin 160 methodologies. (See Bulletins 160-93 and 160-98 for details.)

Water supply data were obtained from the Counties of San Luis Obispo and Santa Barbara, U. S. Geological Survey (USGS), local agencies, and Department records. Groundwater extractions for the large water purveyors are measured by flowmeters and both quantity and quality data are reported to various regulatory agencies. Groundwater extractions for small public and private water purveyors are usually not measured or metered and, more importantly, both quantity and quality data are not reported to any regulatory agency.

Applied Water Demand

Table 2 depicts applied water demand in the study area for 1975 through 2020 for urban, agricultural, and other (includes environmental) categories. Applied water is that water delivered to the intake of a water system or farm headgate. Total applied water demand decreased by 2,400 acre-feet (AF), from 39,900 AF in 1975 to 37,500 AF in 1995, because of decreased agricultural demand. Year 2020 total applied water demand is projected to increase about 9,800 AF over 1995 levels, with the additional amount attributable to increased urban demand of about 8,000 AF and environmental demand of 2,800 AF. Agricultural demand constituted the largest demand in the study area, accounting for about 80 percent of the total in 1975 and declining to about 70 percent of the total in 1995. From 1995 to 2020, agricultural demand is projected to decrease by 1,000 AF and by 2020 will account for about 50 percent of the total applied demand. Average annual decreases of about 115 AF for applied water demand were realized in the 21-year period 1975 through 1995 and an average annual increase of about 400 AF of applied water demand is expected between 1995 and 2020.

Total applied water demand overlying the main Santa Maria Groundwater Basin increased about 12 percent between 1975 and 1995 and by 2020 demand was projected to be 36,200AF, an increase of about 30 percent over the 1995 total demand of 27,500 AF (Table 2).

TABLE 2
APPLIED WATER DEMAND IN STUDY AREA
Thousands of acre-feet*

Water Demand Within Study Area/ *Overlying the Main Santa Maria Groundwater Basin*	1975	1980	1985	1990	1995	2010	2020
Urban	6.6	8.1	12.0	13.2	11.3	16.3	19.2
Groundwater Basin	*6.4*	*7.9*	*11.5*	*12.6*	*10.9*	*15.8*	*18.5*
Agricultural	32.3	30.7	26.9	25.4	25.1	23.7	24.1
Groundwater Basin	*17.2*	*18.2*	*19.2*	*17.4*	*15.5*	*14.6*	*15.1*
Other**	1.0	1.0	1.1	1.1	1.1	4.0	4.0
*Groundwater Basin****	*1.0*	*1.0*	*1.1*	*1.1*	*1.1*	*2.6*	*2.6*
Study Area Total	39.9	39.8	40.0	39.7	37.5	44.0	47.3
Groundwater Basin Total	*24.6*	*27.1*	*31.8*	*31.1*	*27.5*	*32.9*	*36.2*

*All values rounded to the nearest 100 acre-feet.
**Values for 2010 and 2020 include 2,800 AF of applied environmental demand.
***Values for 2010 and 2020 include 1,400 AF of applied environmental demand.

TABLE 3
POPULATION IN STUDY AREA
State of California Department of Finance*

Hydrologic Area/Subarea *Division Within Main Santa Maria Groundwater Basin*	1975	1980	1985	1990	1995	2010	2020
Pismo/Oceano HSA	32,910	33,500	39,150	44,800	47,090	60,440	67,810
*Tri-Cities Mesa - Arroyo Grande Plain***	*31,260*	*31,840*	*37,190*	*41,570*	*44,730*	*57,420*	*64,420*
Nipomo Mesa HSA							
*Nipomo Mesa****	*5,530*	*6,490*	*7,580*	*9,660*	*10,400*	*17,900*	*22,960*
Guadalupe HA	2,460	2,600	3,150	3,700	4,030	5,590	6,760
Santa Maria Valley	*2,340*	*2,560*	*2,990*	*3,560*	*3,830*	*5,310*	*6,420*
Study Area Total	41,190	43,040	50,280	57,680	62,060	84,880	98,740
Groundwater Basin Total	*39,130*	*40,890*	*47,760*	*54,790*	*58,960*	*80,640*	*93,790*

Note: All values rounded to the nearest 10 persons.
*All values from DOF Special Projections for DWR, May 1996.
**Division includes lower Pismo Creek and Los Berros Creek portions of the groundwater basin.
***This portion of the main groundwater basin lies entirely within the HSA.

Trends in population and land use affect the applied water demands within the study area.

Population and Land Use

The population is concentrated in small communities. Small family homesteads are also distributed throughout the study area. Table 3 depicts population for 1975 through 2020 with values obtained from the State of California Department of Finance. Total population increased by almost 21,000 between 1975 and 1995 and is expected to increase by almost 37,000 over 1995 levels by 2020, with a total population in 2020 of more than 98,000. Population overlying the main groundwater basin increased by almost 20,000 between 1975 and 1995 and is expected to increase by almost 35,000 by 2020, with a 2020 population of almost 94,000.

Land use in the study area was surveyed by the Department in 1977, 1985, and 1995, and the resultant maps were digitized using AutoCAD. A geographic information system (GIS) was used to determine the spatial distribution and acreages of the various land uses. Analysis of the acreages contributed to the present urban, agricultural, other, and environmental water demand estimates and facilitated the forecasting of future demand.

The detailed land use acreages obtained from the GIS were divided into their respective hydrologic areas and subareas. These acreages were then divided as being either within the main groundwater basin, within the groundwater subbasins, or outside the main groundwater basin and subbasins. Finally, the detailed land use acreages were aggregated into agricultural, native, and urban classifications as depicted in Table 4.

