SECTION 3.2: AGRICULTURE

This section discusses the potential effects that the alternatives considered in Chapter 2 would have on agricultural productivity in the DMC Unit. Methods of analysis are described below.

AFFECTED ENVIRONMENT

Renewal of the long-term water service contracts could potentially affect the following agricultural resources:

- Income from agricultural production (both gross and net)
- Irrigated acres under production

The study area includes the geographic service areas of the 20 CVP water contractors within the DMC Unit, as previously described in Section 3.1.

The contractor service areas all run roughly along the Interstate 5/California Aqueduct corridor from the City of Tracy in San Joaquin County in the north, through parts of Stanislaus and Merced Counties, to the northern portion of Fresno County, just south of U.S. Highway 180 to the south. The farmland served by much of this water lies in the heart of California's Central Valley, one of the most productive agricultural regions in the world.

Agricultural products grown or raised in the unit are extremely varied. The Central Valley of California boasts not only a wide variety of agricultural products, but also exceptional productivity of the crops and livestock produced here. From alfalfa to zucchini, if it is grown somewhere in North America, it is probably grown somewhere in the Central Valley. Fruits, nuts, and vegetables are particularly noteworthy crops in the area because of the lack of substitute growing regions elsewhere.

In terms of product volume and value, hay, corn silage, sugar beets, and cotton are the dominant field crops; grapes and almonds are the dominant orchard crops; tomatoes are the dominant row crop; and dairy and poultry are the dominant livestock products in San Joaquin, Stanislaus, Merced, and Fresno Counties.

Agricultural producers in the Central Valley and elsewhere operate under several economic pressures. When it comes to the sale of their product, they are "price-takers." Because no producer has enough market share to exercise any control over the market, the price they receive for their products is determined entirely outside their control.

The agricultural production cycle is not rapid. Decisions regarding a producer's product mix have to be made months or even years in advance. When July arrives and it is evident that corn is going to be more profitable to produce that year than tomatoes would be, it is too late for the producer to change what they will produce for that year. If tomatoes were planted, tomatoes will be harvested. In the case of orchards, the production cycle stretches across many years.

Weather greatly impacts the quantity and quality of agricultural production. Certainly, no producer has control over the weather.

Changes in the cost or availability of production inputs also play a large part in the ability of a producer to remain viable. Land, labor, seed, machinery, fertilizers, and water are all important and interrelated components in determining production decisions and enterprise profitability. A decrease in the availability of water or an increase in the cost of water or both can not only decrease or eliminate profits per acre, it can also determine cropping patterns or the ability to utilize other inputs, such as land.

ENVIRONMENTAL CONSEQUENCES

This section describes the environmental impacts of the action alternatives as compared to the No-Action Alternative. Impacts are identified by comparing program components of each action alternative to the No-Action Alternative. The project alternatives are described more fully in Chapter 2.

Impacts are presented for the project area as a whole (i.e., for the entire DMC Unit). This level of aggregation is required due to the use of the Central Valley Production Model (CVPM) as the best available analytical tool. As further described later in this section (under the No-Action Alternative discussion), the CVPM provides output data only at the subregion level, not at the individual contractor or local level. As with all impacts within the project area, the concentration of impacts to a smaller geographic area within the project area increases the relative impact, while a more uniform dispersion of impacts across the project area decreases the relative impact. While it is highly unlikely that all identified impacts would present themselves within a single water district, it is just as unlikely that a fully uniform dispersion of impacts across the entire project area would occur.

While this assessment is not able to geographically pinpoint the location of impacts within the project area, it is likely that greater impacts could be seen in those areas where fewer opportunities to substitute water resources occur. If that is the case, then impacts may be more concentrated among those water districts where CVP water is the only available surface water source and where groundwater resources are limited. Such districts include

Broadview Water District, Centinella Water District, Del Puerto Water District, Laguna Water District, Plain View Water District, Reclamation District #1606, Tranquillity Public Utilities District, and Widren Water District.

In the case of agricultural impacts, there can also be the issue of relative severity to individual producers. The same level of change resulting from implementation of an alternative will cause different degrees of impact to different producers. As an example, taking ten acres of orchard out of production will likely cause a much larger impact to a producer who has only 30 acres in production than it will to a producer who has 1,000 acres in production.

NO-ACTION ALTERNATIVE

As described in Chapter 2, the No-Action Alternative provides a base condition for comparing Alternatives 1 and 2 and represents future conditions at a projected level of development without implementation of either alternative. The No-Action Alternative reflects the conditions that are expected to be present upon implementation of the Preferred Alternative from the CVPIA PEIS.

The data used to describe the No-Action Alternative conditions and those of the two renewal alternatives can be found in the April 24, 2000 Technical Memorandum titled *Economic Analysis of November 1999 Tiered Pricing Proposal for PEIS Preferred Alternative* (CH2M Hill, 2000), attached as Appendix A. It is important for the reader to understand the key assumptions contained in the April 24, 2000 Technical Memorandum.

The economic analysis in the April 24, 2000 Technical Memorandum evaluates agricultural economics using the CVPM. As previously described, the CVPM provides analyses for specific subregions, not by individual water district. The CVPM subregions contained in the DMC Unit are subregions 9, 10, and 15 (a more detailed description of the subregions can be found in Table 1 of the April 24, 2000 Technical Memorandum, which is included as Appendix A).

Tiered pricing for the No-Action Alternative is based on the current contract amount of water. Tiered pricing is defined further in Chapter 2. Contractors may purchase, as available, 80 percent of their full contract amounts at the basic contract rate (Tier 1). The next 10 percent of the full contract amount (Tier 2) is priced at the midpoint between the basic contract rate and the full-cost rate (as defined in the Reclamation Reform Act). The last 10 percent of the full contract amount (Tier 3) is priced at the full-cost rate as defined in the Reclamation Reform Act. Table 3.2-1 shows the tiered water rates for each of the three CVPM subregions used for the No-Action Alternative. These rates are based on the 1992 CVP water rates.

Table 3.2-1
CVP Tiered Water Rates
Used in No-Action Alternative
(in dollars per acre-foot)

CVPM Subregion	Tier 1	Tier 2	Tier 3
9	$28.54	$35.25	$41.95
10	$33.46	$40.02	$46.57
15	$28.16	$34.88	$41.59

Source: CH2M Hill 2000, Table 3.

Using the tiered rates described in Table 3.2-1 and the farm budget assumptions within the CVPM, estimates of irrigated acreage and value of production for primary crops in each CVPM subregion were developed under average, wet, and dry water conditions. An average water year represents the average water delivery during the period 1922–1990 from the CVPIA PEIS Preferred Alternative; a wet water year represents the average delivery from the period 1967–1971 from the CVPIA PEIS Preferred Alternative; and a dry water year represents the average delivery from the period 1928–1934 from the CVPIA PEIS Preferred Alternative.

Table 3.2-2 describes the total irrigated acreage under the No-Action Alternative by primary crop and CVPM subregion in average, wet, and dry years. Table 3.2-3 describes the value of production under the No-Action Alternative by primary crop and CVPM subregion in average, wet, and dry years.

It is worth noting that within the No-Action Alternative tiered pricing structure and rate levels, very little change is seen in either irrigated acreage for the subregion or the value of crop production for the subregion from average to wet to dry water years.

ALTERNATIVE 1

Alternative 1 involves a tiered pricing program that is based on the full current contract amount of water. A complete description of Alternative 1 is provided in Chapter 2.

Agricultural resource use resulting from this alternative is assumed to be similar to the No-Action Alternative because, as described in Table 2-1, the amount of water delivered, the timing of these deliveries, and the rates and methods of payment for water delivered under Alternative 1 do not substantially differ from the No-Action Alternative.

Table 3.2-2
No-Action Alternative Irrigated Acreage by CVPM Subregion and Crop
(in thousands of acres)

CVPM Subregion	Crop Category	Average Year	Wet Year	Dry Year
9	Pasture	24.6	24.6	23.4
	Alfalfa	43.8	43.8	43.1
	Sugar Beets	28.6	28.6	28.5
	Other Field Crops	114.9	115.0	113.6
	Rice	0.9	0.9	0.9
	Truck Crops	46.0	46.0	46.0
	Tomatoes	42.5	42.5	42.3
	Deciduous Orchard	21.3	21.3	21.3
	Small Grain	96.8	97.5	93.7
	Grapes	5.8	5.8	5.8
	Subtotal	**425.2**	**426.0**	**418.6**
10	Pasture	13.3	13.3	13.3
	Alfalfa	40.8	40.9	40.8
	Sugar Beets	13.9	13.9	13.9
	Other Field Crops	48.2	48.2	48.3
	Rice	2.9	2.9	2.9
	Truck Crops	112.9	112.9	113.0
	Tomatoes	40.2	40.2	40.2
	Deciduous Orchard	36.6	36.6	36.6
	Small Grain	14.0	14.0	14.0
	Grapes	1.0	1.0	1.0
	Cotton	103.1	103.1	103.1
	Subtropical Orchard	0.1	0.1	0.1
	Subtotal	**427.0**	**427.1**	**427.2**
15	Pasture	3.9	3.9	3.7
	Alfalfa	83.1	83.4	80.6
	Sugar Beets	5.0	5.0	5.0
	Other Field Crops	86.0	86.1	84.2
	Rice	0.1	0.1	0.1
	Truck Crops	12.0	12.0	12.0
	Tomatoes	2.0	2.0	2.0
	Deciduous Orchard	38.0	38.0	38.0
	Small Grain	71.0	71.6	67.9
	Grapes	56.0	56.0	56.0
	Cotton	242.1	242.7	235.5
	Subtropical Orchard	1.0	1.0	1.0
	Subtotal	**600.2**	**601.8**	**586.0**
Total – All Subregions		**1,452.4**	**1,454.9**	**1,431.8**

Source: CH2M Hill 2000, Table 17.

Table 3.2-3
No-Action Alternative Value of Production by CVPM Subregion and Crop
(in millions of dollars)

CVPM Subregion	Crop Category	Average Year	Wet Year	Dry Year
9	Pasture	3.6	3.6	3.4
	Alfalfa	25.6	25.7	25.2
	Sugar Beets	22.0	22.0	21.9
	Other Field Crops	55.9	56.0	55.3
	Rice	0.7	0.7	0.7
	Truck Crops	190.8	190.8	190.6
	Tomatoes	64.9	65.0	64.8
	Deciduous Orchard	22.7	22.7	22.7
	Small Grain	30.7	30.9	29.7
	Grapes	10.0	10.0	10.0
	Subtotal	**426.9**	**427.4**	**424.3**
10	Pasture	3.1	3.1	3.1
	Alfalfa	23.6	23.6	23.6
	Sugar Beets	12.2	12.2	12.2
	Other Field Crops	31.0	31.0	31.0
	Rice	2.3	2.3	2.3
	Truck Crops	718.0	717.9	718.1
	Tomatoes	60.1	60.1	60.1
	Deciduous Orchard	52.4	52.4	52.4
	Small Grain	7.6	7.5	7.6
	Grapes	1.9	1.9	1.9
	Cotton	102.6	102.7	102.6
	Subtropical Orchard	0.4	0.4	0.4
	Subtotal	**1,015.2**	**1,015.1**	**1,015.3**
15	Pasture	0.9	0.9	0.9
	Alfalfa	51.3	51.4	49.7
	Sugar Beets	4.1	4.1	4.0
	Other Field Crops	51.2	51.3	50.2
	Rice	0.1	0.1	0.1
	Truck Crops	72.0	72.0	71.9
	Tomatoes	3.0	3.0	3.0
	Deciduous Orchard	58.7	58.7	58.7
	Small Grain	41.6	41.9	39.7
	Grapes	121.7	121.7	121.7
	Cotton	275.0	275.7	267.5
	Subtropical Orchard	3.7	3.7	3.7
	Subtotal	**683.3**	**684.5**	**671.1**
Total – All Subregions		**2,125.4**	**2,127.0**	**2,110.7**

Source: CH2M Hill 2000, Table 18.

ALTERNATIVE 2

Alternative 2 involves the application of a tiered pricing structure that differs from the No-Action Alternative in a few ways.

Tiered pricing for the Alternative 2 is based on a rolling five-year average of actual water deliveries, rather than the current contract amount of water. The five-year rolling average of actual deliveries is referred to as Category 1 water. Contractors may purchase, as available, 80 percent of their Category 1 water at the basic contract rate (Tier 1). The next 10 percent of their Category 1 water (Tier 2) is priced at the midpoint between the basic

contract rate and the full-cost rate (as defined in the Reclamation Reform Act). The last 10 percent of their Category 1 water (Tier 3) is priced at the full-cost rate (as defined in the Reclamation Reform Act).

Any difference between the full contract amount of water and the five-year rolling average of actual water deliveries is referred to as Category 2 water. To the extent that Category 2 water is available, contractors may purchase such water at Tier 3 prices.

Table 3.2-4 shows the tiered water rates for each of the three CVPM subregions used for Alternative 2. A key difference between the No-Action Alternative and Alternative 2 is that the Alternative 2 rates shown in Table 3.2-4 are based on CVP water rates presented in the November 17, 1999 financial workshop, not the 1992 CVP water rates used in the No-Action Alternative. This is done because the implementation of tiered pricing as a result of the PEIS means that tiered pricing is the law and that Alternative 2 rates should be compared to the most likely rate structure (in this case, the 1999 proposed CVP water rates). Alternative 1, a by-product of the PEIS, was compared to 1992 rates, consistent with the PEIS.

Table 3.2-4
CVP Tiered Water Rates Used in Alternative 2
(in dollars per acre-foot)

CVPM Subregion	Tier 1	Tier 2	Tier 3
9	$24.79	$55.14	$85.50
10	$31.15	$40.16	$49.16
15	$32.71	$41.91	$51.10

Source: CH2M Hill 2000, Table 2.

Tier 1 prices in subregions 9 and 10 are lower in Alternative 2 than in the No-Action Alternative. This difference in price level appears to help offset the more rigorous price structure of Alternative 2.

Another key difference in the analysis of Alternative 2 is the application of blended rates. It is assumed that the contractor will blend the rate of CVP water in any tier or category before selling the water to growers. This differs from the assumption used to assess alternatives in the PEIS, in which contractors were assumed to sell CVP water to growers at tiered rates.

Blended rates were developed for a series of nine water supply sequences:

- **Average-Average:** An average water year following a five-year sequence of average years.

- **Wet-Average:** An average water year following a five-year sequence of wet years.
- **Dry-Average:** An average water year following a five-year sequence of dry years.
- **Average-Wet:** A wet water year following a five-year sequence of average years.
- **Wet-Wet:** A wet water year following a five-year sequence of wet years.
- **Dry-Wet**: A wet water year following a five-year sequence of dry years.
- **Average-Dry:** A dry water year following a five-year sequence of average years.
- **Wet-Dry:** A dry water year following a five-year sequence of wet years.
- **Dry-Dry:** A dry water year following a five-year sequence of dry years.

The blended CVP water rates used for each of the nine sequences described above are shown below in Table 3.2-5.

Table 3.2-5
CVP Blended Water Rates Used in Alternative 2
(in dollars per acre-foot)

CVPM Subregion	Average	Wet	Dry	Average	Wet	Dry	Average	Wet	Dry
	Followed by Average			Followed by Wet			Followed by Dry		
9	33.89	24.79	64.53	55.27	33.89	73.22	24.79	24.79	33.89
10	33.85	31.15	42.94	38.01	33.85	44.63	31.15	31.15	33.85
15	35.47	34.55	38.10	36.34	35.47	38.82	33.07	32.71	35.47

Source: CH2M Hill 2000, Table 2.

Using the blended rates described in Table 3.2-5 and the farm budget assumptions within the CVPM, estimates of irrigated acreage and value of production for primary crops in each CVPM subregion were developed under each of the nine sequences described above. To determine the impacts of Alternative 2, as compared to the No-Action Alternative, sequences ending in an average, wet, or dry year are compared to the average, wet, or dry year No-Action Alternative results, respectively.

Table 3.2-6 presents the change in subregion irrigated acreage from the No-Action Alternative by primary crop and CVPM subregions in average, wet, and dry years. As can be seen in Table 3.2-6, the majority of impacts, adverse and beneficial, are experienced in CVPM subregion 9. The largest beneficial impact to the DMC Unit as a whole is a 3,000-acre increase (0.2 percent) in total irrigated acreage during a dry year. The largest adverse impact to the DMC Unit is a 1,600-acre decrease (0.1 percent) in total irrigated acreage during a wet year. Again, this can be explained partially because Tier 1 prices in

subregions 9 and 10 are lower in Alternative 2 than in the No-Action Alternative. This difference in price level appears to help offset the more rigorous price structure of Alternative 2.

Table 3.2-6
Change in Irrigated Acreage from No-Action Alternative by CVPM Subregion and Crop Resulting from Implementation of Alternative 2
(in thousands of acres)

CVPM Subregion	Crop Category	Change Compared to Average Year No-Action Alternative			Change Compared to Wet Year No-Action Alternative			Change Compared to Dry Year No-Action Alternative		
		Average	Wet	Dry	Average	Wet	Dry	Average	Wet	Dry
		Followed by Average			Followed by Wet			Followed by Dry		
9	Pasture	-0.2	-0.2	-0.1	-0.4	-0.4	-0.4	0.7	0.7	0.7
	Alfalfa	-0.1	-0.1	0.0	-0.3	-0.3	-0.2	0.4	0.4	0.4
	Sugar Beets	0.0	0.0	0.0	-0.1	-0.1	0.0	0.1	0.1	0.1
	Other Field Crops	-0.2	-0.2	-0.2	-0.5	-0.5	-0.5	0.7	0.7	0.7
	Rice	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Truck Crops	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Tomatoes	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1
	Deciduous Orchard	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Small Grain	-0.1	-0.1	-0.1	-0.3	-0.3	-0.3	1.0	1.0	1.0
	Grapes	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Subtotal	-0.6	**-0.6**	**-0.4**	**-1.6**	**-1.6**	**-1.4**	**3.0**	**3.0**	**3.0**
10	Pasture	0.0	0.0	-0.2	0.0	0.0	0.0	0.0	0.0	0.0
	Alfalfa	0.0	0.0	-0.3	-0.1	0.0	-0.1	0.0	0.0	0.0
	Sugar Beets	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Other Field Crops	0.0	0.0	-0.1	0.1	0.0	0.0	0.0	0.0	0.0
	Rice	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Truck Crops	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Tomatoes	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Deciduous Orchard	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Small Grain	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0
	Grapes	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Cotton	0.0	0.0	-0.5	-0.1	0.0	-0.1	0.0	0.0	0.0
	Subtropical Orchard	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Subtotal	**0.0**	**0.0**	**-1.1**	**0.0**	**0.0**	**-0.1**	**0.0**	**0.0**	**0.0**
15	Pasture	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Alfalfa	0.0	0.0	0.2	0.0	0.0	0.1	0.0	0.0	0.0
	Sugar Beets	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Other Field Crops	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Rice	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Truck Crops	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Tomatoes	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Deciduous Orchard	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Small Grain	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Grapes	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Cotton	0.0	0.0	-0.2	0.0	0.0	-0.1	0.0	0.0	0.0
	Subtropical Orchard	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Subtotal	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Total – All Subregions		**-0.6**	**-0.6**	**-1.5**	**-1.6**	**-1.6**	**-1.5**	**3.0**	**3.0**	**3.0**

Source: CH2M Hill 2000, Table 17.

Table 3.2-7 presents the change in the value of production from the No-Action Alternative by primary crop and CVPM subregions in average, wet, and dry years. As can be seen in Table 3.2-7, the majority of impacts, adverse and beneficial, are experienced in CVPM

subregion 9. The largest beneficial impact to the DMC Unit as a whole is a $1.2 million (less than 0.1 percent) increase in total value of production during a dry year. The largest adverse impact to the DMC Unit is a $1.0 million decrease (less than 0.1 percent) in total value of production during an average year that follows a dry five-year period.