Urban Applied Demand

Urban applied water demand[1] for each hydrologic area and hydrologic subarea in the study area for 1975 through 2020 is shown in Table 5. Population figures for each hydrologic area and subarea listed in Table 3 were multiplied by each hydrologic area and subarea per capita unit use values listed in Table D2 of Appendix D to obtain the urban applied water use values.

Population increased by about 21,000 persons between 1975 and 1995 resulting in an increase of 4,700 AF in total urban applied water demand, from the 6,600 AF to 11,300 AF, during the same period. Year 2020 urban applied water demand is expected to increase about 7,900 AF over 1995 levels, with population increasing by about 37,000 persons, or 59 percent, in the same period. Urban applied water demand overlying the main groundwater basin increased by 4,500 AF between 1975 and 1995 and is expected to increase by 7,600 AF over 1995 levels by 2020.

Agricultural Applied Demand

Agricultural applied water demand by hydrologic area and hydrologic subarea for 1975 through

[1]Urban applied water demand includes demand for golf course irrigation.

TABLE 4
LAND USE ACREAGE WITHIN STUDY AREA
In Acres*

Hydrologic Area/Subarea	Land Use Category	Within Main Groundwater Basin			Within Subbasins			Within Watershed Outside Main Groundwater Basin and Subbasins			Total Within Hydrologic Area/Subbarea		
		1975	1985	1995	1975	1985	1995	1975	1985	1995	1975	1985	1995
Pismo		Pismo Creek			Pismo Creek Valley Subbasin			Remaining Area			Subtotal		
	Agriculture **	0	20	0	10	30	0	10	0	0	20	50	0
	Urban	220	240	270	80	140	180	270	510	570	570	890	1,020
	Native	100	60	50	1,130	1,050	1,040	7,100	6,870	6,810	8,330	7,980	7,900
	Total	320	320	320	1,220	1,220	1,220	7,380	7,380	7,380	8,920	8,920	8,920
Oceano		Tri-Cities Mesa - Arroyo Grande Plain***			Arroyo Grande Valley			Remaining Area			Subtotal		
	Agriculture **	3,060	2,760	2,590	1,620	1,900	1,920	1,580	1,810	1,200	6,260	6,470	5,710
	Urban	3,220	3,730	4,070	270	370	380	1,790	2,220	3,160	5,280	6,320	7,610
	Native	4,170	3,960	3,790	1,970	1,590	1,560	35,200	34,540	34,210	41,340	40,090	39,560
	Total	10,450	10,450	10,450	3,860	3,860	3,860	38,570	38,570	38,570	52,880	52,880	52,880
Nipomo Mesa		Nipomo Mesa									Subtotal		
	Agriculture **	1,420	1,430	1,220							1,420	1,430	1,220
	Urban	1,230	2,530	4,670							1,230	2,530	4,670
	Native	14,930	13,620	11,690							14,930	13,620	11,690
	Total	17,580	17,580	17,580							17,580	17,580	17,580
Guadalupe		Santa Maria Valley			Nipomo Valley			Remaining Area			Subtotal		
	Agriculture **	6,630	9,540	9,330	2,890	3,460	3,330	3,280	3,480	3,440	12,800	16,480	16,100
	Urban	500	1,150	1,560	280	310	490	0	50	120	780	1,510	2,170
	Native	14,430	10,870	10,670	3,060	2,460	2,410	7,490	7,240	7,210	24,980	20,570	20,290
	Total	21,560	21,560	21,560	6,230	6,230	6,230	10,770	10,770	10,770	38,560	38,560	38,560
								Study Area Totals					
	Agriculture **	11,110	13,750	13,140	4,520	5,390	5,250	4,870	5,290	4,640	20,500	24,430	23,030
	Urban	5,170	7,650	10,570	630	820	1,050	2,060	2,780	3,850	7,860	11,250	15,470
	Native	33,630	28,510	26,200	6,160	5,100	5,010	49,790	48,650	48,230	89,580	82,260	79,440
	Total	49,910	49,910	49,910	11,310	11,310	11,310	56,720	56,720	56,720	117,940	117,940	117,940

*All values rounded to the nearest 10 acres
**Includes irrigated and nonirrigated lands
***Includes Los Berros Creek portion of the main groundwater basin.

TABLE 5
URBAN APPLIED WATER DEMAND *
Thousands of acre-feet

Hydrologic Area/Subarea *Division Within Main Santa Maria Groundwater Basin*	1975	1980	1985	1990	1995	2010	2020
Pismo/Oceano HSA	4.8	5.7	8.5	8.7	7.7	10.4	11.7
*Tri-Cities Mesa - Arroyo Grande Plain***	*4.6*	*5.5*	*8.1*	*8.1*	*7.3*	*9.9*	*11.1*
Nipomo Mesa HSA							
*Nipomo Mesa****	*1.5*	*2.1*	*3.0*	*3.9*	*3.1*	*5.2*	*6.6*
Guadalupe HA	0.3	0.3	0.5	0.6	0.5	0.7	0.9
Santa Maria Valley	*0.3*	*0.3*	*0.4*	*0.6*	*0.5*	*0.7*	*0.8*
Study Area Total	6.6	8.1	12.0	13.2	11.3	16.3	19.2
Groundwater Basin Total	*6.4*	*7.9*	*11.5*	*12.6*	*10.9*	*15.8*	*18.5*

Note: All values rounded to the nearest 100 acre-feet.
*Demand values derived by multiplying population by per capita water use.
**Division includes lower Pismo Creek and Los Berros Creek portions of the main groundwater basin.
***This portion of the main groundwater basin lies entirely within the HSA.

2020 is shown in Table 6. Unit applied water for each crop category is determined by dividing evapotranspiration of applied water by irrigation efficiency. Unit applied water is then multiplied by the crop acreage of each crop category. The results are summed to obtain applied water demand for each year. Agricultural applied water demand decreased by 7,200 AF from the 32,300 AF in 1975 to 25,100 AF in 1995. Year 2020 agricultural applied water demand is expected to decrease 1,000 AF over 1995 levels. The reduction in applied demand for the two periods is attributable to a reduction in crop acres and increased irrigation efficiency.

Agricultural applied water demand overlying the main groundwater basin decreased 1,700 AF between 1975 and 1995 and is expected to decrease by another 400 AF by 2020. The agricultural demand overlying the main groundwater basin is relatively constant compared with demand in the entire study area. This suggests that most of the changes in agricultural crop type and water use are occurring outside the main groundwater basin.

All agricultural applied water demands are met by groundwater extractions in the study area. In the Pismo/Oceano HSAs, the downstream releases to Arroyo Grande Creek from Lopez Reservoir are extracted also.

Environmental Applied Demand

The county is conducting a Habitat Conservation Plan to determine requirements for water to be released into Arroyo Grande Creek from Lopez Dam for steelhead trout within the creek. Until

TABLE 6
AGRICULTURAL APPLIED WATER DEMAND
Thousands of acre-feet

Hydrologic Area/Subarea *Division Within Main Santa Maria Groundwater Basin*	1975	1980	1985	1990	1995	2010	2020
Pismo/Oceano HSA*	10.5	10.6	9.0	9.4	9.6	9.0	8.8
*Tri-Cities Mesa - Arroyo Grande Plain***	*4.7*	*4.2*	*3.7*	*3.3*	*3.0*	*2.8*	*2.8*
Nipomo Mesa HSA							
*Nipomo Mesa****	*1.4*	*1.7*	*2.0*	*1.9*	*1.6*	*1.6*	*1.6*
Guadalupe HA	20.4	18.4	15.9	14.1	13.9	13.1	13.7
Santa Maria Valley	*11.1*	*12.3*	*13.5*	*12.2*	*10.9*	*10.1*	*10.7*
Study Area Total	32.3	30.7	26.9	25.4	25.1	23.7	24.1
Groundwater Basin Total	*17.2*	*18.2*	*19.2*	*17.4*	*15.5*	*14.5*	*15.1*

Note: All values rounded to the nearest 100 acre-feet.
*The irrigated cropped acres in Pismo HSA for 1975 was 11.4; 1985, 26.6; and 1995, 0.0. Demand associated with these acreages amounted to less than 100 AF; therefore, the demand was combined for the two HSAs.
**Division includes lower Pismo Creek and Los Berros Creek portions of the main groundwater basin.
***This portion of the main groundwater basin lies entirely within the HSA.

the study is completed, the county is conducting an interim supplemental release program of 2,800 acre-feet per year (AFY) from Lopez Dam for maintaining steelhead habitat. The supplemental releases were initiated in the fall of 1998 and are expected to continue until the Habitat Conservation Plan is completed and a permanent release program is negotiated with the State Water Resources Control Board and California Department of Fish and Game.

This environmental applied demand is included in Pismo/Oceano HSA's other applied water demand values for 2010 and 2020 in Table 7. The stretch of Arroyo Grande Creek overlying the main groundwater basin is about half of the length of the creek from Lopez Dam to its confluence with the Pacific Ocean. Therefore, the 2010 and 2020 environmental demands shown in Table 7 for Tri-Cities Mesa and Arroyo Grand Plain are half of the county's proposed release of 2,800 AFY.

Several Sensitive Resource Areas (SRA) are within the study area (San Luis Obispo County, Department of Planning and Building, 1992, 1995). The Nipomo Dunes SRA extends about 12 miles along the coast and is habitat for many endemic flora species, including the threatened beach spectaclepod, surf thistle, and la graciosa thistle. The Nipomo Dunes support such unique vegetative associations as the central foredune and central dune scrub communities. Ten freshwater lakes (Dune Lakes SRA) lie inland of the coastal dunes and support a coastal freshwater marsh, which in turn provides habitat for birds in the Pacific Flyway and for local waterfowl. The Oso Flaco Lake SRA serves as a local wetland complex providing habitat for

TABLE 7
OTHER APPLIED WATER DEMAND*
Thousands of acre-feet

Hydrologic Area/Subarea *Division Within Main Santa Maria Groundwater Basin*	1975	1980	1985	1990	1995	2010	2020
Pismo/Oceano HSA**	0.05	0.05	0.09	0.09	0.09	2.92	2.94
*Tri-Cities Mesa - Arroyo Grande Plain****	*0.05*	*0.05*	*0.09*	*0.09*	*0.09*	*1.52*	*1.54*
Nipomo Mesa HSA							
Nipomo Mesa+	*0.95*	*0.95*	*0.96*	*0.96*	*0.97*	*0.97*	*0.98*
Guadalupe HA	0.03	0.04	0.04	0.05	0.06	0.07	0.08
Santa Maria Valley	*0.03*	*0.04*	*0.04*	*0.05*	*0.06*	*0.07*	*0.08*
Study Area Total	1.03	1.04	1.09	1.10	1.12	3.96	4.00
Groundwater Basin Total	*1.03*	*1.04*	*1.09*	*1.10*	*1.12*	*2.56*	*2.60*

Note: All values rounded to the nearest 10 acre-feet.
*Values for 2010 and 2020 are estimated based on historical trends.
**Values for 2010 and 2020 include 2,800 AF of applied environmental demand.
***Values for 2010 and 2020 include 1,400 AF of applied environmental demand - half of the release is attributable to the area overlying the main groundwater basin. Division includes lower Pismo Creek and Los Berros Creek portions of the main groundwater basin.
+This portion of the main groundwater basin lies entirely within the HSA.

numerous birds including the endangered least tern and threatened western snowy plover. Black Lake Canyon SRA serves as habitat for birds in the Pacific Flyway and local waterfowl. Both the Oso Flaco Lake and Black Lake Canyon SRAs provide the marsh habitat required to support endangered Gamel's watercress and marsh sandwort plants.