Table 3.2-7
Change in Value of Production from No-Action Alternative by CVPM Subregion and Crop Resulting from Implementation of Alternative 2
(in millions of dollars)

CVPM Subregion	Crop Category	Change Compared to Average Year No-Action Alternative			Change Compared to Wet Year No-Action Alternative			Change Compared to Dry Year No-Action Alternative		
		Average	Wet	Dry	Average	Wet	Dry	Average	Wet	Dry
		Followed by Average			Followed by Wet			Followed by Dry		
9	Pasture	0.0	0.0	0.0	-0.1	-0.1	-0.1	0.1	0.1	0.1
	Alfalfa	-0.1	-0.1	0.0	-0.1	-0.1	-0.1	0.2	0.2	0.2
	Sugar Beets	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1
	Other Field Crops	-0.1	-0.1	-0.1	-0.2	-0.2	-0.2	0.3	0.3	0.3
	Rice	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Truck Crops	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.1
	Tomatoes	0.0	0.0	0.0	-0.1	-0.1	0.0	0.1	0.1	0.1
	Deciduous Orchard	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Small Grain	0.0	0.0	0.0	-0.1	-0.1	-0.1	0.3	0.3	0.3
	Grapes	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Subtotal	**-0.2**	**-0.2**	**-0.1**	**-0.6**	**-0.6**	**-0.5**	**1.2**	**1.2**	**1.2**
10	Pasture	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Alfalfa	0.0	0.0	-0.2	-0.1	0.0	-0.1	0.0	0.0	0.0
	Sugar Beets	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Other Field Crops	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
	Rice	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Truck Crops	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0
	Tomatoes	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Deciduous Orchard	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Small Grain	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0
	Grapes	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Cotton	0.0	0.0	-0.5	-0.1	0.0	-0.1	0.0	0.0	0.0
	Subtropical Orchard	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Subtotal	**0.0**	**0.0**	**-0.8**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
15	Pasture	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Alfalfa	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
	Sugar Beets	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Other Field Crops	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Rice	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Truck Crops	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Tomatoes	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Deciduous Orchard	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Small Grain	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Grapes	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Cotton	0.0	0.0	-0.2	0.0	0.0	-0.1	0.0	0.0	0.0
	Subtropical Orchard	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Subtotal	**0.0**	**0.0**	**-0.1**	**0.0**	**0.0**	**-0.1**	**0.0**	**0.0**	**0.0**
Total – All Subregions		**-0.2**	**-0.2**	**-1.0**	**-0.6**	**-0.6**	**-0.6**	**1.2**	**1.2**	**1.2**

Source: CH2M Hill 2000, Table 18.

Table 3.2-8 presents the change in net farm revenues from the No-Action Alternative by CVPM subregions in average, wet, and dry years. As can be seen in Table 3.2-8, the

largest beneficial impact to the DMC Unit as a whole is a $2.2 million increase in net farm revenues during a dry year that follows a dry five-year period. The largest adverse impact to the DMC Unit as a whole is a $700,000 decrease in net farm revenues during a wet year that follows a wet five-year period.

Table 3.2-8
Change in Net Farm Income from No-Action Alternative by CVPM Subregion Resulting from Implementation of Alternative 2
(in millions of dollars)

CVPM Subregion	Cause of Net Revenue Change	Change Compared to Average Year No-Action Alternative			Change Compared to Wet Year No-Action Alternative			Change Compared to Dry Year No-Action Alternative		
		Average	Wet	Dry	Average	Wet	Dry	Average	Wet	Dry
		Followed by Average			Followed by Wet			Followed by Dry		
9	Fallowed Land	-0.1	-0.1	0.0	-0.1	-0.1	-0.1	0.2	0.2	0.2
	Groundwater Pumping	0.6	0.6	0.6	1.2	1.2	1.2	0.3	0.3	0.3
	Irrigation Cost	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	CVP Water Cost	-1.2	-1.2	-1.2	-2.0	-2.0	-2.0	-0.5	-0.5	-0.5
	Higher Crop Prices	0.0	0.0	0.5	0.0	0.0	0.2	0.0	0.0	0.0
	Net Change	-0.4	-0.4	0.1	-0.7	-0.7	-0.5	0.4	0.4	0.3
10	Fallowed Land	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
	Groundwater Pumping	0.0	0.0	6.8	8.3	0.8	8.6	-0.1	-0.1	-0.1
	Irrigation Cost	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	CVP Water Cost	0.1	-0.4	-6.3	-7.9	-0.7	-8.1	-0.2	-0.2	0.1
	Higher Crop Prices	0.0	0.0	0.4	0.0	0.0	0.2	0.0	0.0	0.0
	Net Change	0.1	-0.4	0.8	0.5	0.1	0.7	-0.3	-0.3	0.0
15	Fallowed Land	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Groundwater Pumping	0.0	0.0	0.0	-0.3	-0.3	-0.3	1.5	1.5	1.5
	Irrigation Cost	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	CVP Water Cost	0.3	0.2	0.4	0.2	0.2	0.3	0.4	0.4	0.5
	Higher Crop Prices	0.0	0.0	0.4	0.1	0.0	0.2	0.0	0.0	0.0
	Net Change	0.3	0.2	0.8	-0.1	-0.1	0.2	1.9	1.9	1.9
Total – All Subregions		**0.0**	**-0.6**	**1.7**	**-0.3**	**-0.7**	**0.4**	**2.0**	**2.0**	**2.2**

Source: CH2M Hill 2000, Table 19.

CUMULATIVE IMPACTS

Overall, the cumulative impacts of renewing long-term contracts can be either beneficial or potentially adverse to agricultural resources. In the long-term, the renewal of long-term water service and repayment contracts is beneficial in light of past projects that have assisted growers in bringing marginal lands into irrigation and production, including the statutory authorities for long-term contract renewals listed at the start of Chapter 1.[1]

[1] Renewal of these contracts is being undertaken in pursuance generally of the Act of June 17, 1902 (32 Stat. 388), as amended and supplemented, including, but not limited to the Acts of August 26, 1937 (50 Stat. 844) as amended and supplemented, August 4, 1939 (53 Stat. 1187) as amended and supplemented, July 2, 1956 (70 Stat. 483); June 3, 1960 (74 Stat. 156); June 21, 1963 (77 Stat. 68); October 12, 1982 (96 Stat. 1262); and October 27, 1986 (100 Stat. 3050); and Title XXXIV of the CVPIA of October 30, 1992 (106 Stat. 4706).

Continued provision of water to agricultural and M&I users in the DMC Unit beneficially supports the ongoing production of food, fiber, and other agricultural resources that sustain the regional, subregional, and local economies.

In contrast, some aspects of long-term contract renewal may have adverse short-term effects on the agricultural viability of some areas. In particular, increased water prices resulting from a tiered pricing structure under some subregions and water-year scenarios, when combined with reduced south-of-Delta water supply reliability resulting from a combination of CVP operational constraints on deliveries to the DMC Unit (as discussed in Chapter 1), could result in difficult choices regarding the affordability of agricultural production as an enterprise. However, to adequately place the effect of tiered pricing aspects of long-term contract renewals in perspective, one must also consider other factors that may arguably have equal or more bearing on the affordability of agricultural production. In particular, the direction of continued agricultural subsidy and price support programs for selected crops, weather patterns, and market prices for agricultural products affect such decisions. As stated in the introduction to this section, changes in the cost or availability of production inputs also play a large part in a producer's ability to remain viable. Land, labor, seed, machinery, fertilizers, and water are all important, interrelated components in determining production decisions and enterprise profitability.

SECTION 3.3: SOCIOECONOMICS AND POWER RESOURCES

This section discusses the potential effects that the alternatives considered in Chapter 2 would have on the socioeconomic resources of the DMC Unit. Methods of analysis are described below.

AFFECTED ENVIRONMENT

Socioeconomic analyses are composed of two primary types of analyses. Regional economics looks at changes to the income and employment levels of the project area. Social analyses look at changes to the demographic or social makeup and well-being of the project area.

Renewal of the long-term water service contracts could potentially affect the following economic and social resources:

- Regional income
- Regional employment
- Regional population
- Area demographics

The project area includes the geographic service areas of the 20 CVP water contractors within the DMC Unit, as described previously in Section 3.1. The contractor service areas all run roughly along the Interstate 5/California Aqueduct corridor from the City of Tracy in San Joaquin County in the north, through parts of Stanislaus and Merced Counties, to the northern portion of Fresno County, just south of Highway 180 to the south.

When the economic modeling for this analysis was conducted, income and employment information by county was available from the U.S. Department of Commerce, Bureau of Economic Analysis website by industry for 1998. In terms of both earnings (as measured by wages and proprietor earnings) and employment, the largest industries in San Joaquin, Stanislaus, Merced, and Fresno Counties were retail trade, manufacturing, and government. Total earnings by major industry for each of the four counties are shown in Table 3.3-1. Total employment by major industry for each of the four counties is shown in Table 3.3-2.

Table 3.3-1
1998 Total Earnings by Industry by County[1]
(thousands of dollars)

Industry	County			
	San Joaquin	Stanislaus	Merced	Fresno
Farm Income[2]	$327,146	$351,101	$317,439	$554,061
Ag. Services, Forestry & Fishing	143,300	–[3]	90,821	581,149
Mining	12,578	–[3]	888	14,431
Construction	482,184	382,571	95,963	668,436
Manufacturing	975,178	1,099,685	383,958	1,006,513
Transportation & Public Utilities	655,342	341,005	134,501	651,665
Wholesale Trade	389,369	272,639	71,671	616,834
Retail Trade	757,576	625,731	227,704	1,067,575
Finance, Insurance & Real Estate	473,146	239,403	79,922	702,235
Services	1,556,828	1,313,887	357,590	2,578,764
Government	1,393,704	950,288	418,045	2,203,822
Total	**$7,166,351**	**$5,715,861**	**$2,178,502**	**$10,645,485**

Source: U.S. Department of Commerce 1998a.
[1]Includes wages, other labor income, and proprietor income.
[2]Farm income consists of proprietors' income; the cash wages, pay-in-kind, and other labor income of hired farm workers; and the salaries of officers of corporate farms.
[3]Not shown to avoid disclosure of confidential information, but the estimates for this item are included in the total.

Table 3.3-2
1998 Total Employment by Industry by County[1]

Industry	County			
	San Joaquin	Stanislaus	Merced	Fresno
Farm Employment	17,097	14,591	12,086	34,620
Ag. Services, Forestry & Fishing	9,019	–[2]	4,798	41,266
Mining	231	–[2]	52	456
Construction	12,457	11,482	3,074	19,202
Manufacturing	24,259	27,870	13,012	28,847
Transportation & Public Utilities	14,399	7,150	3,597	15,633
Wholesale Trade	10,124	7,400	2,162	16,654
Retail Trade	40,824	36,143	13,439	60,941
Finance, Insurance & Real Estate	16,800	10,748	4,161	25,906
Services	63,495	51,209	15,353	98,520
Government	34,714	24,152	12,506	56,770
Total	**243,689**	**201,613**	**84,240**	**398,815**

Source: U.S. Department of Commerce 1998b.
[1]Includes full-time labor, part-time labor, and proprietor employment.
[2]Not shown to avoid disclosure of confidential information, but the estimates for this item are included in the total.

Agriculture is also a very important industry. If taken together, the farm and agricultural service sectors are particularly important to Fresno and Merced Counties. Agriculture takes on additional significance because it is generally considered a "primary" industry (along with mining and manufacturing). A reasonably large portion of activity in non-primary industries can be attributed to support for primary industry activity in an area. Changes in primary industry activity, therefore, usually precipitate additional changes in non-primary, or support, industries.

Population data can be most closely related to the project area by aggregating individual census tract information. Population and ethnicity breakdowns were available by census tract for 1990, the most recent reported census supporting economic modeling. The California Department of Finance develops population and ethnicity estimates and projections at the county level. Implied growth rates from the California Department of Finance's county estimates were applied to the 1990 tract information to generate estimates and projections from 1990 through 2026 for the aggregated tracts. The following census tracts were used to simulate the DMC Unit's service area.

Fresno County:	Tracts 39, 82, 84.01, 84.02
Merced County:	Tracts 20, 21.98
Stanislaus County:	Tracts 32, 33.98, 34.98, 35
San Joaquin County:	Tracts 52.02, 52.03, 52.04, 52.05, 53.02, 53.03, 53.05, 53.06, 54.02, 55

Table 3.3-3 shows the estimated and projected population and ethnicity in the DMC Unit service area. As shown in Table 3.3-3, the Hispanic community makes up a large proportion of the regional population. It is estimated that over 40 percent of the regional population is identified as Hispanic in 2001 and that the percentage will rise to over 50 percent by 2026.

In addition to the information provided above, regional income, employment, and population can be impacted by changes to the availability, cost, or profitability of agricultural resources, recreational resources, power resources, and M&I water resources. Agricultural and recreational resources are discussed in their own sections within this chapter and the reader is referred to those sections for a review of the affected environment of those resources.

Table 3.3-3
Population and Ethnicity–Delta-Mendota Canal Unit Project Area[1]

Year	Population				
	White	Black	Other	Hispanic[2]	Total[3]
1990	69,542	2,257	21,885	35,995	93,684
1995	72,173	2,504	28,136	42,177	102,777
2000	75,774	2,802	33,601	48,500	112,883
2005	80,395	3,142	41,109	56,592	125,813
2010	85,226	3,531	47,514	65,062	139,339
2015	89,462	3,992	53,488	73,896	152,634
2020	93,940	4,417	60,688	85,069	167,985
2026	97,300	4,863	68,221	97,246	184,078

Source: U.S. Census Bureau 1990.
[1]Estimated and extrapolated from aggregated census tract data.
[2]Hispanic population is also counted as White, Black, or Other.
[3]Equals the sum of White, Black, and Other.

ENVIRONMENTAL CONSEQUENCES

This section describes the environmental impacts of the action alternatives as compared to the No-Action Alternative. Impacts are identified by comparing program components of each action alternative to the No-Action Alternative. The project alternatives are described more fully in Chapter 2.

NO-ACTION ALTERNATIVE

The No-Action Alternative provides a base condition for comparing the action alternatives and represents future conditions at a projected level of development without implementation of either action alternative. The No-Action Alternative reflects the conditions that are expected to be present upon implementation of the Preferred Alternative from the CVPIA PEIS.

Under No-Action Alternative conditions, population and ethnicity projections are equal to the 2026 projections shown in Table 3.3-3. It is assumed that relative income and employment levels would not differ substantially from existing conditions, if adjusted for inflation. Agricultural and recreational resources under No-Action Alternative conditions are described in their respective sections.

It is expected that the CVP will continue to provide an important power resource to municipalities and utility districts in the DMC Unit project area. M&I water deliveries would continue to be provided from the CVP. Under average water conditions under the No-Action Alternative, the model simulation indicated that 704,000 acre-feet of water is expected to be supplied to M&I users in the San Joaquin River region (CH2M Hill 2000,

Table 22). This water includes surface water under water rights (such as used in portions of the cities of Modesto and Stockton) and CVP and SWP water (such as used in portions of the city of Tracy and in Kern County). This value does not include groundwater used by the municipalities. Under dry year conditions, the model simulation indicated that the overall available water from these sources would be reduced to 656,000 acre-feet of M&I water (CH2M Hill 2000, Table 22). The reduction is due only to changes in CVP and SWP water availability because the model assumed that full amounts of surface water rights would be delivered in all water year types.

ALTERNATIVE 1

Alternative 1 involves a tiered pricing program that is based on the full current contract amount of water. Socioeconomic resource use resulting from this alternative is assumed to be similar to the No-Action Alternative because, as described in Table 2-1, the amount of water delivered, the timing of those deliveries, and the rates and method of payment for water delivered under Alternative 1 would not substantially differ from the No-Action Alternative.

ALTERNATIVE 2

Alternative 2 involves the application of a tiered pricing structure that is based on a rolling five-year average of actual water deliveries, rather than the current contract amount of water. A more thorough description of the tiered pricing structure used is found in the description of Alternative 2 in Section 3.2, Agriculture. As noted in Section 3.2, the tiered pricing structure and the No-Action Alternative rates against which it is compared are used because current law requires the adoption of tiered pricing structures.

A regional economic analysis for four different regions was developed in the April 24, 2000 Technical Memorandum (CH2M Hill 2000), which is included as Appendix A. The region used for this assessment is the San Joaquin River region. The DMC Unit is included within the San Joaquin River region. Impacts to this region may overstate the impacts to the DMC Unit service area because the region encompasses a geographic area that includes, but is larger than, the DMC Unit service area.

The regional economic analysis identifies long-term direct and indirect income and employment impacts that would be expected to result from the implementation of Alternative 2. Direct impacts result from changes in agricultural production and profitability and from changes in the cost of M&I water. Had there been any changes in the cost or delivery of CVP power or impacts to recreational resources, such impacts would also have been direct. Indirect impacts are those impacts to the regional economy

that occur to other economic sectors (e.g., trade, services, manufacturing) because of the direct impacts.

As noted above, there would be no impacts to recreational resources or power resources because CVP facilities are required to be operated in the same manner, no matter how much agricultural or M&I water is actually diverted for use. Reservoir levels will be similar and conveyance facilities will continue to have similar water flows. This would allow recreational resources to continue to be used at similar levels. It also would allow CVP hydroelectric facilities to operate at the same level, maintaining the same production and price levels that would be seen under the CVPIA PEIS Preferred Alternative (No-Action Alternative conditions).

The M&I water use economics analysis developed in the April 24, 2000 Technical Memorandum (CH2M Hill 2000) assumes that M&I users can afford the calculated water costs that are described in the CVPIA PEIS. Therefore, CVP water deliveries do not change for the M&I analysis. Additional costs for M&I water are incurred, however. In an average water year, additional costs of $5.2 million are incurred under Alternative 2 (in the entire San Joaquin River region). In a dry water year, no additional costs are incurred under Alternative 2.

Since the input-output model used in the regional economic analysis developed in the April 24, 2000 Technical Memorandum (CH2M Hill 2000) assumes that a long-run equilibrium is reached, it is only appropriate to compare Alternative 2 impacts to average No-Action Alternative conditions. In addition, the only hydrologic sequence that truly reflects long-run conditions is the five-year average followed by an average year. The five-year dry period followed by an average year is also examined because, while it is not strictly a long-run scenario, some regions can be permanently impacted by a five-year series of drought years. Because of this, the results can be considered long-term.

Under the average-average hydrologic sequence discussed in Section 3.2, Agriculture, total employment decreases by 120 jobs and income from profits and wages decreases by $4.2 million. Table 3.3-4 shows the direct and total (direct plus indirect) regional economic impacts to the San Joaquin River region under the average-average hydrologic sequence.

Under the dry-average hydrologic sequence, total employment decreases by 420 jobs and income from profits and wages decreases by $12.4 million. Table 3.3-5 shows the direct and total (direct plus indirect) regional economic impacts to the San Joaquin River region under the dry-average hydrologic sequence.

Table 3.3-4
Regional Economic Impacts on All Sectors for the Average-Average Hydrologic Sequence Compared to the No-Action Alternative Average Conditions–San Joaquin River Region

Impact Resulting From:	Employment (number of jobs)		Income[1] (millions of $)	
	Direct	Total	Direct	Total
Change in Agricultural Output	0	0	-$0.1	-$0.2
Change in Agricultural Net Income	20	40	$0.5	$1.0
Change in M&I Water Costs	-80	-150	-$206.0	-$5.1
Total[2]	**-60**	**-120**	**-$2.2**	**-$4.2**

Source: CH2M Hill 2000, Table 23.
[1]Includes income from wages and profits.
[2]May differ from sum of elements because of rounding.

Table 3.3-5
Regional Economic Impacts on All Sectors for the Dry-Average Hydrologic Sequence Compared to the No-Action Alternative Average Conditions–San Joaquin River Region

Impact Resulting From:	Employment (number of jobs)		Income[1] (millions of $)	
	Direct	Total	Direct	Total
Change in Agricultural Output	-10	-20	-$0.3	-$0.7
Change in Agricultural Net Income	-140	-240	-$3.0	-$6.5
Change in M&I Water Costs	-80	-150	$0.0	$0.0
Total[2]	**-230**	**-420**	**-$5.9**	**-$12.4**

Source: CH2M Hill 2000, Table 27.
[1]Includes income from wages and profits.
[2]May differ from sum of elements because of rounding.

Population impacts can be expected to occur as a result of the implementation of Alternative 2. The key drivers in determining changes in population are birth rates, death rates, and employment. Alternative 2 will not precipitate any changes in birth or death rates, but as shown in Tables 3.3-4 and 3.3-5, employment impacts will occur.

If we assume the same ratio of employment to population is present at the county level and within the San Joaquin River region, we can estimate expected changes in population. Using the same data source that was used for Table 3.3-1 (U.S. Department of Commerce, 1998a), the 1998 population for the area encompassing San Joaquin, Stanislaus, Merced, and Fresno Counties is 1,928,868. From Table 3.3-2, total employment in 1998 can be calculated as 928,357 for the area encompassing all four counties. With this information, a population-to-employment ratio of 2.08 is calculated. If this ratio is applied to the total employment losses in Table 3.3-4, the expected impact is a loss of 250 persons (2.08×120). If this ratio is applied to the total employment losses in Table 3.3-5, the expected impact is a loss of 873 persons (2.08×420).