The source of water for these SRAs is precipitation and runoff and is therefore not considered an environmental demand.

Although not identified as SRAs, Pismo Creek and Santa Maria River also provide important aquatic habitats for threatened and endangered fauna. Both watercourses support the endangered tidewater goby for a short distance (one to three miles) upstream of the ocean. The Santa Maria River and its tributaries also support the threatened California red-legged frog. Habitat for the red-legged frog and the endangered Pismo clarkia plant is found in the Arroyo Grande Creek watershed. The source of water for this habitat is precipitation and runoff and is therefore not considered an environmental demand.

Other Applied Demand

The other applied water demand category consists of conveyance losses, cooling, miscellaneous, recreational,[2] and environmental water demands. Table 7 lists other applied water demands by hydrologic area or subarea for 1975 through 2020. Water demand for this category increased by 90 AF from the 1,030 AF in 1975 to 1,120 AF in 1995, mostly attributable to increased use at recreational facilities. Year 2020 other water demand is expected to increase 2,900 AF over 1995 levels. Environmental demand estimated at 2,800 AF makes up the largest portion of the increase between 1995 and 2020 with increased use of the area's recreational facilities responsible for about 50 AF of the expected increase. Increased Lopez Reservoir deliveries to contractors resulting in increased conveyance losses, increased cooling requirements, and increased miscellaneous uses account for the remainder of the increase from 1995 through 2020.

The values for the other applied water demand category for the main groundwater basin differ only by the 1,400 AF reduction for steelhead releases. All other components remain the same.

Recreational water demand at Lopez Reservoir is not included in this study because it is considered part of the natural supply of the reservoir and so does not enter into any of the calculations for this study.

The impact of the large stands of eucalyptus trees on the water demand in Nipomo Mesa is problematical and beyond the scope of this study. Chipping Geological Services (1994, p. 69) reviewed the hydrologic impacts of eucalyptus on Nipomo Mesa and found that: "Data from India and Australia suggests that eucalyptus does not use any more water than other trees. There are water-saving advantages to removing eucalyptus trees in the riparian corridor, but very little to removing trees higher in the slopes around the canyon."

Water Supply

Groundwater is the major source of supply in the study area. Other available supplies are Lopez Reservoir water, imported State Water Project water, and recycled water.

Water supply for each hydrologic area and hydrologic subarea in the study area for 1975 through 2020 is shown in Table 8. Total water supply in the study area decreased by 2,500 AF, from 40,100 AF in 1975 to 37,600 AF in 1995, because of decreased groundwater extractions. Year 2020 water supply is projected to increase 9,700 AF over 1995 levels with the additional water supply coming from increased groundwater extractions, State Water Project deliveries, environmental releases from Lopez Reservoir, and recycled water. Supplies appear adequate to meet water demands through water year 2020.

The total water supply overlying the main groundwater basin increased by 2,800 AF from 1975 to 1995. Year 2020 water supply is projected to increase 8,700 AF over 1995 levels with the

[2]Recreational demand does not include demand for golf course irrigation water. That demand is included in the urban demand category.

TABLE 8
STUDY AREA WATER SUPPLIES
Thousands of acre-feet

Hydrologic Area/Subarea *Division Within Main Santa Maria Groundwater Basin*	Supply Source	1975	1980	1985	1990	1995	2010	2020
Pismo/Oceano HSA	Groundwater	10.1	10.3	9.1	8.6	10.0	10.1	11.0
	Surface*	5.3	6.1	8.5	9.6	7.4	12.2	12.4
*Tri-Cities Mesa - Arroyo Grande Plain***	*Groundwater*	*4.6*	*4.2*	*4.3*	*3.2*	*3.8*	*4.4*	*5.4*
	*Surface****	*4.8*	*5.6*	*7.6*	*8.3*	*6.6*	*9.8*	*10.1*
Nipomo Mesa HSA								
Nipomo Mesa+	*Groundwater*	*4.0*	*4.7*	*5.9*	*6.7*	*5.7*	*7.8*	*9.2*
Guadalupe HA	Groundwater	20.7	18.7	16.4	14.8	14.5	13.9	14.7
Santa Maria Valley	*Groundwater*	*11.4*	*12.6*	*13.9*	*12.9*	*11.5*	*10.9*	*11.6*
Study Area Total	Groundwater	34.8	33.7	31.4	30.1	30.2	31.8	34.9
	Surface*	5.3	6.1	8.5	9.6	7.4	12.2	12.4
	Total	40.1	39.8	39.9	39.7	37.6	44.0	47.3
Groundwater Basin	*Groundwater*	*20.0*	*21.5*	*24.1*	*22.8*	*21.0*	*23.1*	*26.2*
	*Surface****	*4.8*	*5.6*	*7.6*	*8.3*	*6.6*	*9.8*	*10.1*
	Total	*24.8*	*27.1*	*31.7*	*31.1*	*27.6*	*32.9*	*36.3*

Note: All values rounded to the nearest 100 acre-feet. Water demand/supply totals may not sum because of rounding.
*Values for 1975 through 1995 include Lopez Reservoir deliveries to urban agencies and downstream releases for agriculture (Table 10). Values for 2010 and 2020 include State Water Project deliveries of 1,350 AF and 1,590 AF, respectively and Lopez Reservoir deliveries and releases of 8,000 AF for urban and agricultural demands and environmental releases of 2,800 AF.
**Division includes lower Pismo Creek and Los Berros Creek portions of the main groundwater basin.
***Values for 1975 through 1995 include Lopez Reservoir deliveries to urban agencies and downstream releases for agriculture. Values for 2010 and 2020 include State Water Project deliveries of 1,350 AF and 1,590 AF, respectively and Lopez Reservoir deliveries and releases of 8,000 AF for urban and agricultural demands and environmental releases of 1,400 AF.
+This portion of the main groundwater basin lies entirely within the HSA.

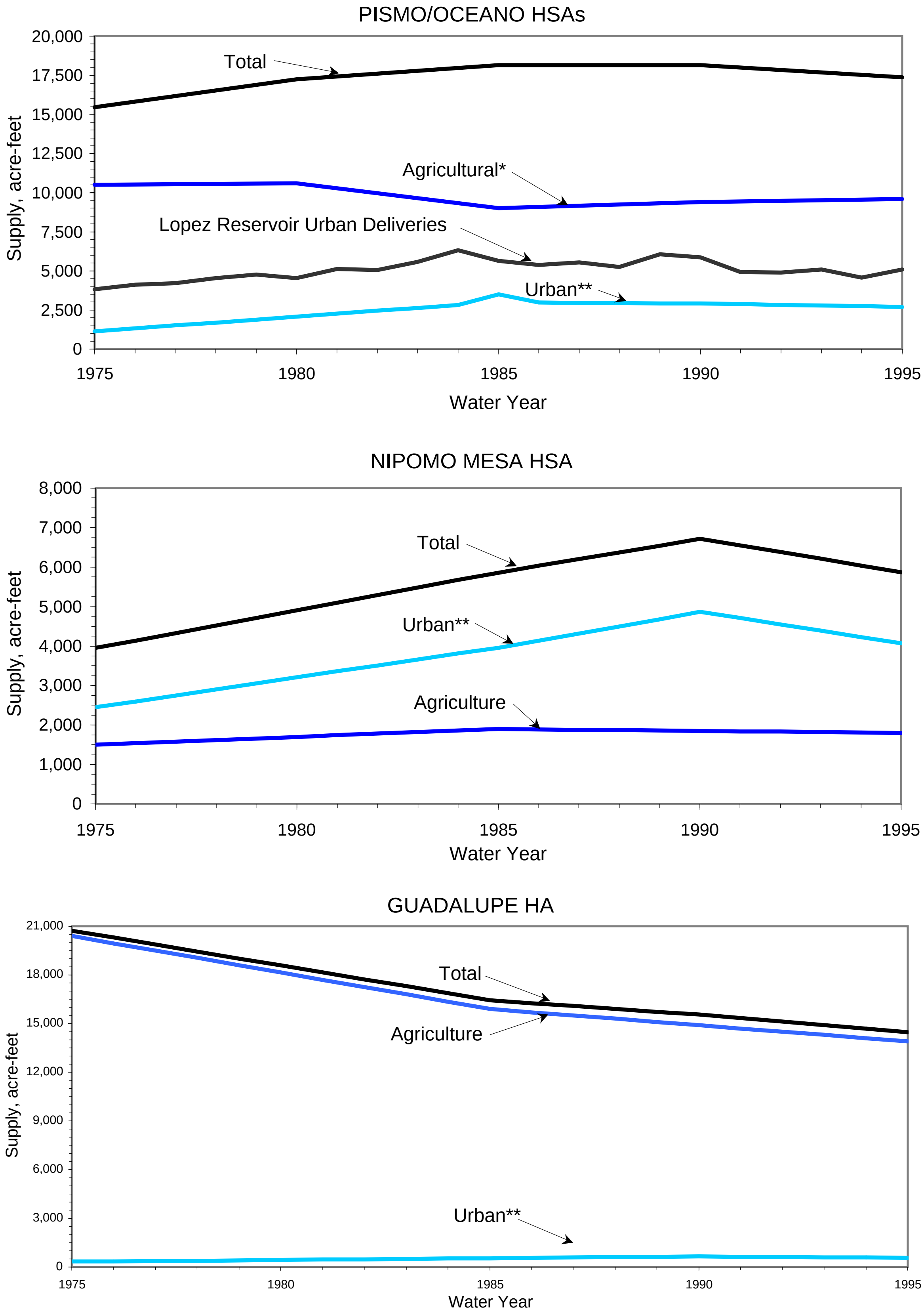
additional water supply coming from those sources mentioned above for the study area.

Figure 5 shows the relative changes in amounts of urban and agricultural water supplies and Lopez Reservoir deliveries between 1975 and 1995.

Groundwater

As Table 8 shows, groundwater is the largest single source of water supply in the study area. Total groundwater extractions within the study area decreased by 4,600 AF from 34,800 AF in 1975 to 30,200 AF in 1995, but year 2020 groundwater extractions are expected to increase

FIGURE 5 - WATER SUPPLIES



* Includes downstream releases from Lopez Reservoir for agriculture. See Table 10 for release data.
** Also includes supplies for "Other" water demands (Table 7).

4,700 AF over 1995 levels. Figure 6 shows the amounts of groundwater extractions in water year 1995 within the study area.