Impacts are presented for the San Joaquin River region as a whole. As with all impacts within a project area, the concentration of impacts to a smaller geographic area within the project area increases the relative impact, while a more uniform dispersion of impacts across the project area decreases the relative impact. While it is highly unlikely that all identified impacts would present themselves within a single water district or community, it is just as unlikely that a fully uniform dispersion of impacts across the entire project area would occur.

To the extent that income, employment, and population impacts are concentrated in a smaller geographic area, impacts to local tax bases and public services may also be exacerbated. While a lower population would lessen the strain on current public services (e.g., police and fire protection, schools, and health services) to meet the needs of their service area, the loss of income would cause a corresponding decrease in local tax revenues used to provide such public services.

More localized impacts than those identified in this analysis are almost certain to occur. However, it is also fair to say that localized impacts are already being felt in areas where the transfer of costs from areas that currently receive water at rates below the value of the water is shifted. Some of this shifting of impacts may, in fact, occur within the regional study area. While it is appropriate to analyze impacts at the regional level, it is also appropriate to recognize the potential for greater (both negative and positive) local impacts than are reflected in the analysis.

In addition, more localized employment impacts could also translate into a disproportionate impact on specific groups such as minority or rural populations. It is likely that impacts realized as a result of implementation of Alternative 2 would be greater than impacts realized as a result of implementation of Alternative 1.

CUMULATIVE IMPACTS

Overall, the cumulative impacts of renewing long-term contracts can be either beneficial or potentially adverse to socioeconomic resources. In the long-term, the renewal of long-term water service and repayment contracts is beneficial in light of past projects that have assisted growers in bringing marginal lands into irrigation and production, including the statutory authorities for long-term contract renewals listed at the start of Chapter 1.[1] Continued provision of water to agricultural and M&I users in the DMC Unit beneficially

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supports the ongoing production of food, fiber, and other agricultural resources that sustain the regional, sub-regional, and local economies.

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SECTION 3.3: SOCIOECONOMICS AND POWER RESOURCES

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Manufacturing	975,178	1,099,685	383,958	1,006,513
Transportation & Public Utilities	655,342	341,005	134,501	651,665
Wholesale Trade	389,369	272,639	71,671	616,834
Retail Trade	757,576	625,731	227,704	1,067,575
Finance, Insurance & Real Estate	473,146	239,403	79,922	702,235
Services	1,556,828	1,313,887	357,590	2,578,764
Government	1,393,704	950,288	418,045	2,203,822
Total	**$7,166,351**	**$5,715,861**	**$2,178,502**	**$10,645,485**

Source: U.S. Department of Commerce 1998a.
[1]Includes wages, other labor income, and proprietor income.
[2]Farm income consists of proprietors' income; the cash wages, pay-in-kind, and other labor income of hired farm workers; and the salaries of officers of corporate farms.
[3]Not shown to avoid disclosure of confidential information, but the estimates for this item are included in the total.

Table 3.3-2
1998 Total Employment by Industry by County[1]

Industry	County			
	San Joaquin	Stanislaus	Merced	Fresno
Farm Employment	17,097	14,591	12,086	34,620
Ag. Services, Forestry & Fishing	9,019	–[2]	4,798	41,266
Mining	231	–[2]	52	456
Construction	12,457	11,482	3,074	19,202
Manufacturing	24,259	27,870	13,012	28,847
Transportation & Public Utilities	14,399	7,150	3,597	15,633
Wholesale Trade	10,124	7,400	2,162	16,654
Retail Trade	40,824	36,143	13,439	60,941
Finance, Insurance & Real Estate	16,800	10,748	4,161	25,906
Services	63,495	51,209	15,353	98,520
Government	34,714	24,152	12,506	56,770
Total	**243,689**	**201,613**	**84,240**	**398,815**

Source: U.S. Department of Commerce 1998b.
[1]Includes full-time labor, part-time labor, and proprietor employment.
[2]Not shown to avoid disclosure of confidential information, but the estimates for this item are included in the total.

Agriculture is also a very important industry. If taken together, the farm and agricultural service sectors are particularly important to Fresno and Merced Counties. Agriculture takes on additional significance because it is generally considered a "primary" industry (along with mining and manufacturing). A reasonably large portion of activity in non-primary industries can be attributed to support for primary industry activity in an area. Changes in primary industry activity, therefore, usually precipitate additional changes in non-primary, or support, industries.

Population data can be most closely related to the project area by aggregating individual census tract information. Population and ethnicity breakdowns were available by census tract for 1990, the most recent reported census supporting economic modeling. The California Department of Finance develops population and ethnicity estimates and projections at the county level. Implied growth rates from the California Department of Finance's county estimates were applied to the 1990 tract information to generate estimates and projections from 1990 through 2026 for the aggregated tracts. The following census tracts were used to simulate the DMC Unit's service area.

Fresno County:	Tracts 39, 82, 84.01, 84.02
Merced County:	Tracts 20, 21.98
Stanislaus County:	Tracts 32, 33.98, 34.98, 35
San Joaquin County:	Tracts 52.02, 52.03, 52.04, 52.05, 53.02, 53.03, 53.05, 53.06, 54.02, 55

Table 3.3-3 shows the estimated and projected population and ethnicity in the DMC Unit service area. As shown in Table 3.3-3, the Hispanic community makes up a large proportion of the regional population. It is estimated that over 40 percent of the regional population is identified as Hispanic in 2001 and that the percentage will rise to over 50 percent by 2026.

In addition to the information provided above, regional income, employment, and population can be impacted by changes to the availability, cost, or profitability of agricultural resources, recreational resources, power resources, and M&I water resources. Agricultural and recreational resources are discussed in their own sections within this chapter and the reader is referred to those sections for a review of the affected environment of those resources.

Table 3.3-3
Population and Ethnicity–Delta-Mendota Canal Unit Project Area[1]

Year	Population				
	White	Black	Other	Hispanic[2]	Total[3]
1990	69,542	2,257	21,885	35,995	93,684
1995	72,173	2,504	28,136	42,177	102,777
2000	75,774	2,802	33,601	48,500	112,883
2005	80,395	3,142	41,109	56,592	125,813
2010	85,226	3,531	47,514	65,062	139,339
2015	89,462	3,992	53,488	73,896	152,634
2020	93,940	4,417	60,688	85,069	167,985
2026	97,300	4,863	68,221	97,246	184,078

Source: U.S. Census Bureau 1990.
[1]Estimated and extrapolated from aggregated census tract data.
[2]Hispanic population is also counted as White, Black, or Other.
[3]Equals the sum of White, Black, and Other.

ENVIRONMENTAL CONSEQUENCES

This section describes the environmental impacts of the action alternatives as compared to the No-Action Alternative. Impacts are identified by comparing program components of each action alternative to the No-Action Alternative. The project alternatives are described more fully in Chapter 2.

NO-ACTION ALTERNATIVE

The No-Action Alternative provides a base condition for comparing the action alternatives and represents future conditions at a projected level of development without implementation of either action alternative. The No-Action Alternative reflects the conditions that are expected to be present upon implementation of the Preferred Alternative from the CVPIA PEIS.

Under No-Action Alternative conditions, population and ethnicity projections are equal to the 2026 projections shown in Table 3.3-3. It is assumed that relative income and employment levels would not differ substantially from existing conditions, if adjusted for inflation. Agricultural and recreational resources under No-Action Alternative conditions are described in their respective sections.

It is expected that the CVP will continue to provide an important power resource to municipalities and utility districts in the DMC Unit project area. M&I water deliveries would continue to be provided from the CVP. Under average water conditions under the No-Action Alternative, the model simulation indicated that 704,000 acre-feet of water is expected to be supplied to M&I users in the San Joaquin River region (CH2M Hill 2000,

Table 22). This water includes surface water under water rights (such as used in portions of the cities of Modesto and Stockton) and CVP and SWP water (such as used in portions of the city of Tracy and in Kern County). This value does not include groundwater used by the municipalities. Under dry year conditions, the model simulation indicated that the overall available water from these sources would be reduced to 656,000 acre-feet of M&I water (CH2M Hill 2000, Table 22). The reduction is due only to changes in CVP and SWP water availability because the model assumed that full amounts of surface water rights would be delivered in all water year types.

ALTERNATIVE 1

Alternative 1 involves a tiered pricing program that is based on the full current contract amount of water. Socioeconomic resource use resulting from this alternative is assumed to be similar to the No-Action Alternative because, as described in Table 2-1, the amount of water delivered, the timing of those deliveries, and the rates and method of payment for water delivered under Alternative 1 would not substantially differ from the No-Action Alternative.

ALTERNATIVE 2

Alternative 2 involves the application of a tiered pricing structure that is based on a rolling five-year average of actual water deliveries, rather than the current contract amount of water. A more thorough description of the tiered pricing structure used is found in the description of Alternative 2 in Section 3.2, Agriculture. As noted in Section 3.2, the tiered pricing structure and the No-Action Alternative rates against which it is compared are used because current law requires the adoption of tiered pricing structures.

A regional economic analysis for four different regions was developed in the April 24, 2000 Technical Memorandum (CH2M Hill 2000), which is included as Appendix A. The region used for this assessment is the San Joaquin River region. The DMC Unit is included within the San Joaquin River region. Impacts to this region may overstate the impacts to the DMC Unit service area because the region encompasses a geographic area that includes, but is larger than, the DMC Unit service area.

The regional economic analysis identifies long-term direct and indirect income and employment impacts that would be expected to result from the implementation of Alternative 2. Direct impacts result from changes in agricultural production and profitability and from changes in the cost of M&I water. Had there been any changes in the cost or delivery of CVP power or impacts to recreational resources, such impacts would also have been direct. Indirect impacts are those impacts to the regional economy

that occur to other economic sectors (e.g., trade, services, manufacturing) because of the direct impacts.

As noted above, there would be no impacts to recreational resources or power resources because CVP facilities are required to be operated in the same manner, no matter how much agricultural or M&I water is actually diverted for use. Reservoir levels will be similar and conveyance facilities will continue to have similar water flows. This would allow recreational resources to continue to be used at similar levels. It also would allow CVP hydroelectric facilities to operate at the same level, maintaining the same production and price levels that would be seen under the CVPIA PEIS Preferred Alternative (No-Action Alternative conditions).

The M&I water use economics analysis developed in the April 24, 2000 Technical Memorandum (CH2M Hill 2000) assumes that M&I users can afford the calculated water costs that are described in the CVPIA PEIS. Therefore, CVP water deliveries do not change for the M&I analysis. Additional costs for M&I water are incurred, however. In an average water year, additional costs of $5.2 million are incurred under Alternative 2 (in the entire San Joaquin River region). In a dry water year, no additional costs are incurred under Alternative 2.

Since the input-output model used in the regional economic analysis developed in the April 24, 2000 Technical Memorandum (CH2M Hill 2000) assumes that a long-run equilibrium is reached, it is only appropriate to compare Alternative 2 impacts to average No-Action Alternative conditions. In addition, the only hydrologic sequence that truly reflects long-run conditions is the five-year average followed by an average year. The five-year dry period followed by an average year is also examined because, while it is not strictly a long-run scenario, some regions can be permanently impacted by a five-year series of drought years. Because of this, the results can be considered long-term.

Under the average-average hydrologic sequence discussed in Section 3.2, Agriculture, total employment decreases by 120 jobs and income from profits and wages decreases by $4.2 million. Table 3.3-4 shows the direct and total (direct plus indirect) regional economic impacts to the San Joaquin River region under the average-average hydrologic sequence.

Under the dry-average hydrologic sequence, total employment decreases by 420 jobs and income from profits and wages decreases by $12.4 million. Table 3.3-5 shows the direct and total (direct plus indirect) regional economic impacts to the San Joaquin River region under the dry-average hydrologic sequence.

Table 3.3-4
Regional Economic Impacts on All Sectors for the Average-Average Hydrologic Sequence Compared to the No-Action Alternative Average Conditions–San Joaquin River Region

Impact Resulting From:	Employment (number of jobs)		Income[1] (millions of $)	
	Direct	Total	Direct	Total
Change in Agricultural Output	0	0	-$0.1	-$0.2
Change in Agricultural Net Income	20	40	$0.5	$1.0
Change in M&I Water Costs	-80	-150	-$206.0	-$5.1
Total[2]	**-60**	**-120**	**-$2.2**	**-$4.2**

Source: CH2M Hill 2000, Table 23.
[1]Includes income from wages and profits.
[2]May differ from sum of elements because of rounding.

Table 3.3-5
Regional Economic Impacts on All Sectors for the Dry-Average Hydrologic Sequence Compared to the No-Action Alternative Average Conditions–San Joaquin River Region

Impact Resulting From:	Employment (number of jobs)		Income[1] (millions of $)	
	Direct	Total	Direct	Total
Change in Agricultural Output	-10	-20	-$0.3	-$0.7
Change in Agricultural Net Income	-140	-240	-$3.0	-$6.5
Change in M&I Water Costs	-80	-150	$0.0	$0.0
Total[2]	**-230**	**-420**	**-$5.9**	**-$12.4**

Source: CH2M Hill 2000, Table 27.
[1]Includes income from wages and profits.
[2]May differ from sum of elements because of rounding.

Population impacts can be expected to occur as a result of the implementation of Alternative 2. The key drivers in determining changes in population are birth rates, death rates, and employment. Alternative 2 will not precipitate any changes in birth or death rates, but as shown in Tables 3.3-4 and 3.3-5, employment impacts will occur.

If we assume the same ratio of employment to population is present at the county level and within the San Joaquin River region, we can estimate expected changes in population. Using the same data source that was used for Table 3.3-1 (U.S. Department of Commerce, 1998a), the 1998 population for the area encompassing San Joaquin, Stanislaus, Merced, and Fresno Counties is 1,928,868. From Table 3.3-2, total employment in 1998 can be calculated as 928,357 for the area encompassing all four counties. With this information, a population-to-employment ratio of 2.08 is calculated. If this ratio is applied to the total employment losses in Table 3.3-4, the expected impact is a loss of 250 persons (2.08×120). If this ratio is applied to the total employment losses in Table 3.3-5, the expected impact is a loss of 873 persons (2.08×420).

Impacts are presented for the San Joaquin River region as a whole. As with all impacts within a project area, the concentration of impacts to a smaller geographic area within the project area increases the relative impact, while a more uniform dispersion of impacts across the project area decreases the relative impact. While it is highly unlikely that all identified impacts would present themselves within a single water district or community, it is just as unlikely that a fully uniform dispersion of impacts across the entire project area would occur.

To the extent that income, employment, and population impacts are concentrated in a smaller geographic area, impacts to local tax bases and public services may also be exacerbated. While a lower population would lessen the strain on current public services (e.g., police and fire protection, schools, and health services) to meet the needs of their service area, the loss of income would cause a corresponding decrease in local tax revenues used to provide such public services.

More localized impacts than those identified in this analysis are almost certain to occur. However, it is also fair to say that localized impacts are already being felt in areas where the transfer of costs from areas that currently receive water at rates below the value of the water is shifted. Some of this shifting of impacts may, in fact, occur within the regional study area. While it is appropriate to analyze impacts at the regional level, it is also appropriate to recognize the potential for greater (both negative and positive) local impacts than are reflected in the analysis.

In addition, more localized employment impacts could also translate into a disproportionate impact on specific groups such as minority or rural populations. It is likely that impacts realized as a result of implementation of Alternative 2 would be greater than impacts realized as a result of implementation of Alternative 1.

CUMULATIVE IMPACTS

Overall, the cumulative impacts of renewing long-term contracts can be either beneficial or potentially adverse to socioeconomic resources. In the long-term, the renewal of long-term water service and repayment contracts is beneficial in light of past projects that have assisted growers in bringing marginal lands into irrigation and production, including the statutory authorities for long-term contract renewals listed at the start of Chapter 1.[1] Continued provision of water to agricultural and M&I users in the DMC Unit beneficially

[1] Renewal of these contracts is being undertaken in pursuance generally of the Act of June 17, 1902 (32 Stat. 388), as amended and supplemented, including, but not limited to the Acts of August 26, 1937 (50 Stat. 844) as amended and supplemented, August 4, 1939 (53 Stat. 1187) as amended and supplemented, July 2, 1956 (70 Stat. 483); June 3, 1960 (74 Stat. 156); June 21, 1963 (77 Stat. 68); October 12, 1982 (96 Stat. 1262); and October 27, 1986 (100 Stat. 3050); and Title XXXIV of the CVPIA of October 30, 1992 (106 Stat. 4706).

supports the ongoing production of food, fiber, and other agricultural resources that sustain the regional, sub-regional, and local economies.

In contrast, some aspects of long-term contract renewal may have adverse short-term effects on the economic viability of some areas. In particular, increased water prices resulting from a tiered pricing structure under some subregions and water-year scenarios, when combined with reduced south-of-Delta water supply reliability resulting from a combination of CVP operational constraints on deliveries to the DMC Unit (as discussed in Chapter 1), could result in difficult choices regarding the affordability of agricultural production as an enterprise. However, to adequately place the effect of tiered pricing aspects of long-term contract renewals in perspective, one must also consider other factors that may arguably have equal or more bearing on the affordability of agricultural production. In particular, the direction of continued agricultural subsidy and price support programs for selected crops, weather patterns, and market prices for agricultural products affect such decisions. As stated in the introduction to this section, changes in the cost or availability of production inputs also play a large part in the ability of a producer to remain viable. Land, labor, seed, machinery, fertilizers, and water are all important, interrelated components in determining production decisions and enterprise profitability.

SECTION 3.4: LAND USE

This section discusses the potential effects that the alternatives considered in Chapter 2 would have on land uses within the DMC Unit. Information in this section was summarized primarily from the final CVPIA PEIS (Reclamation and Service 1999), county general planning documents, CVP contractor water conservation plans, U.S. Bureau of the Census data on population, and information obtained in interviews with individual DMC Unit contractors.

AFFECTED ENVIRONMENT

Land use can be defined as the human use of land resources for various purposes including economic production, natural resources protection, recreation, or institutional uses. Land uses are frequently regulated by management plans, policies, ordinances, and regulations that determine allowable uses. Agricultural development and the conversion of natural habitat to agricultural uses began in the early to mid-1800s and intensified in the later 1800s as the railroads provided the means to transport agricultural produce to much larger markets. This section discusses lands in the project area at the county level and for the geographic service areas of the 20 contractors in the DMC Unit. A discussion of areas of Important Farmland is also included.

COUNTY LAND USES

As discussed previously, the DMC Unit contractors are located in the San Joaquin River Region. Land uses could be affected in portions of San Joaquin, Stanislaus, Merced, and Fresno Counties. The following discussion generally addresses lands located within these counties.

San Joaquin County

San Joaquin County encompasses approximately 1,440 square miles and includes the seven incorporated cities of Stockton, Tracy, Manteca, Escalon, Ripon, Lodi, and Lathrop. Stockton and Tracy are the largest cities in the county. The City of Tracy is the only CVP contractor in the DMC Unit that is a municipality and uses its CVP supply solely for M&I use.

Demographics

In 1990, it was estimated that more than 77 percent of the county's population resided within the seven incorporated cities, with the additional 23 percent residing within urban and rural unincorporated areas (San Joaquin County 1992a, 1992b, 1992c). The population in San Joaquin County is expected to increase from about 465,000 in 1990 to

about 750,000 by the year 2010 or to increase on average by about 14,000 persons per year (San Joaquin County 1992a, 1992b, 1992c). Year 2000 Census data reports a population of 563,598 persons in San Joaquin County (U.S. Bureau of Census 2000a). In 2004, the population of San Joaquin County was estimated to be 613,500 (California State Association of Counties 2004).

Land Use

According to the county's most recent General Plan, approximately 86 percent of the county's total acreage in 1990 was used for agriculture. The land uses in San Joaquin County are shown in Table 3.4-1.

Table 3.4-1
San Joaquin County Land Uses

Land Use	Acres	Percentage of County
Agriculture	788,896	86.47
Urban*	63,760	6.99
Other Land	49,332	5.41
Water	10,341	1.13
Total	**912,329**	**100.00**

Source: San Joaquin County General Plan (San Joaquin County 1992a, 1992b, 1992c)
* Includes residential, commercial and industrial

San Joaquin County contains large areas of highly productive soils. Agriculture and related activities have historically constituted a major portion of the county's economic base, and agriculture has been a mainstay of the county's economy. According to the 1997 Agricultural Census for San Joaquin County, there were 808,838 acres in farms; this represents an increase from 783,715 acres in 1992, but a decrease from the 823,729 acres in 1987. It is estimated that with projected population growth and continued urbanization in the county that the amount of agricultural land lost could increase from the 10 percent loss over the last 50 years to a 33 percent loss by the year 2040 (San Joaquin County 1992a).

Stanislaus County

Stanislaus County encompasses an area of approximately 1,500 square miles and includes the nine incorporated cities of Ceres, Hughson, Modesto, Newman, Oakdale, Patterson, Riverbank, Turlock, and Waterford. Modesto and Turlock are the largest cities in the county.

Demographics

In 1990, an estimated 74 percent of the population lived in incorporated areas, an increase from 65 percent in 1980 (Stanislaus County 1994). Based on U.S. Bureau of the Census data, the population in Stanislaus County increased by 39 percent in the 1980s from 265,900 to 370,522. This compared to the average increase statewide of 26 percent. Between 1980 and 1990, the population in Stanislaus County increased by 59 percent in incorporated cities, while the unincorporated areas saw an increase of only 3 percent. Since 1990, the county's population has continued to grow at an average annual rate of

3.5 percent, reaching a total population of 412,676 in 1994 (Stanislaus County 1994). Year 2000 Census data reports a population of 446,997 persons in Stanislaus County (U.S. Bureau of Census 2000b). In 2004, the population of Stanislaus County was estimated to be 481,600 (California State Association of Counties 2004).

Land Use

Stanislaus County has adopted a number of community plans for most of the unincorporated towns in the county. Community plans outline land uses and future growth patterns of the towns in the county and are used in conjunction with county general planning documents. For unincorporated areas not included in a community plan, land use designations generally include residential, commercial, industrial, agricultural, urban transition, and industrial transition. Over 95 percent of the area in the unincorporated county is zoned for agricultural use.

The incorporated cities in the county have adopted city general plans. Specific land use information is available from community and city general plans. General countywide land use information is not readily available in the Stanislaus County General Plan. However, the plan does state that urban development has spread over 48,000 acres, much of which was originally prime farmland in agricultural production. According to the 1997 Agricultural Census for Stanislaus County, there were 732,736 acres in farms; this represents a decrease from 759,649 acres in 1992 and a further decrease from 819,845 acres in 1987.

Merced County

Merced County encompasses approximately 2,020 square miles and includes the six incorporated cities of Atwater, Dos Palos, Gustine, Livingston, Los Banos, and Merced and 18 unincorporated communities. Merced is the largest incorporated city in the county.

Demographics

From 1980 to 1990, the population in Merced County grew by over 33 percent from 134,560 to 178,403. This is compared to the average increase statewide of 26 percent. The incorporated cities grew by approximately 41 percent and the unincorporated areas by 19 percent. Year 2000 Census data reports a population of 210,554 persons in Merced County (U.S. Bureau of Census 2000c). In 2004, the population of Merced County was estimated to be 225,100 (California State Association of Counties 2004).

Land Use

Merced County uses the “Urban Centered Concept” as a basic land use principle. This concept directs urban development in identified centers. Increased growth often results in

a loss of the most productive agricultural soils. Under this concept, however, urban development will only occur within cities, unincorporated communities, and other urban centers. The Urban Centered Concept was revised in 1990 to include the development of unincorporated communities in the foothills on both sides of the county. This revision has fostered the planned development of subdivisions that will presumably become the urban centers for new communities in the foothills of the county.[1] In Merced County, besides the urban areas discussed above, rural areas of the county, which are typically used for cropping or pasturing activities, are subject to their own land use designations. When the general plan was developed in 1990, it was estimated that 80 percent of the population lived in the urban centers, the remaining 20 percent lived in rural areas, and 95 percent of the land in the county was considered rural.

According to the 1997 Agricultural Census for Merced County, there were 881,696 acres in farms, a decrease from 1,049,302 acres ten years earlier.

Fresno County

Fresno County encompasses nearly 6,000 square miles and includes the 15 incorporated cities of Coalinga, Clovis, Firebaugh, Fowler, Fresno, Huron, Kerman, Kingsburg, Mendota, Orange Cove, Parlier, Reedley, San Joaquin, Sanger, and Selma. Over 60 percent of the population resides in the county's two largest cities, Fresno and Clovis.

Demographics

According to Department of Finance population estimates, the population in Fresno County grew between 1980 and 1990 by approximately 29 percent, from 514,621 to 661,400. This is compared to the average statewide increase of 26 percent. The combined populations of Fresno and neighboring Clovis comprise 61 percent of the total county population and 82 percent of the population of the other incorporated cities combined (County of Fresno 2000a). Year 2000 Census data reports a population of 799,407 persons in Fresno County (U.S. Bureau of Census 2000d). In 2004, the population of Fresno County was estimated to be 841,400 (California State Association of Counties 2004).

Land Use

In 1997, approximately 50 percent of the county's total acreage was used for agriculture. The current land uses in Fresno County are shown on Table 3.4-2.

[1] Pursuant to the Merced County General Plan, full environmental review is required for community specific plans for any such development that may, to the extent they are within the CVP permitted place of use, eventually rely on the CVP allocation to the agricultural water districts after the environmental review has been completed.

Farming and agriculture-related businesses comprise a major component of the local economy. Factors that contribute to its success include excellent soil and climatic growing conditions and workforce and transportation availability. According to the 1997 Agricultural Census for Fresno County, there were 1,881,418 acres in farms; this represents a decrease from 1,975,373 acres in 1987.

Table 3.4-2
Fresno County Land Uses
(1997)

Land Use	Square Miles
Residential	152
Commercial	7
Industrial	11
Agricultural	2,911
Resource Conservation[1]	2,691
Unclassified[2]	11
Incorporated Cities	154
Total	**5,937**

Source: Fresno County General Plan (County of Fresno 2000a, 2000b)
[1]Including national forests, parks and timber preserves
[2]Includes streets, highways and rivers

CVP CONTRACTORS

As discussed in Section 3.1, 20 contractors receive CVP water from the Delta-Mendota Canal. The following discussion provides information on land uses for each contractor as well as a discussion of current agriculture and future trends in agriculture as applicable. The figures included at the end of Section 3.1 display the current land use/land cover for those contractors discussed below.

Banta-Carbona Irrigation District

Banta-Carbona Irrigation District is entirely an agricultural district and currently does not supply any water for M&I use. It is anticipated that as the City of Tracy and the Interstate 5 corridor continue to grow, some areas currently within the district may be detached and annexed to the City of Tracy. Also, new areas that may require water for M&I purposes would be detached from the district. Currently, a few parcels within the district are targeted for detachment and would be annexed to the City of Tracy. Whenever a new urban expansion is planned, the land is automatically deleted from district boundaries. Banta-Carbona Irrigation District has informed Reclamation of its plan to transfer a portion of its CVP supply to the City of Tracy by 2025. Therefore, while vulnerable to development pressures along the Interstate 5 corridor, Banta-Carbona Irrigation District is expected to remain an entirely agricultural district.

The district was considered built-out in 1968, following the completion of an underground pipeline made possible with funds from a PL 84-984 federal assistance loan. All of those facilities have been used for district deliveries. However, as the City of Tracy continued to expand, some of these facilities have been modified or moved to continue serving the agricultural lands remaining in the district; water service through some of the newest

alignments has not yet begun. When an area is detached from the district, the water that was used to serve the land remains with the district.

Major crops being produced within the district include both row crops (cannery tomatoes, dry beans, alfalfa, and a small quantity of melons) and permanent crops (primarily almonds, with smaller amounts of walnuts, apricots, peaches, and apples). Also, some areas have been planted with grapes over the last few years. Irrigation methods include furrow, open ditch or border flooding, siphon pipe on row crops, and sprinklers on permanent crops. Historically, small areas of the district have remained fallow during the growing season.

Broadview Water District

Most of the farmers in the Broadview District lease the land from absentee landowners. Broadview Water District is almost entirely an agricultural district. The only CVP water used for M&I use is 23 acre-feet, which is used as the drinking water source in the district. The drinking water serves both Broadview Water District buildings and a small number of residents. Because Broadview Water District is located in a rural area away from major development pressures, the conversion from agricultural to M&I uses is unlikely.

Cropping patterns in the district have remained stable. The entire district is planted in row crops with approximately one-half of the district producing cotton. Other crops include seed alfalfa, tomatoes, and melons. There are no permanent crops in the district because of shallow groundwater levels. Irrigation methods include primarily furrow and gated pipe, with a smaller number of acres on sprinklers. Historically, areas of the district have remained fallow during the growing season.

Centinella Water District

The Centinella Water District, an entirely agricultural district, is 840 acres in size and has only one landowner. All CVP water is used for agricultural uses. Because Centinella Water District is located in a rural area away from major development pressures, the conversion from agricultural to M&I uses is unlikely. While Del Puerto Water District provides the administrative functions for the district, Centinella Water District has its own CVP contract.

City of Tracy

All CVP water received by the City of Tracy is used for M&I purposes. As urban growth continues both in Tracy and along the Interstate 5 corridor, urbanization would likely continue to expand into neighboring water districts. It is expected that some lands located in neighboring The West Side Irrigation District, Plain View Water District, and Banta-

Carbona Irrigation District may detach from their respective districts and be annexed to the City of Tracy. Once annexed, the City of Tracy will be responsible for fulfilling all water supply needs. To meet its growing water demands, the City of Tracy is actively pursuing additional surface water supplies in the form of permanent water transfers. The West Side Irrigation District is currently working with the City of Tracy to permanently transfer 5,000 acre-feet (2,500 acre-feet initially, with another 2,500 acre-feet in five years) of CVP supply for M&I use to help meet the city's growing demand. In addition, the South County Water Supply Program is expected to supply 10,000 acre-feet of treated surface water supply to the City of Tracy (South County Water 2004). Construction of facilities necessary to provide the supplemental supply is currently under way and is scheduled to be completed by the summer of 2005. The Banta-Carbona and West Side Irrigation Districts have also informed Reclamation of their plans to transfer a portion of their CVP supplies to the City of Tracy by 2025.

A large portion of the development in Tracy will be residential in nature; however, an increase in industrial and commercial development is also anticipated. Fueling the growth in the area is low land prices, expansion out of the San Francisco Bay Area, and freeway access.

Coehlo Family Trust

The portion of the Coehlo Family Trust property under contract with Reclamation for the delivery of CVP water is 1,120 acres in size. Row crops grown on the property include primarily cotton, with smaller quantities of wheat, garlic, and cannery tomatoes. Permanent crops include table grapes.

The Coehlo Family Trust property is located in the area of the Interstate 5 Business Development Corridor. This corridor is a rural partnership for Central California commerce and is formed by a coalition of the cities of Firebaugh, Mendota, Kerman, and San Joaquin and the unincorporated community of Tranquillity, in western Fresno County. The group has a goal of working as a cooperative association to attract business and industrial development and new jobs to the area. The area is currently experiencing small amounts of growth; however, this growth is not expected to affect the Coehlo Family Trust property operations in the short term. Growth in this portion of Fresno County is considered minor compared to the major growth pressures experienced along Interstate 5 near the cities of Patterson and Tracy.

Del Puerto Water District

Del Puerto Water District is primarily an agricultural district. There are about 170 water users in the district. Currently, the only CVP supply used for M&I purposes is the 1 acre-

foot of water supplied to the city landfill each month for dust suppression. All remaining CVP supplies are used for agriculture. Despite the urban sprawl in the area resulting from the growth of Patterson and Tracy and along the Interstate 5 corridor, Del Puerto Water District would like to continue to remain primarily an agricultural district. The district does not intend to increase the amount of CVP water used for M&I purposes.

More than 30 different crops have been grown commercially in the district over the years. Principal crops grown include row crops (cannery tomatoes, alfalfa, large limas, and dry beans). However, almost one-half of the agricultural production in the district is permanent crops (almonds, apricots, and walnuts). Typical irrigation methods in the district include primarily furrow irrigation for row crops and sprinkler, sprinkler with less frequent use of drip, and micro-misters for permanent crops. Historically, areas of the district have remained fallow during the growing season.

Eagle Field Water District

Eagle Field Water District is entirely an agricultural district. Because it is located in a rural area away from major development pressures, the conversion from agricultural to M&I uses is unlikely. The crops produced in the district include cotton, cannery tomatoes, and rice. In the past, some of the land has also been farmed with sugar beets and dry onions.

Fresno Slough Water District

Fresno Slough Water District is entirely an agricultural district and does not supply water for M&I use. It is also located in the area of the Interstate 5 Business Development Corridor, nearest to the town of Tranquillity. While the area is currently experiencing small amounts of growth, this growth is not expected to affect the district's ability to remain entirely an agricultural district.

There are about 10 landowners in the district. Most of these landowners have farmed in the district for a number of years, contributing to its stable landowner base. Crops grown in the district are predominantly row crops (cotton, seed alfalfa, and sugar beets). There are few, if any permanent crops in the district and no major land conversions to permanent crops are anticipated. The main reason for the reliance on row crops rather than permanent crops is that soils are typically heavy clays and suitable only for row crops. Irrigation methods in the district include mostly furrow irrigation and a few solid-set sprinklers. Historically, small areas of the district have remained fallow during the growing season.

James Irrigation District

James Irrigation District is entirely an agricultural district and currently does not supply any water for M&I use. The district is also located in the area of the Interstate 5 Business Development Corridor and nearest to the city of San Joaquin in Fresno County. While the area is currently experiencing small amounts of growth, this growth is not expected to affect James Irrigation District's ability to remain entirely an agricultural district.

There are approximately 200 farms in James Irrigation District and about 23,233 acres of the 26,103-acre district were irrigated in 1996. The principal crops grown in the district include cotton and seed alfalfa with smaller amounts of alfalfa hay and tomatoes. Also, a small parcel of land (less than 500 acres) produces barley and wheat in rotation. Soil types in the areas of row crops include heavy Merced clay. Soil types in small areas of the district include light sandy loam soil types; these areas are planted with permanent crops (almonds and grapes). The trend in the district has been a gradual shift from larger farms to smaller family-owned farms. The typical irrigation method in the district is furrow irrigation. Drip irrigation was used for grapes. Historically, areas of the district have remained fallow during the growing season.

Laguna Water District

Laguna Water District is entirely an agricultural district with only one landowner. Because it is located in a rural area away from major development pressures, the conversion from agricultural to M&I uses is unlikely. Primary crops produced in the district include alfalfa hay, cotton, oats, sugar beets, and wheat. All the land in the district is irrigable agriculture.

Tranquillity Public Utilities District

The Tranquillity Public Utilities District includes approximately 32 farmable acres located adjacent to Fresno Slough. A portion of the property is occupied by the wastewater treatment plant. The balance is used for agriculture and is located in the area of the Interstate 5 Business Development Corridor. The nearby area is currently experiencing small amounts of growth; however, this growth is not expected to affect the Tranquillity Public Utilities District property operations in the short term.

Mercy Springs Water District

Mercy Springs Water District is entirely an agricultural district. Because it is located in a rural area away from major development pressures, the conversion from agricultural to M&I uses is unlikely. The crops typically produced in the district include cotton and alfalfa. All administrative functions for the district are currently being provided by Panoche Water District. Also, most of the district has been acquired by the Panoche

Drainage District for use as a regional drainage management facility on which subsurface drain water is applied to salt-tolerant crops. The CVP contract supply for this area has been assigned to other CVP districts. Administrative functions for Mercy Springs Water District are performed by Panoche Water District.

Oro Loma Water District

Oro Loma Water District is entirely an agricultural district with only one landowner. Because it is located in a rural area away from major development pressures, the conversion from agricultural to M&I uses is unlikely. The crops typically produced in the district include rice, and historically, some of the land has also been farmed with cotton.

Patterson Irrigation District

Patterson Irrigation District is entirely an agricultural district. The district provides no M&I water. It is anticipated that as Patterson and the Interstate 5 corridor continue to grow, any new proposed development requiring M&I water would be detached from the district. Patterson Irrigation District policy requires water users requesting M&I water to detach from the district. Therefore, despite neighboring growth pressures, Patterson Irrigation District is expected to remain entirely an agricultural district.

In the last 15 years, the primary crops have included apricots, beans, and alfalfa. Because the district is located in the heart of dairy country, crops like alfalfa will continue to be staple crops. However, there is a continued conversion from these row crops to higher valued permanent crops (almonds). Patterson Irrigation District does not currently maintain detailed records regarding irrigation methods. The best estimates show that the main irrigation methods used between 1986 and 1996 were primarily furrow/border followed by sprinklers and trickle irrigation.

Plain View Water District

Plain View Water District is primarily an agricultural district. In 1990, a portion of the district's CVP supply was allocated for M&I use to service commercial and residential development. The water provided by the district was treated and delivered by the City of Tracy. The district also intends to continue to provide M&I water to increasing urban development within its boundaries. This water will also be treated and delivered by the City of Tracy. Alternatively, the district may decide to assign a portion of its CVP water supply to the City of Tracy. Since 1990, approximately 500 acres of land have been converted to M&I use. The water allocated for the converted land will continue to serve the new land use through the City of Tracy water supply system. It is possible that as Tracy continues to grow, the amount of CVP water used for M&I purposes could increase.

It is also possible that the growth could result in some areas currently within the district being detached and annexed to the City of Tracy.

Row crops produced within the district include primarily alfalfa. Permanent crops include almond and cherries. There is also some dry farming in the district. Typical irrigation methods include primarily furrow and border irrigation and sprinklers.

Reclamation District #1606

Reclamation District #1606 has only one lessee and is entirely an agricultural district. Historically, only a small area of the district has been farmed and all remaining lands remained fallow. On those acres being farmed, cotton is the only crop produced. The other portions of the district are typically used for dry grazing.

Reclamation District #1606 is adjacent to James Irrigation District and near the city of San Joaquin. While the area is currently experiencing small amounts of growth, this growth is not expected to affect Reclamation District #1606's ability to remain entirely an agricultural district.

The West Side Irrigation District

The West Side Irrigation District is divided in half by the City of Tracy and, therefore, is directly impacted by the city's continuing growth. Currently, the district is an agricultural district and does not provide any water for M&I use. The district would prefer to continue to be solely an agricultural district. The City of Tracy has recently considered annexing approximately 1,400 acres of the district. It is possible that as the City of Tracy continues to grow, additional acres could be detached from the district. The district has held discussions with the City of Tracy to permanently transfer 5,000 acre-feet of CVP supply to meet Tracy's growing demand. This transfer would allow the district to continue to be strictly an agricultural district.

There are about 100 water users within the district. The main crops typically produced in the district include alfalfa for hay, cannery tomatoes, and beans. Although there are two small parcels of permanent crops (apricots and walnuts) within the district, the soil in the district is substandard for growing permanent crops and further conversion to permanent crops is not anticipated. Major irrigation types include furrow and border (flood) irrigation. The use of sprinkler irrigation in the district is difficult because of high winds. This year, no historically farmed land is fallow.

Tranquillity Irrigation District

Tranquillity Irrigation District is an agricultural district and currently does not supply water for M&I use. It is also located in the area of the Interstate 5 Business Development Corridor, nearest to the town of Tranquillity. While the area is currently experiencing small amounts of growth, this growth is not expected to affect the district's ability to remain entirely an agricultural district.

Principal crops grown in the district include cotton, seed alfalfa, canning tomatoes, sugar beets, and melons. Over the past few years, about 50 acres of land have been converted from row crops to permanent crops (almonds). The almond trees are still young (at two to three years old); however, it is expected that if they are successful, more land will be converted from row crops to more profitable permanent crops. The district has also experimented with growing small areas of innovative crop types including mustard, bell peppers, and zinnias for seed. It is estimated that 9,270 of the 10,750 acres in the district are irrigated. Typical irrigation for the row crops includes furrow irrigation. Drip systems were also installed for those acres converted to permanent crops. Tranquillity Irrigation District has approximately 100 landowners.

West Stanislaus Irrigation District

West Stanislaus Irrigation District is entirely an agricultural district and currently provides no water for M&I use. Although some land within the district is zoned for industrial use, there are currently no known development plans. It is also the district's policy to remain solely an agricultural district and it requires that any M&I users detach from the district.

Primary crops in the district include row crops (cannery tomatoes, beans, and alfalfa). The district has also continued to see a conversion from row crops to more profitable permanent crops including almonds and grapes. This trend is expected to continue. A portion of the district land is also being used for dairy farms. The typical irrigation methods in the district are furrow irrigation for row crops and drip irrigation or sprinklers for permanent crops. Gated pipe is also used extensively throughout the district for both furrow and border irrigation.