Surface Water

Surface water supply depicted in Table 8 comprises State Water Project water and Lopez Reservoir water. Total surface water supply in the study area increased by 2,100 AF from 5,300 AF in 1975 to 7,400 AF in 1995, and year 2020 surface water supply is expected to increase 5,000 AF over 1995 levels. State Water Project deliveries were estimated to be 1,350 AF in 2010, then increasing to full entitlement of 1,590 AF in 2020. San Luis Obispo County is proposing to release 2,800 AF of Lopez Reservoir water to Arroyo Grande Creek as an interim plan to satisfy steelhead habitat demand. According to San Luis Obispo County staff, the releases are not expected to impact urban and agricultural entitlements to Lopez Reservoir water. This demand has been included in the year 2010 and 2020 calculations.

Lopez Reservoir. Completion of Lopez Reservoir in 1969, with a capacity of 52,500 AF, afforded the area a dependable supply of potable water. Its annual dependable yield is 8,700 AF; about 192,000 AF were delivered to municipal and agricultural interests between 1969 and 1995. Annual entitlements to Lopez Reservoir water for all users are shown in Table 9. Agricultural entitlements to Lopez Reservoir water, amounting to 4,200 AF annually, are received via downstream releases. Annual pipeline deliveries to local agencies (excluding Avila Beach), downstream releases for agricultural entitlements, other releases, and spillway discharges for water years 1969 through 1995 are given in Table 10. Historical average annual pipeline deliveries amounted to about 4,600 AF and downstream releases for agricultural entitlements amounted to about 2,500 AF.

According to Vernon H. Persson, Chief of the Department's Division of Safety of Dams: "A

TABLE 9
LOPEZ RESERVOIR ENTITLEMENTS
In acre-feet

User	Entitlement
City of Arroyo Grande	2,290
City of Grover Beach	800
Community of Oceano	303
City of Pismo Beach	896
Agriculture	4,200
CSA 12	241
Study Area Total	8,489
Project Total	8,730

FIGURE 6 - GROUNDWATER EXTRACTIONS IN WATER YEAR 1995 WITHIN THE STUDY AREA
In acre-feet

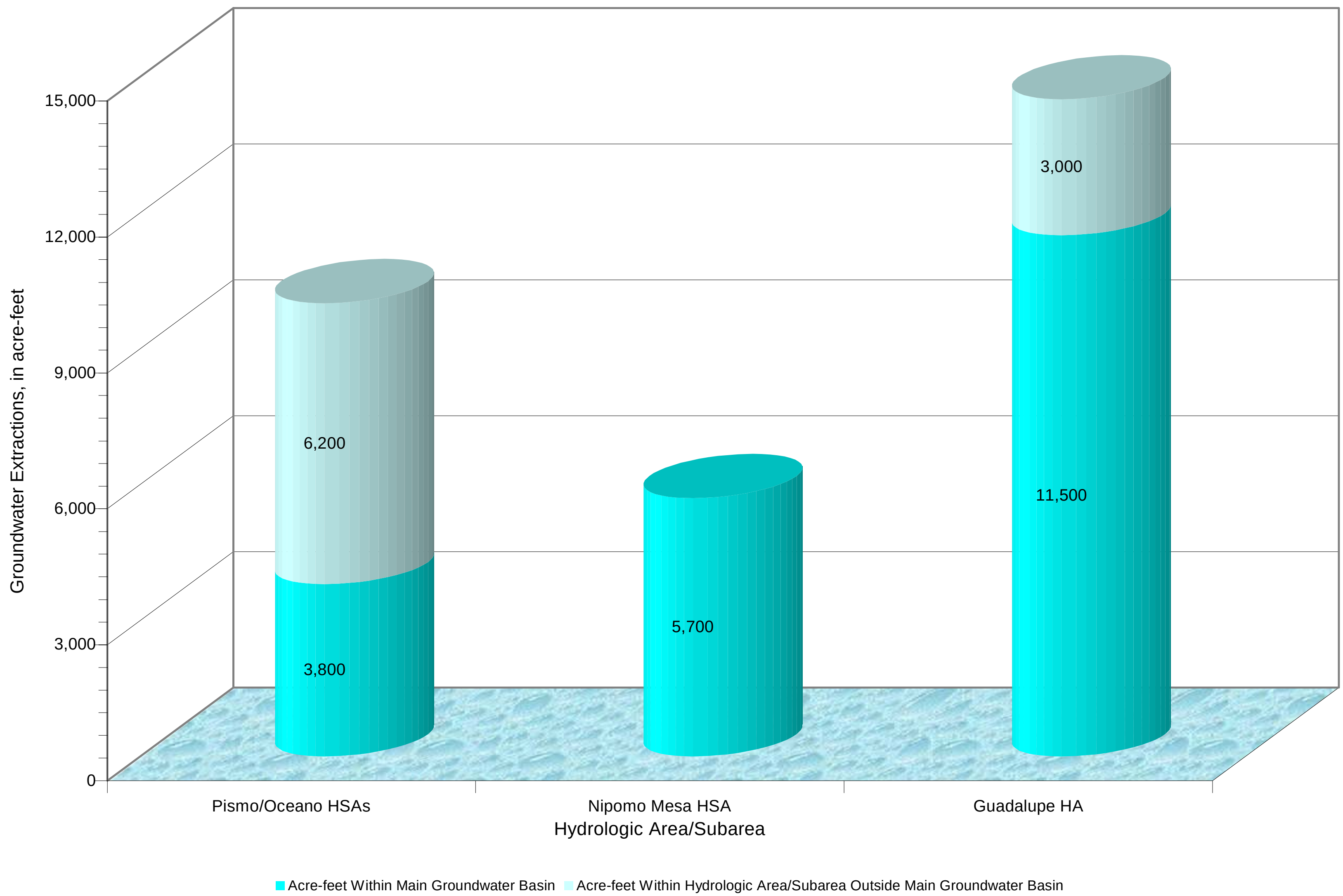


TABLE 10
LOPEZ RESERVOIR WATER DELIVERIES TO CONTRACTORS,* 1969 through 1995
All values in acre-feet