Widren Water District

Widren Water District is approximately 30 acres in size and is entirely an agricultural district with only one landowner. Because it is located in a rural area away from major development pressures, the conversion from agriculture to M&I is unlikely. Crops typically produced in the district include seed alfalfa and sugar beets.

FARMLAND CATEGORIES

Table 3.4-3 contains a description of farmland categories as defined by the U.S. Department of Agriculture, Natural Resources Conservation Service. Some of these farmland categories are found within San Joaquin, Stanislaus, Merced, and Fresno Counties.

Table 3.4-3
Important Farmland Map Categories

Category	Description
Prime Farmland	Land that has the best combination of physical and chemical characteristics for producing food, seed, forage, fiber, and oilseed crops and is also available for use. It has the soil quality, growing season, and moisture supply needed to produce economically sustained high yields of crops when treated and managed according to acceptable farming methods.
Farmland of Statewide Importance	Land other than Prime Farmland that has a good combination of physical and chemical characteristics for crop production. The land must have been used for production of irrigated crops within the last three years and also meet specific criteria including soil temperature and range.
Unique Farmland	Land that does not meet the criteria for either Prime Farmland or Farmland of Statewide Importance, but that is used for the production of specific high economic value crops. It is land that has a special combination of soil quality, location, growing season, and moisture supply needed to produce sustained high quality of high yield of specific crops.
Farmland of Local Importance	Land that may be important to the local economy because of its productivity.

Source: County of Fresno 2000b.

Prime farmland continues to decline across the counties encompassing the contract service areas. Table 3.4-4 summarizes important farmland trends for Fresno, Merced, San Joaquin, and Stanislaus Counties.

REGULATORY SETTING

Williamson Act

The California Land Conservation Act of 1965 (more commonly known as the Williamson Act) established a voluntary tax incentive program for preserving both agricultural and open space lands. The Act reduces property taxes in return for the guarantee that the property will remain in agriculture for not less than 10 years, thereby slowing down the conversion of agricultural land. Under the Act, property owners enter into 10-year contracts with their respective counties. The county then places restrictions on the land in exchange for tax savings. The property is then taxed according to the income it is capable

Table 3.4-4
Important Farmland Changes from 2000 to 2002

Type of Farmland	Fresno County		Merced County		San Joaquin County		Stanislaus County	
	2000	2002	2000	2002	2000	2002	2000	2002
Prime Farmland	734,052	731,149	287,160	286,054	419,227	415,527	264,121	260,730
Farmland of Statewide Importance	491,569	490,353	157,936	158,405	93,739	92,521	30,715	30,069
Unique Farmland	104,223	102,946	96,355	100,749	59,118	61,849	59,850	61,205
Farmland of Local Importance	70,691	74,347	47,621	41,772	58,906	56,507	31,848	29,519
Important Farmland Subtotal	1,400,535	1,398795	589,072	586,980	630,990	626,404	386,534	381,523

Source: California Department of Conservation 2004; Division of Land Resource Protection, Farmland Mapping and Monitoring Program 2004.

of generating from agriculture and other compatible uses, rather than being taxed on its full market value. The contract is automatically renewed annually after the first 10 years, unless a written request, called a Notice of Non-Renewal, is prepared.

The California Department of Conservation, Division of Land Resources Protection maintains information by county on acres of land currently enrolled in the Williamson Act. Table 3.4-5 summarizes acreage of farmland enrolled in the Williamson Act for Fresno, Merced, San Joaquin, and Stanislaus Counties.

Table 3.4-5
Williamson Act: Total Reported Enrollment in 2000 and 2001

Type of Farmland	Fresno County		Merced County		San Joaquin County		Stanislaus County	
	2000	2001	2000	2001	2000	2001	2000	2001
Prime	1,084,968	1,080,671	--*	215,249	343,153	338,757	281,910	284,764
Nonprime	487,012	487,075	--*	122,907	151,703	148,213	405,484	404,869

Source: California Department of Conservation 2004
*Merced County began its participation in the Williamson Act in 2000; therefore, the number of acres in 2000 was unavailable.

ENVIRONMENTAL CONSEQUENCES

The renewal of the long-term contracts could potentially affect the following:

- Agricultural lands going out of production and remaining fallow, including some Prime or Unique Farmlands.

- Agricultural lands being converted to M&I use.

ACTIONS NOT EVALUATED IN THIS EA

The authorities and laws governing the renewal of the DMC Unit long-term water service contracts allow no discretionary control over private land-use activities. The renewal of long-term water service contracts being analyzed in this document, therefore, does not include any actions on private land.

Actions outside the renewal of current water service contracts between Reclamation and the DMC Unit contractors are also not analyzed. In addition, Reclamation's action does not include any discretionary actions relating to land-use questions. Changes in land use will be determined by the actions of individual water users as a result of multiple factors, including many that are unrelated to the federal action of this contract renewal.

For example, the implementation of long-term water service contract renewals would not directly affect land uses or result in any land use changes within the DMC Unit. It would not require the construction of new facilities that would alter current land uses and would not result in the installation of any structures that would conflict with current land use plans. The construction of facilities and the installation of structures associated with the operation and maintenance of the DMC Unit facilities are separate actions, subject to compliance with federal law and separate environmental review.

LAND FALLOWING

As discussed above under Affected Environment, some previously farmed land in the project area may remain fallow during a particular growing season. It can be assumed that some of this land also meets the Important Farmland criteria listed in Table 3.4-3. The specific districts that have fallowed land and the amounts and locations of the fallowed land vary during each growing season. Among the several reasons that land may be fallowed are:

- Water deliveries, reliability, and timing and their relation to pre-planting and management decisions and costs.

- Water availability.

- Water rights being transferred from one parcel of land to another.
- Economics, including cost controls, commodity pricing and market conditions.
- Foreclosures.
- Marginal agricultural land or poor soil conditions.
- Growth pressures (discussed below).

M&I, COMMERCIAL, AND RESIDENTIAL DEVELOPMENT

The long-term water service contract renewals would also not directly or indirectly cause land use to change from irrigation to M&I uses. Land use changes could occur regardless of the renewal, in part, because only cities and counties have land use jurisdiction. The irrigation or water districts or other agricultural districts have no land use jurisdiction, and thus they cannot control such changes within their boundaries. Moreover, the renewals are only for the maximum quantity available to each contractor under its current long-term water service contract. Therefore, there would be no substantive change from the supply provided under these contracts. It is important to emphasize that ongoing and future development pressures in the DMC Unit will continue to rely on CVP water.

The provision of continued CVP water service pursuant to the renewal of long-term water service contracts and authorized use of water for irrigation or M&I purposes means that M&I development may occur at some level and that some CVP contract water supply could be converted from agricultural to M&I use. This type of analysis, however, is "fact-specific," and the outcome depends in large part on the availability of alternative water supplies and reasonably foreseeable events that are outside of the scope of this EA.

The San Joaquin River Region is experiencing unprecedented growth and considerable development pressures. The Central Valley has become a magnet for those in search of affordable housing within a commuting distance of major employment centers. Specifically, for San Joaquin and Stanislaus Counties, this growth is primarily a result of people who move from the San Francisco Bay Area in a search for affordable housing costs and a highly attractive quality of life. Increased demand for residential property, combined with low prices for agricultural products and rising costs of farming, has created increased pressure for farmers to sell their land for housing developments. As the population increases and development pressures continue, it is expected that a corresponding increase in urban development and a decrease in agricultural lands in production would also continue.

Many of the DMC Unit contractors could be directly affected by the increasing growth pressures (specifically, those contractors located in San Joaquin and Stanislaus Counties and near the cities of Tracy and Patterson). While it is the policy of most of these districts to remain entirely agricultural districts, this could require an area currently within the district to detach from the district if M&I water is required for development. In the case of some districts, the amount of CVP water used for M&I purposes could increase.

The factors that could limit the potential for growth include the lack of water and areas that cannot be developed. Increased development pressures may result in increased pressures for additional M&I supply. In some areas, current water restrictions could result in little or no room for growth. Overall, to accommodate growth, other options for water supply would need to be considered, including water transfers and exchanges or additional groundwater pumping, if that is a feasible water supply option in the area.

INDIRECT IMPACTS/INTERRELATED ACTIVITIES

As a result of the federal action evaluated in this EA, DMC Unit contractors would continue to receive CVP water supplies in quantities that do not exceed their current contract amounts and that provide for continued agricultural or M&I use in their service areas. To the extent that such uses depend upon CVP supplies to continue, such continued uses are an indirect effect of contract renewal or are an interrelated activity. Much or all of the lands in the DMC Unit that can be cultivated are cultivated, and therefore continuation of the supply of water or even the addition of water would simply be used on lands currently under production. Thus, contract renewal would not result in increasing the level of agricultural activity within the DMC Unit above the current baseline.

In terms of indirect impacts, continued delivery of CVP water in the DMC Unit will likely support current trends towards M&I development in only specific, limited areas. The respective percentage and distribution of M&I and agricultural activities in the project area will be subject to a wide range of economic factors, local land use decisions, and other factors outside of Reclamation's control.

Depending on the effects of other contract provisions, such as increased prices for water, or related federal actions causing increased shortages of available CVP supplies, the amount of CVP water used by irrigation and M&I users may decrease as a result of the renewed contracts. Such indirect effects cannot be determined or quantified.

NO-ACTION ALTERNATIVE

As described in Chapter 2, the No-Action Alternative provides a baseline condition for comparing the action alternatives and represents future conditions at a projected level of

development without the implementation of any action alternative. Under the No-Action Alternative, long-term contracts would be renewed and contractors would still receive their CVP allocation.

The No-Action Alternative would not directly impact land uses within the project area. The renewal of long-term contracts in the DMC Unit would not involve construction of new facilities that would alter current land uses and would not result in the installation of structures that would conflict with current land use plans.

The long-term renewal of CVP water to the project area would only continue to provide water supplies that accommodate a portion of the planned populations and land uses that have been identified in the county general planning documents. The renewal of the long-term contracts would beneficially continue the water supply for agricultural production and crop production and, therefore, contribute to the continued production of these lands. Implementation of this alternative would not directly impact the continued production of agricultural crops or impair the productivity of important farmlands.

An indirect impact could occur as more land is fallowed when surface water supplies are unavailable or when deliveries are reduced in response to higher water costs under tiered pricing. Also, alternative surface water and groundwater supplies may become unaffordable because of the factors listed above. It is, however, difficult to attribute a corresponding loss of acreage to the affordability of water because of the wide range of factors that drive land use decisions.

ALTERNATIVE 1

Similar to the discussion above for the No-Action Alternative, Alternative 1 would not directly result in any adverse impacts to land use. The long-term renewal of CVP water to the project area would only continue to provide water supplies that accommodate a portion of the planned populations and land uses that have been identified in the county general planning documents. The renewal of the long-term contracts would continue the water supply for agricultural production and crop production and, therefore, contribute to the continued production of these lands. Implementation of this alternative would not directly impact the continued production of agricultural crops or impair the productivity of important farmlands.

ALTERNATIVE 2

Similar to the discussion above for the No-Action Alternative, Alternative 2 would not directly result in any adverse impacts to land use. The long-term renewal of CVP water to the project area would only continue to provide water supplies that accommodate a portion

of the planned populations and land uses that have been identified in the county general planning documents. The renewal of the long-term contracts would continue the water supply for agricultural production and crop production and, therefore, contribute to the continued production of these lands. Implementation of this alternative would not directly impact the continued production of agricultural crops or impair the productivity of important farmlands.

CUMULATIVE IMPACTS

Some of the DMC Unit contractors that are primarily agricultural could be affected by increasing growth pressures as California's population and economy continue to expand and to locate in the San Joaquin Valley. Most likely to be affected are those contractors located in San Joaquin and Stanislaus Counties and along the portion of the Interstate 5 corridor near the cities of Tracy and Patterson (i.e., Banta-Carbona Irrigation District, Del Puerto Water District, Patterson Irrigation District, Plain View Water District, The West Side Irrigation District, and, to a lesser extent, West Stanislaus Irrigation District).

Contractors in the I-5 Business Development Corridor, such as Tranquillity Irrigation District, James Irrigation District, Reclamation District #1606, the Coehlo Family Trust, and Tranquillity Public Utilities District, could also be affected, although the growth pressure is far less evident in that area. It is the present policy of most of these districts to remain entirely agricultural districts and to require that an area currently within the district to detach from the district if the land is to be converted from irrigated land to an M&I purpose of use. The only exception is the Plain View Water District, which has overlapping boundaries in some instances with the City of Tracy and has entered into arrangements for the City of Tracy to treat and deliver some of the district's M&I water to areas within the district's boundaries. Because the City of Tracy is already an M&I-only contractor, continued CVP service under its renewal contract would not cause a change.

In summary, any conversions from agricultural to M&I land use within the DMC Unit would not be caused by the terms of the renewal contract, nor by actions of the contractors that have no land use planning jurisdiction. Instead, such changes will result from land use planning decisions made by individual landowners. Some guidance as to the likely effect of future development in the area is found in the conservation policies of the agencies with land use planning jurisdictions. For example, the open space policies set forth in the City of Tracy General Plan and the opportunities for participation in the San Joaquin County Multi-Species Habitat Conservation Plan indicate that parties converting land to M&I uses in the area that is under the greatest development pressure will only be able to do so after an appropriate assessment of and mitigation for environmental impacts.

In order to evaluate how a change from an agricultural land use to an M&I land use could affect the environment, it is necessary to know both the current use of the parcel of land and the species associated with that parcel or area. The location of the converted land and the nature of the proposed M&I use are also highly relevant factors. Such information cannot be identified until specific changes have been proposed as part of the environmental review of the specific projects.

SECTION 3.5: AIR QUALITY

This section discusses the potential effects that the alternatives considered in Chapter 2 would have on the air quality in the area of the DMC Unit. Information in this section was summarized from the Draft CVPIA PEIS, Air Quality, Technical Appendix, Volume 6 (Reclamation 1997e) and has been updated as appropriate for more recent changes in air quality standards.

AFFECTED ENVIRONMENT

Most of the air pollutants in the area of the DMC Unit are associated with both urban and agricultural land uses. In general, there are four basic land uses: irrigated agriculture; dryland agriculture (dry cropped, fallow, idle, or grazed land); M&I; and undeveloped (natural). The primary air pollutants include particulate matter (PM) and hydrocarbons or organic gases that may serve as ozone (O_3) precursors.

Pollutants commonly associated with agricultural land uses include particulate matter, carbon monoxide (CO), nitrogen oxides (NO_x), and ozone precursors. Particulate matter results from field burning, farm operations such as tilling, plowing, and the operation of farm equipment on loose earth, and entrained road dust releases and fuels combustion in vehicles and farm equipment. Particulate emissions may also occur when fallowed fields do not have a crop cover to inhibit wind erosion. Carbon monoxide is released to the atmosphere during field burning and fuel combustion in farm equipment. Nitrous oxides are also released during field burning. Ozone precursors are released in farm equipment emissions and during the application of pesticides and fertilizers. The effect of these practices on air quality conditions may be influenced by meteorological conditions, the variability of emissions controls, and the adoption and enforcement of emissions regulations.

Many M&I practices result in hydrocarbon and particulate matter emissions. Sources of hydrocarbon emissions include fuel combustion in vehicles and industrial equipment, painting and solvent use, and residential heating. Sources of particulate matter emissions include dust entrained in pavement, structural and automobile fires, construction and demolition, residential fuel combustion, and fuel consumption in vehicles. CVPIA actions are not anticipated to affect air pollutants associated with relatively minor urban and industrial uses in the DMC Unit. Therefore, this section focuses on potential impacts to air quality conditions that would result from changes in agricultural land uses.

The DMC Unit is located in the San Joaquin Valley Air Basin (SJVAB), which includes the southern portion of the Central Valley, including the lower slopes of the mountain

ranges. The air quality of the SJVAB is regulated by the San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD), which has jurisdiction over Merced, Fresno, San Joaquin, and Stanislaus Counties. The entire SJVAB is designated nonattainment[1] with respect to federal and state ozone and particulate matter standards, and the urban area of Fresno is nonattainment for federal and state carbon monoxide standards.

ENVIRONMENTAL CONSEQUENCES

Air quality impacts that could occur are judged to be adverse if the action being evaluated causes or contributes to a violation of federal or state ambient air quality standards; increases exposure of people to air pollution in concentrations in violation of ambient standards; causes pollutant or pollutant precursor emissions in excess of local air quality management agency impact adverse thresholds; or violates federal, state, or local emission limitations for specific pollutants or emission sources. Current federal and SJVUAPCD regulations require that the project alternatives not have an adverse impact on regional air quality, as reflected by the estimated long- and short-term impacts from the direct and indirect emissions sources created by the action. The SJVUAPCD recommends the following thresholds for adverse air quality impacts:

- Reactive organic gases and NO_x should not exceed 10 tons per year.
- Complying with SJVUAPCD Regulation VIII reduces potential impacts from particulate matter emissions to less than adverse. Large or high intensity construction projects near sensitive receptors may require mitigation beyond Regulation VIII.
- The project causes or contributes to an exceedance of federal and state ambient carbon monoxide standards, as determined by screening or modeling.
- The adverse threshold for hazardous air pollutant emissions is based on the potential to increase cancer risk for the person with maximum exposure potential by 10 in one million. The non-cancer Hazard Index must be less than 1. This is to be determined by screening or modeling.
- The adverse threshold for odor impacts is based on distance of the odor source from people and complaint records for the facility or a similar facility. More than one confirmed complaint per year averaged over a three-year period or three

[1] The Clean Air Act and Amendments of 1990 define a "nonattainment area" as a locality where air pollution levels persistently exceed National Ambient air Quality Standards or that contributes to ambient air quality in a nearby area that fails to meet standards.

unconfirmed complaints per year averaged over a three-year period would be an adverse impact.

- Construction impacts have the same thresholds as above, but adverse thresholds apply only during the construction period.

NO-ACTION ALTERNATIVE

In the No-Action Alternative, agricultural land uses would include similar crops and cropping patterns as those described in the Affected Environment. It is assumed that retired or fallowed lands would be reseeded with grasses and grazed by livestock or occasionally dryland-farmed.

Very little change would be seen in either irrigated acreage from average to wet to dry water years. Actively farmed lands and fallowed lands can serve as a source of fugitive air emissions, particulate emissions, and minimal emissions from farm equipment engines. Fugitive dust emissions from irrigated lands are not substantially different from dry-farmed lands or fallow lands with a non-cultivated cover crop (Montgomery Watson 1995). Furthermore, emissions from farm equipment and transportation of agricultural materials would not substantially increase under the No-Action Alternative. Therefore, the No-Action Alternative would not result in adverse impacts to air quality.

ALTERNATIVE 1

Similar to the discussion above for the No-Action Alternative, Alternative 1 would not result in adverse impacts to air quality. Agricultural land uses would include similar crops and cropping patterns as those described in the Affected Environment. It is assumed that retired or fallowed lands would naturally revegetate, be grazed by livestock, or be occasionally dryland-farmed. Therefore, Alternative 1 would not result in adverse impacts to air quality.

ALTERNATIVE 2

As described in Table 3.2-6, 1,600 total acres could be taken out of production as a result of implementing Alternative 2 under average-wet or wet-wet hydrologic sequences, as compared to No-Action Alternative wet year conditions. This would be a short-term impact because, in the long run, hydrology would reflect average levels and long-term land fallowing could be considerably lesser in extent. The only long-term impact would be the impact resulting from comparing the total acres that could be taken out of production from implementation of Alternative 2 under the average-average hydrologic sequences, as compared to No-Action Alternative average year conditions. As described in Table 3.2-6, a total of 600 acres could be taken out of production as a result of implementing

Alternative 2 under average-average hydrologic sequences, as compared to No-Action Alternative average year conditions.

Fugitive dust could be generated from these 600 acres until native plants and grasses provide natural cover for land taken out of production. As with all impacts within the study area, the concentration of impacts to a smaller geographic area within the study area increases the relative impact, while a more uniform dispersion of impacts across the study area decreases the relative impact. It is unlikely that the amount of fugitive dust generated would constitute an adverse impact of any measurable level when considered in the context of an air basin-wide impact. To the extent that land taken out of production is concentrated in a smaller geographic area, impacts could be larger to the area directly adjacent to barren lands. In addition, fugitive dust emissions from irrigated lands are not substantially different from dry-farmed lands or fallow lands with a non-cultivated cover crop (Montgomery Watson 1995).

CUMULATIVE IMPACTS

Cumulative impacts to air quality are not expected to result from the combined effect of long-term contract renewals and past, present, and reasonably foreseeable future actions related to air quality. Growth and development decisions that indirectly affect air quality by increasing the number of vehicles and their emissions will be made independently at the local land use planning decision-making level, as discussed in Section 3.4, Land Use. The California Air Resources Board continues to pursue additional incentives to reduce air pollution from agricultural sources, including the incentives in Assembly Bill 923 recently signed by Governor Schwarzenegger. Additional California Air Resources Board programs include, but are not limited to the development of the 2004 San Joaquin Valley Ozone State Implementation Plan, which identifies the clean air strategies needed to bring the valley into attainment with the federal 1-hour ozone standard by 2010, and the implementation of Senate Bill 656 enacted in 2003, which requires the board, in consultation with air districts, to develop and adopt a list of the most readily available, feasible, and cost-effective control measures that could be employed by the board and the air districts to reduce inhalable particulate matter (PM_{10}) and the subset of fine particles ($PM_{2.5}$). The goal is to make progress toward attainment of state and federal PM_{10} and $PM_{2.5}$ standards. The proposed control measures are to be based on rules, regulations, and programs existing in California as of January 1, 2004, to reduce emissions from new, modified, or existing stationary, area, and mobile sources. As a second step, the bill requires the board and air districts to adopt implementation schedules for control measures no later than July 31, 2005. By their nature, these reasonably foreseeable future actions being pursued at different stages of implementation by the California Air Resources Board are designed to address ongoing air quality issues in the project study area.

SECTION 3.6: SOILS AND GEOLOGY

This section discusses the potential effects that the alternatives considered in Chapter 2 would have on the soils and geology within the DMC Unit. Information in this section was summarized from the Draft CVPIA PEIS, Soils and Geology, Technical Appendix, Volume 2 (Reclamation 1997b).

AFFECTED ENVIRONMENT

This section describes the soils and geologic conditions found within the project area, which is located in the San Joaquin Valley and includes portions of San Joaquin, Stanislaus, Merced, and Fresno Counties as well as the geographic service areas of the 20 DMC Unit contractors.

SOILS

The soils of the San Joaquin Valley are divided into four physiographic groups: valley land soils, valley basin soils, terrace soils, and upland soils. Valley land and valley basin land soils comprise most of the San Joaquin Valley floor. In the vicinity of the Delta-Mendota Canal, valley land soils consist of deep alluvial and aeolian soils that make up some of the best agricultural land in California. Valley basin lands consist of organic soils of the delta, poorly drained soils, and saline and alkali soils in the valley trough and on the basin rims.

The San Joaquin Valley experiences drainage and soil salinity problems. Drainage problems are a result of irrigated agriculture in an area with shallow groundwater tables and little or no drainage outlet. In a large part of the valley, on the west side, shallow groundwater tables, salts imported by water deliveries, and accumulation of natural salts in soil and groundwater from irrigation threaten sustained agriculture.

Backlund and Hoppes (1984) estimated that about 2.4 million of the 7.5 million acres of irrigated cropland in the Central Valley have been affected by salt. These saline soils generally exist in the valley trough and along the eastern and western edges on both sides of the San Joaquin Valley. By the year 2000, it was projected that up to 918,000 acres of farmland in the San Joaquin Valley would be affected by high water tables less than five feet from the ground surface (San Joaquin Valley Drainage Program 1990). In addition to drainage, problems have occurred with the accumulation of toxic metals (arsenic, boron, molybdenum, and selenium) that have leached from natural deposits through the application of irrigation water.

Selenium in the soil is primarily a concern on the west side of the San Joaquin Valley. When the soils in this area are irrigated, selenium, other salts, and trace elements dissolve and leach into the groundwater (Gilliom et al. 1989). Over the past 30 to 40 years of irrigation, most soluble selenium has been leached from the soils into the shallow groundwater. It is drained from those soils when growers try to protect crop roots from salts and the high water table.

In areas with high selenium concentrations, selenium leached from the soils enters irrigation return flows and subsurface drainage flows. Irrigation of these soils further mobilizes selenium, facilitating its movement into shallow groundwater that is retained in poorly drained or mechanically drained soils. In the absence of adequate drainage facilities, leaching cannot fully remove the salts from these soils because water cannot percolate beyond one or more confining clay layers under the shallow groundwater aquifer.

GEOLOGY

The San Joaquin Valley is part of a large, northwest-to-southeast-trending asymmetric trough of the Central Valley, which has been filled with up to six vertical miles of sediment. This sediment includes both marine and continental deposits ranging in age from Jurassic to Holocene. The San Joaquin Valley lies between the Coast Ranges on the west, the Sierra Nevada on the east, and extends northwestward from the San Emigdo and Tehachapi Mountains to the Delta near the City of Stockton. The San Joaquin Valley is 250 miles long and 50 to 60 miles wide. The relatively flat alluvial floor is interrupted occasionally by low hills.

The San Joaquin Valley floor is divided into several geomorphic land types including dissected uplands, low alluvial fans and plains, river floodplains and channels, and overflow lands and lake bottoms. The alluvial plains cover most of the valley floor and comprise some of the most intensely developed agricultural lands in the San Joaquin Valley. In general, alluvial sediments of the western and southern parts of the San Joaquin Valley tend to have lower permeability than eastside deposits.

Near the valley trough, fluvial deposits of the east and west sides grade into fine-grained deposits. The San Joaquin Valley has several thick lakebed deposits. The deposit that most notably affects groundwater and confinement is the Corcoran Clay Member, deposited about 600,000 years ago. This clay bed, which is found in the western and southern portions of the valley, separates the upper semi-confined to unconfined aquifer from the lower confined aquifer (Page 1986). The clay bed covers approximately 5,000 square miles and is up to 160 feet thick beneath the present bed of Tulare Lake.

Subsidence occurs in the western San Joaquin Valley as a result of reduced groundwater elevations and the related compaction of the soil interstitial spaces that had previously been filled with groundwater. Land subsidence has caused substantial reductions in ground elevations in some locations.

ENVIRONMENTAL CONSEQUENCES

Implementation of the project alternatives would result in adverse geologic impacts if it increased the likelihood of or resulted in exposure to earthquake damage, slope failure, foundation instability, land subsidence, or other severe geologic hazards. It would be considered an adverse impact if it caused severe erosion or sedimentation or resulted in the loss of the use of soil for agriculture or habitat, loss of aesthetic value associated with a unique landform, or loss of mineral resources.

NO-ACTION ALTERNATIVE

Groundwater levels may decline 1 to 3 percent because of the allocation of CVP water to Level 2 refuge water supplies and improved fish and wildlife habitat. As a result of increased groundwater pumping, land subsidence could increase over its present rate.

Groundwater pumping and land subsidence will continue in the project area as they have historically. However, to the extent that CVP deliveries are curtailed in some years, especially in one or more successive dry years, groundwater pumping may prove to be more economical than obtaining surface water at the higher tiered price or through transfers. If this becomes the case, groundwater pumping could increase over present levels, especially in service areas that will tend to rely heavily on groundwater pumping because of limited, affordable surface water options. As a result, local groundwater levels could decline with no or little recharge and land subsidence could increase over present rates. Soils may increase in salinity because salts may concentrate from an insufficient surface water supply for adequate leaching or because of poor quality, pumped groundwater.

ALTERNATIVE 1

Alternative 1 could have impacts similar to those discussed above for the No-Action Alternative. Groundwater pumping and land subsidence will continue in the project area as they have historically. However, to the extent that CVP deliveries are curtailed in some years, especially in one or more successive dry years, groundwater pumping may prove to be more economical than obtaining surface water at the higher tiered price or through transfers. If this becomes the case, groundwater pumping would increase over present levels, especially in service areas that will tend to rely heavily on groundwater pumping because of limited, affordable surface water options. As a result, the groundwater levels

could decline with no or little recharge and land subsidence could increase over present rates. Soils may increase in salinity as salts concentrate as a result of an insufficient surface water supply for adequate leaching or poor quality, pumped groundwater.

ALTERNATIVE 2

Alternative 2 could have impacts similar to those discussed above for the No-Action Alternative. Groundwater pumping and land subsidence will continue in the project area as they have historically. However, to the extent that deliveries of CVP surface water are reduced, especially in one or more successive dry years, groundwater pumping may prove to be more economical than obtaining surface water at the higher tiered price or through transfers. If this becomes the case, groundwater pumping would increase over present levels, especially in service areas that will tend to rely heavily on groundwater pumping because of limited, affordable surface water options. As a result, the groundwater levels could decline with no or little recharge and land subsidence could increase over present rates. Soils may increase in salinity as salts concentrate as a result of an insufficient surface water supply for adequate leaching or poor quality, pumped groundwater.

CUMULATIVE IMPACTS

Long-term contract renewals, when considered in combination with other past, present, and reasonably foreseeable future actions, will not likely result in cumulative impacts to soils and geologic resources. Some DMC Unit soils may be subject to growth and development pressures that indirectly lead to the conversion of their current uses to commercial, residential, or industrial use. However, these decisions are made at the individual and local levels, and are difficult to estimate because of the speculative nature of the real estate market and locations where such pressures may arise, the ability of local jurisdictions to enforce best management practices encouraging wind and water erosion control, and the localized effectiveness of such practices. Long-term contract renewals continue the delivery of water to predominantly irrigated lands in the DMC Unit. Deliveries support the continued beneficial impacts of current farming practices that encourage erosion control from an economic standpoint. Erosion control measures practiced by DMC Unit farmers conserve topsoil that is rich in nutrients and water-holding capacity—qualities that are expensive to replace—thereby maintaining the agricultural quality of potentially affected soil resources.

SECTION 3.7: GROUNDWATER

This section discusses the potential effects that the alternatives considered in Chapter 2 would have on the groundwater resources within the DMC Unit. Information in this section was summarized from the Draft CVPIA PEIS, Groundwater, Technical Appendix, Volume 2 (Reclamation 1997b).

AFFECTED ENVIRONMENT

The southern two-thirds of the Central Valley regional aquifer system, which covers over 13,500 square miles and extends from just south of the Delta to just south of Bakersfield, is referred to as the San Joaquin Valley Basin (DWR 1975). Much of the western portion of this area is underlain by the Corcoran Clay Member, which divides the groundwater system into two major aquifers: a confined aquifer below the clay and a semi-confined aquifer above the clay (Williamson et al. 1989). Aquifer recharge to the semi-confined upper aquifer historically occurred from stream seepage, deep percolation of rainfall, and subsurface inflow along basin boundaries. With the introduction of irrigated agriculture into the region, recharge was augmented with deep percolation of applied agricultural water and seepage from the distribution systems. Recharge of the lower confined aquifer results from the subsurface inflow from the valley floor and foothill areas to the east of the eastern boundary of the Corcoran Clay Member.

Groundwater in the San Joaquin Valley has been heavily developed by pumping, largely for crop irrigation. Pumping has caused depressions to form as a result of subsidence and has altered regional groundwater flow patterns, recharge, and discharge. Annual groundwater pumping in the San Joaquin River region may often exceed estimates of perennial yield. All the subbasins within the San Joaquin River region have experienced some overdraft (CDWR 1994).

Land subsidence in the San Joaquin Valley has occurred mostly in areas that are confined by the Corcoran Clay, where pressure changes caused by groundwater pumping promote greater compressive stress than in the unconfined zone (CDWR 1977). The maximum land subsidence levels recorded in the Central Valley occurred within Fresno County. Land subsidence levels of as great as 30 feet have been measured in parts of northwestern Fresno County (Ireland et al. 1982).

As a result of land subsidence, increased pumping lifts, and water quality limitations, surface water was imported to the western valley to decrease groundwater pumping. Beginning in 1967, surface water imported via the California Aqueduct began to replace groundwater as the primary source of irrigation supply in the area south of the city of

Mendota. The availability of surface water led to an increase in the total quantity of water applied, whereas the quantity of water removed from the system by the wells decreased. The marked decrease in groundwater pumping has allowed a recovery in hydraulic head. The rise in the potentiometric surface from 1967 to 1984 was nearly one-half of the drawdown that occurred from predevelopment conditions to 1967.[1] Agricultural development also has affected the semi-confined zone. Increased rates of recharge resulting from percolation of irrigation water, combined with the rapid post-1967 decrease in pumping, caused a rise in the height of the water table over much of the western valley (Belitz and Heimes 1990).

Vertical groundwater flow is substantial in the western San Joaquin Valley. The combined result of pumping from below the Corcoran Clay and percolation of irrigation water from above the water table has been the development of a large downward flow gradient in the semi-confined aquifer and a groundwater flow divide in the western part of the valley (Belitz and Moore 1990).

GROUNDWATER QUALITY

Groundwater quality conditions in the San Joaquin River Region vary throughout the area. Total dissolved solids, boron, nitrates, arsenic, selenium, and dibromo-chloropropane are parameters of concern for agricultural and M&I uses in the San Joaquin River region. Of particular concern on the west side of the San Joaquin Valley are total dissolved solids and selenium.

Groundwater zones commonly used along a portion of the western margin of the San Joaquin Valley have high concentrations of total dissolved solids, ranging from 500 milligrams per liter (mg/L) to greater than 2,000 mg/L (Bertoldi et al. 1991). The concentrations in excess of 2,000 mg/L commonly occur above the Corcoran Clay layer. These high levels have impaired groundwater for irrigation and M&I uses in the western portion of the San Joaquin Valley. Contractors within the DMC Unit that have drainage-impacted lands have developed aggressive programs to manage salts in the root zone and to minimize deep percolation through the use of high-efficiency irrigation techniques, such as sprinklers, shortened rows, and installation of groundwater monitoring wells.

High selenium concentrations in soils of the west side of the San Joaquin River region are of considerable concern because of their potential to leach from the soil by subsurface irrigation return flow into the groundwater and into receiving surface waters (Bertoldi et al.

[1] The potentiometric surface is defined as the level that water from the confined aquifer would rise to in a tightly cased well completed in the confined aquifer.

1991). Selenium concentrations in shallow groundwater along the west side of the region have been highest in the central and southern area south of the cities of Los Banos and Mendota, with median concentrations of 10,000 to 11,000 mg/L (Bertoldi et al. 1991).

AGRICULTURAL SUBSURFACE DRAINAGE

Inadequate drainage and accumulating salts have been persistent problems along the west side and in parts of the east side of the San Joaquin River region for more than a century. The most extensive drainage problems exist on the west side of the San Joaquin River and Tulare Lake regions. The soils on the west side of the region are derived from marine sediments and are high in salts and trace elements. Irrigation of these soils has mobilized these compounds and facilitated their movement into the shallow groundwater. Much of this irrigation has been with imported water containing salts, resulting in rising groundwater and increasing soil salinity. Where agricultural drains have been installed to control rising water tables, drainage water frequently contains high concentrations of salts and trace elements (San Joaquin Valley Drainage Program 1990).

In some portions of the San Joaquin River region, natural drainage conditions are inadequate to remove the deep percolation to the water table. This occurs because vertical conductivity is low and, therefore, limits downward drainage of infiltrated water. In addition, horizontal hydraulic conductivity is low and inhibits downslope subsurface drainage. Shallow groundwater levels often rise into the root zone, and subsurface drainage must be supplemented by constructed facilities for irrigation to be sustained (Reclamation and Service 1999).

ENVIRONMENTAL CONSEQUENCES

For purposes of this analysis, an adverse impact on the groundwater resources would occur if a long-term water service contract renewal:

- Results in the depletion of current groundwater resources
- Substantially alters the volume of groundwater available for beneficial use, or
- Causes groundwater now available for beneficial use to be unavailable because of contamination or physical obstruction

NO-ACTION ALTERNATIVE

Groundwater levels may decline 1 to 3 percent as a result of the allocation of CVP water to Level 2 refuge water supplies and improved fish and wildlife habitat. As a result, land subsidence could increase over its present rate.

Groundwater pumping and land subsidence will continue in the project area as they have historically. However, to the extent that reduced CVP surface water is delivered, especially in one or more successive dry years, groundwater pumping may prove to be more economical than obtaining surface water at the higher tiered price or through transfers. If this becomes the case, groundwater pumping would increase over present levels, especially in service areas that will tend to rely heavily on groundwater pumping because of limited, affordable surface water options. As a result, the groundwater levels could decline with no or little recharge and land subsidence could increase over present rates. In addition, salt loading in soils and shallow groundwater would occur as a result of the application of the lower-quality groundwater. Soil salinity and saline subsurface water tables are being managed to maintain agricultural productivity through a combination of best management practices and the operation of subsurface drainage collection systems. With the reduced CVP water supply projected in the No-Action Alternative, drainage would not be expected to increase.

ALTERNATIVE 1

Alternative 1 could have impacts similar to those discussed above for the No-Action Alternative. Groundwater pumping and land subsidence will continue in the project area as they have historically. To the extent that deliveries of CVP surface water are reduced, especially in one or more successive dry years, groundwater pumping may prove to be more economical than obtaining surface water at the higher tiered price or through transfers. If this becomes the case, groundwater pumping would increase over present levels, especially in service areas that will tend to rely heavily on groundwater pumping because of limited, affordable surface water options. As a result, the groundwater levels could decline with no or little recharge and land subsidence could increase over present rates. In addition, salt loading in soils and shallow groundwater would occur. These impacts would be the same as the impacts for the No-Action Alternative.

ALTERNATIVE 2

Alternative 2 could have impacts similar to, but perhaps more pronounced than those discussed above for the No-Action Alternative. Groundwater pumping and land subsidence will continue in the project area as they have historically. However, to the extent that less CVP surface water is purchased because tiered pricing starts at a lower percentage of contract deliveries, especially in one or more successive dry years, groundwater pumping may prove to be more economical than obtaining surface water at the higher tiered price or through transfers. If this becomes the case, groundwater pumping would increase over present levels, especially in service areas that will tend to rely heavily on groundwater pumping because of limited, affordable surface water options. As a result, the groundwater levels could decline with no or little recharge and land subsidence could

increase over present rates. In addition, salt loading in soils and shallow groundwater would occur. These impacts would be the same as the impacts for the No-Action Alternative.

CUMULATIVE IMPACTS

Long-term contract renewals, when added to other past, present, and reasonably foreseeable future actions, could result in indirect impacts to groundwater resources by contributing to those factors that increase the reliance on groundwater pumping during those years when the price of surface water exceeds the costs of groundwater pumping. The extent and severity of these impacts will depend on many factors, including the availability and price of CVP water. First, the costs of pumping can increase as groundwater basins and aquifers are drawn down and can decrease as they recharge. Extensive drawdown of the aquifers can cause poorer quality from nearby zones to degrade the aquifers, but only if the pumping is so extensive as to remove hydrologic barriers to aquifer degradation. Extensive pumping can also exacerbate subsidence problems. The increased depth of pumping needed when aquifers are drawn down leads to increased lift/energy costs and, in some instances, can result in the need to resize pumps to access deeper groundwater. Similarly, the increased use of pumps resulting from a greater reliance on groundwater can accelerate pump equipment wear and tear and lead to earlier repair and replacement costs. These and related costs will need to be considered over the long-term and compared to the future annual prices of CVP water or water transfers to make the right economic decisions to pump or purchase surface water.

SECTION 3.8: SURFACE WATER RESOURCES

This section discusses the effects that the alternatives considered in Chapter 2 may have on surface water resources for the CVP contractors in the DMC Unit.

AFFECTED ENVIRONMENT

WATER RIGHTS

The DMC Unit is composed of two different types of water rights holders: (1) Exchange Contractors, who have a previous San Joaquin River water right that is now supplied by Reclamation and who are not subject to the Proposed Action, and (2) water service contractors, who have acquired water through the CVP and whose long-term contract renewals constitute the Proposed Action. The CVP has developed different reliability criteria for each type of contractor. Typically, Exchange Contractors have a more reliable water supply because of their pre-CVP water right.

WATER SUPPLY

Prior to the CVP, irrigators in the Central Valley depended primarily on groundwater for agricultural irrigation. As the groundwater quantity and quality declined and land subsidence increased, it became apparent that an additional source of water was needed for agriculture to continue. The CVP was implemented in part to supply irrigators, primarily in the Central Valley, with a more consistent water supply than the existing groundwater resources. Groundwater resources were previously discussed in Section 3.7.

CVP water is used for irrigation of agricultural areas, M&I uses, and more recently, to restore fisheries and aquatic habitat in the waterways that have been affected by water development. The largest use of CVP water is for agricultural irrigation. The greatest demand for irrigation water occurs in mid- to late summer, as crops mature and crop water use increases. During the winter, farmers also use water for frost control and pre-irrigation of fields to saturate the upper soil. This saturation process loosens the soil for plowing and provides adequate moisture for seed germination. Natural winter precipitation is usually insufficient for these pre-irrigation needs at the lower elevations typical of the DMC Unit.