Water Year	Pipeline Deliveries	Downstream Release	Other Release	Spillway Discharge	Total
1969	1,860	1,030	296	3,122	6,308
1970	2,114	2,546	217	3,700	8,577
1971	3,467	3,551	0	0	7,018
1972	3,722	3,495	0	0	7,217
1973	3,395	1,241	0	791	5,427
1974	3,397	1,465	2,530	7,950	15,342
1975	3,810	1,478	0	1,800	7,088
1976	4,107	3,000	0	0	7,107
1977	4,207	3,283	0	0	7,490
1978	4,543	1,668	295	13,691	20,197
1979	4,780	1,822	418	335	7,355
1980	4,550	1,511	0	21,798	27,859
1981	5,120	2,624	69	172	7,985
1982	5,053	1,822	817	3,540	11,232
1983	5,575	910	3,360	79,106	88,951
1984	6,331	2,227	1,948	6,131	16,637
1985	5,647	2,920	0	0	8,567
1986	5,393	2,301	0	4,810	12,504
1987	5,538	2,517	0	0	8,055
1988	5,259	2,514	0	0	7,773
1989	6,059	2,812	0	0	8,871
1990	5,858	3,673	0	0	9,531
1991	4,919	2,761	0	0	7,680
1992	4,879	2,950	0	0	7,829
1993	5,075	2,164	0	0	7,239
1994	4,583	2,270	0	0	6,853
1995	5,078	6,844**	0	0	11,922

Note: All values rounded to the nearest acre-foot.
*Does not include deliveries to Avila Beach.
**Includes release made for dam stability reasons.

TABLE 11
LOPEZ RESERVOIR INTERIM OPERATING PLAN

End of Month	Reservoir Elevation in feet	Estimated Inflow in acre-feet	Planned Storage in acre-feet
November	503.0	--------	37,400
December	503.5	600	38,000
January	505.0	1,000	39,000
February	507.5	2,000	41,000
March	510.0	2,000	43,000
April	510.0	--------	43,000
May	510.0	--------	43,000

1992 Woodward-Clyde Consultant study of Lopez Dam, No.1055 in San Luis Obispo County, identified liquefiable alluvium in the foundation under the shells. Liquefaction in the foundation could result in loss of reservoir storage after a moderate-sized earthquake."

As a result of these findings, an interim operating plan was proposed by the owner (County of San Luis Obispo) and approved by the Division of Safety of Dams (Table 11). This interim operating plan is expected to remain in effect until repairs to the dam are complete, which is anticipated to be in December 2002.

Future supplies from Lopez Reservoir are expected to equal or exceed those of the past 30 years.

Imported Water. In 1991, the citizens of San Luis Obispo and Santa Barbara Counties voted to extend the Coastal Branch of the California Aqueduct of the State Water Project. Plate 1 depicts the route the Coastal Branch follows. Construction was completed in July 1997 with deliveries commencing in August 1997.

The City of Pismo Beach (1,240 AF) and Oceano Community Service District (750 AF) have contracted with the County of San Luis Obispo for the delivery of State Water Project water.

Oceano Community Service District is trying to sell up to 400 AF of its entitlement, according to a spokesperson for the District.

Recycled Water

Recycled water use programs in California are governed by regulations primarily from the California Department of Health Services. The regulations are set forth in the California Code of Regulations, Title 22, Division 4, Chapter 3, entitled "Reclamation Criteria." The Regional

Water Quality Control Boards grant approval for projects and follow the established criteria in Title 22 and county health department recommendations. In the study area, specifications, level of treatment, and regulations for all plants are given in their discharge requirements issued by the Central Coast Regional Water Quality Control Board.

Present Facilities. Plate 6 depicts the locations of existing and proposed wastewater treatment plants (WWTPs) in the study area. Average yearly effluent[3] from each of the plants for 1990 through 1995 is shown in Table 12.

The Pismo Beach, South San Luis Obispo County Sanitation District, and Tosco WWTPs treat their wastewater to the secondary standards of the Regional Board using traditional treatment methods. The Black Lake Golf Course, Southland, and Cypress Ridge WWTPs, using different treatment methods, treat their wastewater to a quality that is comparable to secondary standards before it is delivered to aerated lagoons.

The Pismo Beach WWTP, which began operation in 1953, has an operating capacity of 1,960 AFY. Disposal of effluent was formerly through a city-operated ocean outfall; however, since 1981, the effluent is discharged to the ocean through the South San Luis Obispo County Sanitation District's ocean outfall. The South San Luis Obispo County Sanitation District WWTP began operation in 1966, has an operating capacity of 5,600 AFY, and disposes of its effluent through the ocean outfall. The Tosco (formerly Unocal) WWTP, which began operation in 1954, produces about 650 AFY of effluent; this is disposed of through a company-owned and

TABLE 12
WASTEWATER TREATMENT PLANT EFFLUENT
All values in acre-feet

Water Year	Treatment Plants					Total
	Pismo Beach	South SLO County	Black Lake	Southland	Tosco*	
1990	1,130	3,030	50	210	470	4,890
1991	1,190	2,980	50	200	560	4,980
1992	1,130	2,840	60	240	660	4,930
1993	1,240	2,890	70	250	660	5,110
1994	1,050	2,900	90	290	560	4,890
1995	1,130	2,920	80	330	660	5,120

Note: All values rounded to the nearest 10 acre-feet.
*Formerly Unocal. Only refinery discharge water is treated prior to ocean disposal. No sewage is treated.