Reclamation makes water from the CVP available to contractors for reasonable and beneficial uses, but this water is generally insufficient to meet all of the contractors' needs. In the DMC Unit service area, contractors without a sufficient CVP water supply may extract groundwater if pumping is feasible or negotiate water transfers with other contractors. Available alternate supplies from groundwater pumping, alternate surface water supplies, and/or transfers may also be accessed when CVP surface water deliveries

become more expensive than pumping or transfer costs. However, increased groundwater pumping can cause overdraft conditions and land subsidence. Shallow aquifers have been contaminated by years of irrigation in the valley. The application of pesticides and herbicides and the increased solubility of naturally occurring trace elements in the soil, including selenium, boron, and arsenic, contribute to groundwater contamination.

The CVPIA PEIS developed estimates of maximum water contract deliveries for the year 2026 (Reclamation and Service 1999). These estimates were based on previous use, existing contract amount, and appropriate general plan environmental documentation relevant to CVP water use. The estimates for the two types of contracts, depending on the type of service, include the following:

- **Agricultural Water Service Contracts:** The maximum annual use between 1980 and 1993 or the projected use as addressed in the appropriate environmental documentation, limited by the maximum contract amount.

- **Water Rights and Exchange Contractors:** The maximum annual use between 1980 and 1993 or projected use as addressed in relevant environmental documentation, limited by the maximum contract amount.

- **M&I Water Service Contracts:** Total demand based on 2020 demands in DWR Bulletin 160-93 (DWR 1994) or the current M&I shortage criteria. Since 1991, Reclamation has been attempting to develop an M&I shortage policy applicable to as many CVP contractors as possible. Current M&I shortage criteria are detailed in the CVP Draft M&I Water Shortage Policy (Reclamation 2001f).

WATER QUALITY

Surface water quality in the San Joaquin River Basin is affected by many factors, most notably, the upstream development of Friant Dam and dams on other tributaries, which withhold most of the natural flow of the river, except during flood conditions. Other factors affecting San Joaquin River surface water quality include natural runoff, agricultural return flows, biostimulation, construction, logging, grazing, operations of flow-regulating facilities, urbanization, and recreation. In addition, irrigated crops grown in the western portion of the San Joaquin Valley have accelerated the leaching of minerals from soils, altering water quality conditions in the San Joaquin River system.

In the western part of the San Joaquin Valley, soils are derived mainly from the marine sediments that make up the Coast Range and are high in salts and trace elements such as selenium, molybdenum, arsenic, and boron. As a result of extensive land development in the San Joaquin Valley, erosion and drainage patterns have been altered, thereby

accelerating the rate at which these trace elements have been dissolved from the soil to accumulate in groundwater, streams, and the San Joaquin River.

Water quality in the San Joaquin River varies considerably along the river's length. Above Millerton Lake and downstream toward the Mendota Pool, water quality is generally excellent. The reach from Gravelly Ford to the Mendota Pool (about 17 miles) is frequently dry except during flood control releases, because all water released from Millerton Lake is diverted upstream to satisfy water rights agreements or percolated to groundwater. During the irrigation season, most of the water released from the Mendota Pool to the San Joaquin River is imported from the Delta via the Delta-Mendota Canal and generally has a higher concentration of total dissolved solids than that of the water in the upper reaches of the San Joaquin River. Most of the water released from the Mendota Pool to the San Joaquin River is diverted at or above Sack Dam for agricultural uses. Between Sack Dam and the confluence with Salt Slough, the San Joaquin River is often dry. From Salt Slough to Fremont Ford, most of the flow in the river is derived from irrigation returns carried by Salt and Mud Sloughs. This reach typically has the poorest water quality of any reach of the river.

As the San Joaquin River progresses downstream from Fremont Ford, water quality generally improves at successive confluences, specifically at those with the Merced, Tuolumne, and Stanislaus Rivers. In the relatively long reach between the Merced and Tuolumne Rivers, however, mineral concentrations tend to increase as a result of agricultural drainage water, other wastewaters, and effluent groundwater (DWR 1965). Total dissolved solids in the San Joaquin River near Vernalis have historically ranged from 52 mg/L (at high stages) to 1,220 mg/L from 1951 to 1962 (DWR 1965). During the mid- to late 1960s, San Joaquin River water quality continued to decline. In 1972, the State Board included a provision in Decision 1422 that Reclamation maintain average monthly total dissolved solid concentrations in the San Joaquin River at Vernalis of 500 mg/L as a condition of the operating permit for New Melones Reservoir on the Stanislaus River. The State Board's Decision 1641 implementing the 1995 Bay-Delta Plan requires both the CVP and SWP to meet Delta water quality standards. The Regional Board has developed a proposed Basin Plan Amendment dealing with salinity and boron on the San Joaquin River that is pending before the State Board. In addition, extensive water quality monitoring and implementation of best management practices to address water quality is being implemented through the Regional Board's Irrigated Lands Conditional Waiver Program. The Westside San Joaquin River Watershed Coalition has obtained an approved waiver, with most contractors in the DMC Unit participating.

In drier years, CVP water quality and reliability decreases. First, the salinity and the concentration of organic materials from upstream soils and return flows increase in the

Delta in drier years because the flow volumes from the Sacramento and San Joaquin Rivers decrease and salt water intrudes further upstream in the Delta.

WATER DELIVERY CRITERIA

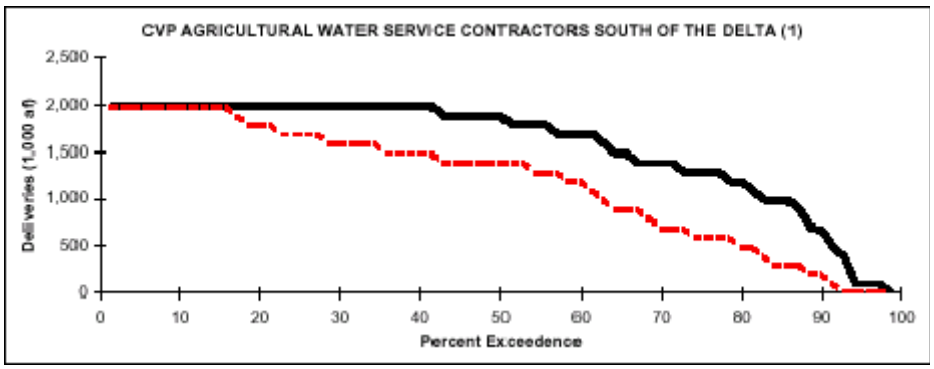
The amount of CVP water available each year for contractors is based on the storage of winter precipitation and control of spring runoff in the Sacramento and San Joaquin River basins. The schedule of CVP water conveyed to and diverted from the river is determined by state water right permits, judicial decisions, and state and federal obligations to maintain water quality, enhance environmental conditions, and prevent flooding. Water delivery criteria are shaped by these obligations to a larger degree than was realized in the CVPIA PEIS (Reclamation and Service 1999) and the impact that meeting these obligations has had on water deliveries is greater than was foreseen in the CVPIA PEIS (Reclamation and Service 1999). The allocation of CVP water to the contractors is determined by water service contracts and the capacity of project facilities to store and convey water.

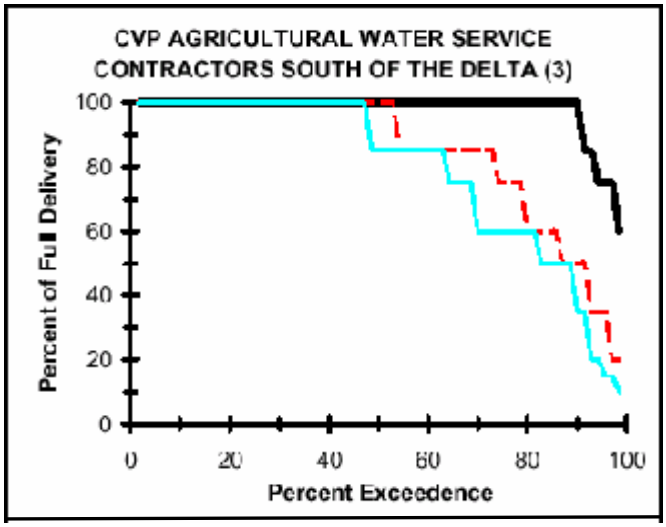
Conditions with CVPIA Implementation

With CVPIA implementation in accordance with the PEIS Preferred Alternative, in addition to conditions in the late 1990s, CVPIA PEIS modeling indicated that CVP agricultural water service contractors located south of the Delta would receive an average of 59 percent of current total contract amounts, based upon a hydrologic pattern that is similar to the previous 70 years of hydrology, as shown below in Figure 3.8-1 and described in Technical Appendix, Volume 2, of the Draft CVPIA PEIS (Reclamation 1997b). These conditions result in the delivery of total contract amounts to agricultural water service contractors located south of the Delta approximately 15 percent of the time. Minimum deliveries of zero would occur only in critically dry years. The 2004 Biological Assessment for the CVP OCAP (Reclamation 2004b) projects that under current operation of the EWA, agricultural contractors located south of the Delta would receive their total contracted amount approximately 50 percent of the time.

Under these conditions, PEIS modeling indicated that CVP M&I water service contractors will receive an average of 85.5 percent of existing total contract amounts, as shown in Figure 3.8-1. PEIS modeling estimated that total contract amounts would be delivered to M&I water service contractors located south of the Delta approximately 65 percent of the time. Minimum deliveries of 50 percent would occur only in critically dry years.

Figure 3.8-1
Percentages of Full Delivery;
CVP Agricultural and M&I Water Service Contractors South of the Delta





ENVIRONMENTAL CONSEQUENCES

NO-ACTION ALTERNATIVE

Water Supply

Under the CVPIA PEIS No-Action Alternative, average annual deliveries under the CVP were estimated at 5.7 million acre-feet per year, including deliveries to refuges, water rights holders, Sacramento River Settlement Contractors, Delta-Mendota Exchange Contractors, and CVP water service contractors. Total CVP water deliveries were estimated to decrease under most alternatives, including the Preferred Alternative, by approximately 10 percent as a result of the allocation of CVP water to Level 2 refuge water supplies, allocation of water to Section 306(b)(2) of the CVPIA, and reduced Trinity River exports to the Central Valley. These reduced delivery impacts were addressed fully in the CVPIA PEIS (Reclamation and Service 1999).

Recent modeling using the assumptions developed for the OCAP generated average annual total CVP deliveries that range from 4,748,000 acre-feet to 5,045,000 acre-feet, depending upon the environmental programs in place. The OCAP modeling assumes that CVP allocations to agriculture range from zero to 100 percent of the contracted deliveries, based on supplies reduced by Section 3406(b)(2) allocations. The modeling assumes that allocations to M&I contractors range from 50 to 100 percent of contracted deliveries, based on the same considerations applied to agriculture.

OCAP modeling estimates that average annual CVP water deliveries to south-of-Delta agricultural and M&I water service contractors would range from 1,225,000 acre-feet to 1,587,000 acre-feet, depending on the environmental programs in place. Table 3.8-1 indicates predicted average south-of-Delta water supply allocations under the six alternatives modeled in the OCAP.

Table 3.8-1
Long-Term Averages for the Six OCAP CALSIM II Studies
(1,000 acre-feet)

	D-1485 (1991)	D-1485 (1992)[1]	D-1485 (1993)[2]	D-1641 (1994)	D-1641 (1997)[3]	EWA (2004)[4]
CVP Total Deliveries	4,868	5,044	5,045	4,918	4,748	4,752
South of Delta – agriculture	1,454	1,374	1,375	1,260	1,102	1,110
South of Delta – exchange	851	851	851	847	847	847
South of Delta – M&I	133	131	131	128	123	124
South of Delta – refuge	132	280	280	280	280	280
South of Delta – total[5]	2,753	2,819	2,821	2,699	2,536	2,545

[1] D-1485 with Firm Refuge Level 2 (1992)
[2] D-1485 with Firm Level 2 and Winter-Run Biological Opinion (1993)
[3] D-1641 with CVPIA Section 3406(b)(2) (1997)
[4] CVPIA Section 3406(b)(2) with EWA (2004)
[5] Total includes canal losses due to evaporation

These modeling estimates illustrate the varying effects of D-1485, D-1641, and the EWA, when added to obligations for Refuge Level 2 deliveries, winter-run chinook salmon Biological Opinion flows, and CVPIA Section 3406(b)(2) allocations.

Water Quality

The No-Action Alternative would not result in any alteration to surface water quality. Continued operation of the system of pumps, canals, laterals, and related water conveyance and distribution facilities would not lead to further degradation in water quality.

ALTERNATIVE 1

Water Supply

Explanatory recitals and provisions in Alternative 1 differ from the No-Action Alternative by emphasizing increased water supply reliability through the completion of yield increase studies and the development of CVP operational criteria that would minimize delivery shortages. Although these recitals and provisions call for increased supply reliability, future reliability will actually depend on several interacting factors, including among other considerations, water year type, water transfer acquisitions, and the implementation of other water development projects. The action of renewing long-term water service contracts under Alternative 1 does not substantially differ from the No-Action Alternative with respect to the following:

- "Contract Total" definition
- Water to be made available and delivered to the contractor
- The time for delivery of water
- The point of diversion and responsibility for water distribution
- Water measurement
- Rates and methods of payment for water

Because there are no substantial differences between Alternative 1 and the No-Action Alternative, there would be no surface water supply impacts from the implementation of Alternative 1.

Water Quality

Alternative 1 would not result in any alteration to surface water quality because there would be essentially no increase in drainage discharges when compared to the No-Action Alternative. Continued operation of the system of pumps, canals, laterals, and related water conveyance and distribution facilities would not lead to degradation in water quality. Current trends affecting the surface water quality would continue.

ALTERNATIVE 2

Water Supply

The action of renewing long-term water service contracts under Alternative 2 does not substantially differ from the No-Action Alternative with respect to the following:

- "Contract Total" definition
- Water to be made available and delivered to the contractor
- The time for delivery of water
- The point of diversion and responsibility for water distribution
- Water measurement
- Rates and methods of payment for water

Because there are no substantial differences between Alternative 2 and the No-Action Alternative, there would be no surface water supply impacts from implementation of Alternative 2.

Water Quality

Alternative 2 would not result in any alteration to surface water quality as long as water deliveries remain the same and, thus, drainage also remains the same. Continued operation of the system of pumps, canals, laterals, and related water conveyance and distribution facilities would not lead to degradation in surface water quality and current trends affecting the surface water quality would continue.

CUMULATIVE EFFECTS

Long-term contract renewals, when added to other past, present, and reasonably foreseeable future actions, will not create any additional cumulative impacts on surface water resources or quality. Water deliveries to DMC Unit contractors will be but one of many competing demands on surface water resources available for diversion and delivery. Because south-of-Delta deliveries rely on several actions "upstream" of the DMC Unit study area, long-term contract renewals in the DMC Unit have limited opportunities to increase reliance on other south-of-Delta surface water resources.

SECTION 3.9: BIOLOGICAL RESOURCES

This section analyzes potential impacts to non-listed species and habitats with the potential to occur in the DMC Unit project area. To avoid redundancy and the potential for conflicts across documents, potential impacts to federal or state listed or federal candidate fish, plant, and wildlife species are addressed in separate documents, including the Delta-Mendota Canal Unit Biological Assessment (Reclamation 2003a).

The study area is located in the San Joaquin Valley and includes portions of San Joaquin, Stanislaus, Merced, and Fresno Counties and the service areas of the 20 DMC Unit contractors. It is reasonable to initially assume that a variety of vegetation types and wildlife resources in the study area could potentially be affected by the long-term water service contract renewals.

Baseline information on biological resources in the DMC Unit project area was compiled primarily from existing literature and information gathered from water district general managers and staff. Data sources included the CVPIA Draft PEIS (Reclamation 1997a), Draft EA for Eastside/Westside Water Transfer/Exchange (Tetra Tech 2000), Draft Biological Opinion on Operation of the CVP and Implementation of the CVPIA (Reclamation and Service 2000), A Guide to Wildlife Habitats of California (Mayer and Laudenslayer 1988), vegetation categories derived from CALVEG data (Matyas and Parker 1980), the CDFG California Natural Diversity Database, and the California Native Plant Society's Inventory of Rare and Endangered Vascular Plants of California.

DOCUMENTS ADDRESSING POTENTIAL IMPACTS TO LISTED SPECIES ASSOCIATED WITH DELIVERIES TO THE DELTA-MENDOTA CANAL UNIT

Reclamation and DWR are currently cooperating in conducting endangered species consultations to address the combined long-term operations of the CVP and SWP. Reclamation is the lead federal agency and DWR is the lead state agency for these consultations. Reclamation is consulting with the Service and NOAA Fisheries regarding potential operational impacts to species listed pursuant to the federal Endangered Species Act. DWR is consulting with CDFG regarding potential operational impacts to species listed pursuant to the California Endangered Species Act. The OCAP is a detailed analysis and explanation of the criteria and procedures for conducting combined CVP and SWP operations.

The OCAP biological assessment for fisheries (Reclamation 2004a) and the OCAP biological assessments for terrestrial (plant and wildlife) species (Reclamation 2004b, 2004c) address the potential environmental consequences of continuing CVP and SWP

operations on listed species and analyze the effects of proposed operations through 2030. The OCAP biological assessments include descriptions of the actions, the biology of the listed species, and the modeling of present and future conditions resulting from continuing operations. The OCAP biological assessment for fisheries (Reclamation 2004a) addresses the continued CVP and SWP operations on fishery resources including winter-run and spring-run chinook salmon, Central Valley steelhead, and delta smelt. It also recommends ongoing actions to reduce impacts to federal and state listed species. The modeling used in the preparation of these documents accounts for several considerations, including the appropriate levels of development, and operations associated with legal decisions and related water facilities and projects, including those in the West San Joaquin Division. The OCAP biological assessment for terrestrial species (Reclamation 2004b) addresses the effects of continued CVP and SWP operations on wildlife and plant species that are listed or proposed for listed under the federal Endangered Species Act, including the bald eagle, California clapper rail, salt marsh harvest mouse, riparian brush rabbit, riparian woodrat, California red-legged frog, giant garter snake, valley elderberry longhorn beetle, Suisun thistle, and soft bird's beak. The OCAP terrestrial species biological assessment (Reclamation 2004c) also covers wildlife and plant species that are listed or proposed for listing under the California Endangered Species Act, including bank swallow, Swainson's hawk, and western yellow-billed cuckoo.

The OCAP biological opinion (NOAA Fisheries 2004) concurs with the determination made in the OCAP biological assessments (fisheries and terrestrial) (Reclamation 2004a, 2004b, 2004c) that the effects of the action of long-term operation of the CVP and SWP are not likely to adversely affect the listed species covered by the consultation (as listed above). The OCAP biological opinion covers formal and early consultation for the operations of the CVP and SWP; it includes two separate effects sections, one for formal consultation and one for early consultation, as well as an incidental take statement for formal consultation and a preliminary incidental take statement for early consultation.

Early consultations are intended to reduce the potential for conflicts between listed species or critical habitat and proposed actions. Early consultation is an optional process that occurs before a prospective applicant files an application for a federal permit or license. Early consultation results in a preliminary biological opinion, except that the incidental take statement provided does not constitute authority to take listed species. When actions have been completed, the Service formalizes the early consultation portion of the biological opinion if the project description and effects are the same as those in the preliminary biological opinion. If there are additional effects resulting from project elements, consultation on the biological opinion will be reinitiated.

The formal consultation in the OCAP biological opinion covers proposed 2020 operations of the CVP including the Trinity River Mainstem Record of Decision, flows on the Trinity River, increased water demands on the American River, delivery of CVP water to the proposed Freeport Regional Water Project, water transfers, long-term EWA, operation of the TFCF, and operation of the SWP-CVP intertie. The formal consultation in the biological opinion also covered the effects of operations of the SWP including water transfers and the operations of the North Bay Aqueduct, Suisun Marsh Salinity Control Gates, and the John E. Skinner Delta Fish Protective Facility.

Early consultation effects include the operation of components of the South Delta Improvement Program, including pumping of 8,500 cfs at the SWP Banks Pumping Plant, permanent barrier operations in the South Delta, the long-term EWA, water transfers, and CVP and SWP operational integration. When these actions have been completed, the Service will formalize the early consultation portion of the biological opinion by either finalizing the effects in the preliminary biological opinion or reinitiating consultation on the biological opinion. Many of these projects are discussed in more detail in Chapter 1, Purpose and Need.