[3] All wastewater treatment plants in the study area produce effluent that meets secondary standards.

operated ocean outfall.

The Black Lake Golf Course WWTP when it began operation in 1986 had an operating capacity of 112 AFY. Expansion of the plant, doubling its capacity to 224 AFY, was completed in January 1998 (Doug Jones, personal communication, March 1998). Disposal of effluent is through an aerated lagoon and ultimately by application to portions of the adjacent golf course. In 1995, the Black Lake Golf Course recycled almost 80 AF of treated wastewater from the Black Lake Golf Course WWTP for irrigation, of which about 10 AF incidentally percolated to the groundwater basin. After expansion of the plant, the incidental percolation from the golf course irrigation was estimated to be 20 AFY (Table 13).

The Southland WWTP, which began operation in 1985, had an operating capacity of 403 AFY. Initial expansion of the plant in 1999 increased its capacity to about 670 AFY with additional expansion, completed in 2000, increasing the plant's capacity to about 1,050 AFY (Ibid.). Disposal of effluent is through several aerated lagoons and eventually infiltration to the groundwater basin. In 1995, about 330 AFY of recycled water from the Southland WWTP was estimated to incidentally percolate to the groundwater basin. After both expansions of the plant, the incidental percolation was estimated to be about 1,000 AFY, with the remainder evaporating (Table 13).

The Cypress Ridge Development constructed a wastewater treatment plant with a capacity of 123 AFY. The plant is similar to the plant at Black Lake Golf Course with recycled water used to meet a portion of the development's golf course water demand. Incidental infiltration to the groundwater basin from golf course irrigation is estimated to be six AFY at build out (Table 13).

TABLE 13
INCIDENTAL GROUNDWATER RECHARGE OF RECYCLED WATER
All values in acre-feet

Water Year	Treatment Plants					Total
	South SLO County*	Black Lake**	Southland	Cypress Ridge**	Woodlands **	
1985	N/A	N/A	N/A	N/A	N/A	N/A
1990	N/A	5	300	N/A	N/A	305
1995	N/A	10	330	N/A	N/A	340
2010	950	20	1,000	6	30	1,756
2020	950	20	1,000	6	30	1,756

Note: All values estimated to the nearest acre-foot.
N/A: not applicable
*South SLO County is a potential recharge amount.
**Incidental recharge from recycled water for irrigation.

Expansion Plans. Most of the wastewater treatment plants have plans to increase their capacity to meet expected future demands, which are being driven by increases in local population and tourism. Estimates of potential future incidental groundwater recharge of treated wastewater are given in Table 13.

The Pismo Beach WWTP will be increasing plant capacity in the future; however, at this time no estimate of the amount of expansion is available.

Additional treatment of the South San Luis Obispo County Sanitation District WWTP effluent for reuse for various purposes was studied by John L. Wallace & Associates (1996). They found that further research of the market for recycled water use in the area was needed and a progress report was published in 2001. The study showed that the market for secondary effluent quality recycled water accounted for only one percent of the current water demand within the District service area. Thus, a tertiary upgrade to the existing WWTP would be required to allow unrestricted use of treated wastewater.

The progress report also indicated that the tertiary quality recycled water market would expand if concentrations of chloride and Total Dissolved Solids were reduced. It was estimated that the combined tertiary recycled water market could exceed 2,600 AFY (more than 40 percent of the current water demand within the service area), with an additional 1,000 AFY of demand potentially realized in the Nipomo area.

In the above-mentioned 2001 report, four alternatives (10 sub-alternatives) were considered for providing recycled water within the district service area and to specific potential demands outside the area. The alternatives are: (1) direct landscape irrigation using 130 to 595 AFY of tertiary recycled water or 76 AFY of secondary-23[4] recycled water; (2) groundwater recharge of 950 AFY of demineralized tertiary recycled water in Tri-Cities Mesa, plus landscape irrigation; (3) direct crop irrigation in Tri-Cities Mesa and stream augmentation of Arroyo Grande Creek using 950 AFY of demineralized tertiary recycled water; and (4) direct industrial reuse for cooling at the Tosco refinery of 950 AFY of demineralized tertiary recycled water (Tosco has expressed no interest in using the recycled water). The cost of the alternatives ranges from $2,200/AF for direct landscape irrigation using secondary-23 recycled water to $8,500/AF for direct landscape irrigation using tertiary recycled water within the entire service area. The costs were found to be up to tenfold the cost of potable water in the area and prohibitive. If any of these alternatives is adopted, up to about 950 AFY of recycled water could incidentally recharge the groundwater basin in the future (Table 13).

The baseline environmental assessment and constraint analysis and supplemental environmental impact report for the Woodlands Specific Plan depicts the construction of a wastewater treatment plant similar to the plant at Black Lake Golf Course. The plant will have a capacity of 350 AFY and produce tertiary quality recycled water to be used for meeting a portion of the development's golf course water demand. Incidental infiltration to the groundwater basin from the golf course

[4]Number refers to most probable number count of total coliform bacteria in 100 milliliters.

irrigation is estimated to be 30 AFY for Woodlands at build out (Table 13).

Recycled water is being increasingly used for various beneficial purposes throughout California, the U.S., and the world. The State of California has a goal of 1,000,000 AF of recycled water use by year 2020. In 1995 within the study area, about 4,700 AF of wastewater treatment plant effluent was disposed of through ocean outfall discharge. This water could be treated to suitable standards and beneficially used in various ways.