Since listed fishery and terrestrial species and habitat affected by CVP (and SWP) operations that serve to deliver water to the DMC Unit have been evaluated extensively in the OCAP biological assessments (Reclamation 2004a, 2004b, 2004c) and corresponding OCAP biological opinion (NOAA Fisheries 2004), this EA will not address the potential impacts of long-term contract renewals to listed fishery or terrestrial resources outside the DMC Unit service area. In addition, listed fishery and terrestrial species and habitat have been extensively analyzed in the DMC Unit biological assessment, presented under separate cover (Reclamation 2003). The DMC Unit biological assessment was submitted to the Service in July 2003 and a biological opinion is pending. In summary, impact evaluations of those listed species requiring consultation under the federal ESA are addressed one of the three OCAP biological assessments (Reclamation 2004a, 2004b, 2004c), all of which are available under separate cover.

AFFECTED ENVIRONMENT

The analysis of fisheries and terrestrial impacts in this EA is limited to impacts to non-listed species that could occur within or affected by deliveries to the DMC Unit service area.

Historically, the region surrounding the DMC Unit contained a diverse and productive patchwork of aquatic, wetland, riparian forest, and terrestrial habitats that supported abundant populations of resident and migratory species of wildlife (Tetra Tech 2000). Huge herds of pronghorn antelope, tule elk, and mule deer grazed the prairies, and large

flocks of waterfowl used the extensive wetlands. The major natural plant communities included grasslands, vernal pools, marshes, and riparian forests. Agricultural development and the conversion of natural habitat to agricultural uses began in the early to mid-1800s and intensified in the later 1800s, when the railroads provided the means to transport agricultural products to much larger markets.

Land uses in the region include agricultural, residential, and M&I uses. Over the years, land has been converted from native habitats to cultivated fields, pastures, residences, water impoundments, flood control structures, and other developments. Agricultural land comprises the majority of the DMC Unit project area and includes row crops, pastures, orchards, and vineyards. Almost half of the irrigated acreage in the San Joaquin region is planted with grains, hay, and pasture (Reclamation 1997a). Orchards are planted on about one-third of the irrigated acres, with cotton and row crops grown on most of the remaining lands.

As a result of this historical conversion of native habitats, many species have been displaced or extirpated from the region. Most of the species that occurred historically are now restricted to habitat patches that are fragmented and isolated, making it difficult for viable populations to exist. Some species have adapted to portions of the new landscape and are able to maintain populations. However, as a result of the largely fragmented habitats, the potential for expansion or growth of these populations is greatly reduced. Because of the reduction in habitat available to these species, remnants of habitats such as wetlands and riparian forests are increasingly valuable and important to resident and migratory wildlife species.

FISHERIES

On the arid west side of the San Joaquin River basin, relatively small intermittent streams drain the Coast Ranges but rarely reach the San Joaquin River. On the east side, numerous streams and three major rivers drain the western Sierra Nevada and provide flow to the San Joaquin River. The lower San Joaquin River is located within the DMC Unit beginning at the Mendota Pool. Mud and Salt Sloughs are tributaries to the San Joaquin River that receive drainage (including tile water and tailwater) from the northern districts, as well as other drainage from their watersheds.

Historical fishery resources within the project area were different from the fishery resources present today (Reclamation 1997a). Many native species have declined in abundance and distribution, and several introduced species have become well established. The major factors producing changes in aquatic habitat within the project area are habitat modification, species introduction, and over-fishing of fishery resources that originate in

the project area. These factors and anthropogenic activities within the project area have adversely affected the fisheries resources in the area.

The San Joaquin River in the vicinity of the DMC Unit is characterized as a warm-water, Deep-Bodied Fishes Zone composed of a variety of habitats, ranging from slow-moving backwaters with emergent vegetation to the shallow tule beds and deep pools of slow-moving water in the main river (Moyle 1976). The environment is dominated by a warm-water habitat, but also supports anadromous, cold-water chinook salmon. The natural habitat and water quality of the river and Mud and Salt Sloughs have been highly modified by the addition of canals, agricultural drainwater, and seasonal regulation of main stem river flows.

The fish community in the area is dominated by introduced species and reduced populations of the remaining native warm-water species. Historically, the upper reaches of the San Joaquin River and its tributaries have provided habitat for chinook salmon and steelhead trout. Spring-run chinook historically used the upper reaches of the San Joaquin River, but was extirpated when Friant Dam was completed in 1949. Spring-run chinook was probably eliminated by 1930 from the Stanislaus, Tuolumne, and Merced Rivers as a result of the construction of water storage facilities. Both fall-run chinook salmon and steelhead trout continue to use these tributaries; their returns have been low for a number of years. The Merced River Fish Hatchery, operated by CDFG, produces fall-run chinook salmon. This facility is the only salmon production facility located within the San Joaquin River basin.

Little information exists about fishery resources in water bodies located within the DMC Unit study area. The intermittent streams located within the study area are not known to support anadromous fish and are unlikely to support populations of resident fish because of their hydrologic conditions, which are often characterized by low flows, increased temperatures, and reduced water quality. The numerous water conveyance facilities and water supply and drainage canals could support warm-water fish, such as bass, crappie, sunfish, catfish, and shad.

Laboratory and field research has demonstrated that elevated waterborne and/or dietary concentrations of several trace elements in the San Joaquin Valley drainwaters are toxic to fish and wildlife. Selenium is the most toxic of these elements; other constituents include arsenic, boron, chromium, mercury, molybdenum, and salts (SJVDP 1990). Elevated selenium levels have been detected in a wide variety of fish in the San Luis Unit area, including chinook salmon and striped bass (Hamilton et al. 1986; Saiki and Palawski 1990). The bio-accumulative food chain threat of selenium contamination on fish and aquatic birds has also been well documented.

VEGETATION AND WILDLIFE

This section discusses land use and land cover types within the DMC Unit. The categories discussed below correspond to the land use and land cover types displayed on the figures in Section 3.1, Contractor Service Area Descriptions. It also includes a discussion of vegetation types, plants, and animals located in and adjacent to the DMC Unit project area. Lists of common and scientific names of plants and animals are provided in Appendix B.

Natural Communities

Wetlands

Available wetland habitats in the two-mile buffer area around the project area include both riparian corridors and the more classic wetland habitat with emergent vegetation associated with the San Joaquin River.

Palustrine Wetlands. Palustrine wetlands include any nontidal wetlands not classified as lacustrine, estuarine or riverine and have no deepwater habitat associations. In the San Joaquin Valley, this classification includes both permanent and seasonal fresh emergent wetlands.

Permanent Fresh Emergent Wetlands. In the San Joaquin Valley, the topography is generally level or gently rolling. Wetlands follow basin contours or occur in conjunction with riverine or lacustrine environments. Subtypes of permanent emergent wetlands are generally classified by species presence and/or their association with specific terrestrial habitats. Because emergent wetlands are typically inundated for most of the year, the roots of vegetation have evolved to thrive in an anaerobic environment. Characteristic floral species are erect, rooted hydrophytes dominated by perennial monocots such as the common tule, cattail, various sedges, and spike rushes. Permanent wetland habitat can occur on virtually any slope or exposure that provides a saturated depression.

Seasonal Fresh Emergent Wetlands. In the San Joaquin Valley, seasonal fresh emergent wetlands most often occurred in grassland and saltbush areas. A broad description of a seasonal wetland would include any area that ponds water during the wet season. Vegetation may vary from Italian rye grass in the driest areas to spike rush in the wettest. Cattail species are conspicuously absent from seasonal wetlands as they are indicative of permanent wetlands. These wetlands were historically composed of vast areas that, although inundated only periodically, provided crucial seasonal habitat for many wildlife species, most conspicuously for waterfowl and other migrants. They can occur as a subtype in almost any community.

Vernal Pools. Prior to the era of the plow in the Central Valley, two forms of vernal pool were historically widespread in the grassland and saltbush regions of the San Joaquin River basin. The "valley" pool was typically found in areas with saline or alkaline soils such as basins or low-lying plains. "Terrace" pools were common in the neutral or slightly acidic soils of the more upland grasslands of the California prairie.

Vernal pools are seasonal wetlands that form in shallow depressions underlain by a substrate near the surface that restricts the percolation of water. They are characterized by a barrier to overland flow that causes water to collect and pond. These depressions fill with rainwater and runoff from adjacent areas during the winter and may remain inundated until spring or early summer, sometimes filling and emptying during the wet season.

Vernal pools undergo four distinct annual phases: wetting, inundation, drying and drought. Each phase can be crucial to the life cycle of the species of plant and animal that have evolved in a given pool type. Although the vegetation composition of vernal pools varies with pool type, land use practices, annual rainfall and temperature variation, the vegetation in relatively undisturbed vernal pools is typically characterized by native annual species, many of which are endemic to vernal pools or vernal pool-swale systems and many of which are obligate symbiotes. Annual grasses are conspicuously absent as a descriptive species of vernal pools.

Riparian Habitat

The Central Valley's riparian habitats are dominated by cottonwood and willow near watercourses. Sycamore, box elder, and valley oak dominate the less frequently flooded higher terraces. Floodplain habitats above the riparian zone typically do not support wetland vegetation, but are hydrologically connected to rivers and riparian forests by periodic flooding and can be considered with them as an ecological unit. Streams historically flooded during the winter rainy season sometimes dry up partially or completely during summer droughts.

Riparian vegetation occurs in valleys and bottomlands bordered by gently sloping alluvial fans and dissected terraces and coastal plains. Riparian vegetation generally consists of woodlands or forests of broad-leaved deciduous hardwood trees as the overstory, with a variety of shrubs and vines composing the midstory, and a few grass and forb species and vines composing the understory. The floodplains of riparian communities are usually well-developed. Fluvial processes such as flooding, with its resulting sediment deposition and bank erosion, create three characteristic riparian landforms: gravel point bars, low terraces, and high terraces. Each landform has a different hydrology because of its physical relationship to the aquifer and flooding.

Grassland/Herbaceous and Unknown Rangeland

Grasslands in the Central Valley were originally dominated by native perennial grasses such as needlegrass and alkali sacaton. Currently, grassland vegetation is characterized by a predominance of annual or perennial grasses in an area with few or no trees and shrubs. Annual grasses found in grassland vegetation include wild oats, soft chess, ripgut grass, medusa head, wild barley, red brome, and slender fescue. Perennial grasses found in grassland vegetation are purple needlegrass, Idaho fescue, and California oatgrass. Forbs commonly encountered in grassland vegetation include long-beaked filaree, redstem filaree, dove weed, clovers, Mariposa lilies, popcornflower, and California poppy. Vernal pools found in small depressions with an underlying impermeable layer are isolated wetlands within grassland vegetation.

Rangeland communities are composed of similar grasses, grass-like plants, forbs, or shrubs, which are grazed by livestock. Forbs commonly encountered in grassland vegetation include long-beaked filaree, redstem filaree, dove weed, clovers, Mariposa lily, popcornflower, and California poppy. Most of the grasslands in California are dominated by naturalized annual grasses with perennial grasses existing in relict prairie communities or on sites with soil or water conditions unfavorable for annual grasses, such as on serpentine. Grassland vegetation occurs from sea level to about 3,900 feet in elevation. Grassland communities as a whole have relatively high species diversity when compared to other California plant communities.

Grassland habitats are important foraging areas for black-shouldered kite, red-tailed hawk, Swainson's hawk, northern harrier, American kestrel, yellow-billed magpie, loggerhead shrike, savannah sparrow, American pipit, mourning dove, Brewer's blackbird, red-winged blackbird, and a variety of swallows. Birds such as killdeer, ring-necked pheasant, western kingbird, western meadowlark, and horned lark nest in grassland habitats. Grasslands also provide important foraging habitat for the coyote and badger because this habitat supports large populations of small prey species, such as the deer mouse, California vole, pocket gopher, and California ground squirrel. Common reptiles and amphibians of grassland habitats include western fence lizard, common kingsnake, western rattlesnake, gopher snake, common garter snake, western toad, and western spadefoot toad.

Agricultural Communities

Agricultural communities within the project area are very diversified, and almost half of the irrigated acreage in the San Joaquin region is planted with grains, hay, and pasture (Reclamation 1997a). Orchards are planted on about one-third of the irrigated acres, with cotton and row crops grown on most of the remaining lands.

Although natural communities provide the highest value for wildlife, many of these historic natural habitats have been largely replaced by agricultural habitats with varying degrees of benefits to wildlife. The intensive management of agricultural lands, including soil preparation activities, crop rotation, grazing, and the use of chemicals, effectively reduces the value of these habitats for wildlife. However, many wildlife species have adapted to some degree to particular crop types and now use them for foraging and nesting. Orchards, vineyards, and cotton fields generally provide relatively low-quality wildlife habitat because the frequent disturbance results in limited foraging opportunities and a general lack of cover. Pasture and row crops provide a moderate-quality habitat with some limited cover and foraging opportunities.

Cropland and Pasture. Pasture habitat can consist of both irrigated and unirrigated lands dominated by perennial grasses and various legumes. The composition and height of the vegetation, which varies with management practices, also affects the wildlife species composition and relative abundance. Irrigated pastures may offer some species habitats that are similar to those of both seasonal wetlands and unirrigated pastures. The frequent harvesting required, which reduces the overall habitat quality for ground-nesting wildlife, effectively reduces the value of the habitat. Irrigated pastures provide both foraging and roosting opportunities for many shorebirds and wading birds, including black-bellied plover, killdeer, long-billed curlew, and white-faced ibis. Unirrigated pastures, if lightly grazed, can provide forage for seed-eating birds and small mammals. Ground-nesting birds, such as ring-necked pheasant, waterfowl, and western meadowlark, can nest in pastures if adequate vegetation is present. Small mammals occupying pasture habitat include California voles, Botta's pocket gophers, and California ground squirrels. Raptors including red-tailed hawks, white-tailed kites, and prairie falcons prey upon the available rodents. In areas where alfalfa or wild oats have been recently harvested, the large rodent populations can provide high-quality foraging habitat for raptors.

The habitat value in cropland is essentially regulated by the crop production cycle. Most crops in California are annual species and are managed with a crop rotation system. During the year, several different crops may be produced on a given parcel of land. Many species of rodents and birds have adapted to croplands, which often requires that the species be controlled to prevent extensive crop losses. This may require intensive management and often the use of various pesticides. Rodent species that are known to forage in row crops include the California vole, deer mouse, and the California ground squirrel. These rodent populations are preyed upon by Swainson's hawks, red-tailed hawks, and black-shouldered kites.

Orchards and Vineyards. Orchard-vineyard habitat consists of cultivated fruit or nut-bearing trees or grapevines. Orchards are typically open, single-species, tree-dominated

habitats and are planted in a uniform pattern and intensively managed. Understory vegetation is usually sparse; however, in some areas, grasses or forbs are allowed to grow between vineyard and orchard rows to reduce erosion. In vineyards, the rows under the vines are often sprayed with herbicides to prevent the growth of herbaceous plants.

Wildlife species associated with vineyards include the deer mouse, California quail, opossum, raccoon, mourning dove, and black-tailed hare. Nut crops provide food for American crows, scrub jay, northern flicker, Lewis' woodpecker, and California ground squirrel. Fruit crops provide additional food supplies for yellow-billed magpies, American robin, northern mockingbird, black-headed grosbeak, California quail, gray squirrel, raccoon, and mule deer. Loss of fruit to grazers often results in species management programs designed to force these species away from the orchards.

Idle or Retired Farmland. Lands of this category are similar to abandoned farmlands in the ruderal or unknown rangeland category, but with less time out of agricultural production. Similarly, the habitat value of these lands may vary with land management practices.

AREAS NOT AFFECTED BY USE OF CVP WATER

Four natural areas in the vicinity of the project area that are managed as uplands do not receive water from the Delta-Mendota Canal (Wilbur 2000). These areas include the Little Panoche, Lower Cottonwood Creek, O'Neill Forebay, and Upper Cottonwood Creek Wildlife Management Areas. The Upper and Lower Cottonwood Creek Wildlife Management Areas are located adjacent to San Luis Reservoir. The O'Neill Forebay Wildlife Management Area is located adjacent to O'Neill Forebay. The Little Panoche Wildlife Management Area is located on Little Panoche Creek in the hills approximately 10 miles southwest of the Eagle Field Water District.

AREAS AFFECTED BY USE OF CVP WATER

Each of the DMC Unit contractors and several Significant Natural Areas in the area of the DMC Unit study area use CVP water. The individual contractors are described in Section 3.1. The following sections describes several of the larger Significant Natural Areas affected by CVP water.

Significant Natural Areas

The 77 Significant Natural Areas[1] in the San Joaquin Valley, while scattered throughout the region, are also concentrated in the grasslands of the San Joaquin Valley in freshwater marsh, valley sink scrub, and grassland vernal pool habitats. These areas are important to waterfowl and shorebirds that winter and nest in the San Joaquin Valley, as well as for several special-status species, including the giant garter snake, Swainson's hawk, tricolored blackbird, colusa grass, delta button celery, San Joaquin woolythreads, and soft birds-beak. Historically, the San Joaquin River basin was a large floodplain of the San Joaquin River that supported vast expanses of permanent and seasonal marshes, lakes, and riparian areas. Almost 70 percent of the basin has been converted to irrigated agriculture, with wetland acreage estimated to have been reduced to approximately 120,300 acres. In combination with the adjacent uplands, the wetland complex is referred to as "the Grasslands" and consists of approximately 160,000 acres of private and public lands. Approximately 53,300 acres of the Grasslands are permanently protected in state or federal wildlife refuges or in federal conservation easements.

Several Significant Natural Areas are present in the project area or are located nearby. Significant Natural Areas present in the project area include the Lower and Upper Cottonwood Creek Wildlife Management Areas, Mendota Wildlife Management Area, and O'Neill Forebay.[2] Significant Natural Areas present near the project area include Los Banos Wildlife Management Area, Little Panoche Wildlife Management Area, Merced National Wildlife Refuge, North Grasslands Wildlife Management Area, San Joaquin River National Wildlife Refuge, San Luis National Wildlife Refuge, and Volta Wildlife Management Area.

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[1] The Significant Natural Areas Program is part of the CDFG's Wildlife and Habitat Data Analysis Branch. It was legislatively established in 1981 (Fish and Game Code Sections 1930–1933) and mandated to develop and maintain a data management system for natural resources; identify the most "significant natural areas" in California; ensure the recognition of these areas; seek the long-term perpetuation of these areas; and provide coordinating services for other public agencies and private organizations interested in protecting natural areas. The Significant Natural Areas Program analyzes data from the California Natural Diversity Database. The following biological criteria are used to identify Significant Natural Areas: areas supporting extremely rare species or natural communities and areas supporting associations or concentrations of rare species or communities. Significant Natural Area data have been used for bioregional conservation planning, environmental review, designation of special-status areas on public lands and land acquisition planning.

[2] All of the areas discussed, except Lower and Upper Cottonwood Creek Wildlife Management Areas and the San Joaquin River National Wildlife Refuge, receive CVP water supplies to meet Level 2 requirements, in accordance with the CVPIA.

Lower and Upper Cottonwood Creek Wildlife Management Areas

The Lower and Upper Cottonwood Creek Wildlife Management Areas are located in both Merced and Santa Clara Counties, approximately 36 miles east of the city of Gilroy. The Cottonwood Creek Wildlife Management Area consists of 6,315 acres of steep oak-grassland (upper unit) and steep hilly grassland (lower unit). The area is accessible only by foot. Wildlife in the area includes wild pigs, black-tailed deer, gray fox, and over 100 species of birds. Allowable recreational activities in the Cottonwood Creek Wildlife Management Areas include wildlife viewing, boat access (hand-carried only), fishing, hiking, and camping.

Mendota Wildlife Management Area

The 12,425-acre Mendota Wildlife Management Area is the largest publicly owned and managed wetland in the San Joaquin Valley (Reclamation 1997a). Established between 1954 and 1966, the refuge is located on a part of the Coelho Family Trust and is adjacent to the Fresno Slough Water District, the Tranquillity Public Utilities District, Reclamation District #1606, Tranquillity Irrigation District, and the 900-acre Alkali Sink Ecological Reserve. Approximately 8,300 acres of wetlands are maintained on the refuge, including almost 6,800 acres of seasonal wetlands, which are used by migratory ducks and shorebirds. To feed these animals, several crops, including corn, barley, milo, and safflower, are raised. Giant garter snakes have also been observed on the refuge. The water used to maintain these seasonal wetlands is purchased directly from the CVP (Huddleson 2000).

Los Banos Wildlife Management Area

Purchased in 1929, the Los Banos Wildlife Management Area was the first of a series of waterfowl refuges established in California to manage habitat for wintering waterfowl. Expanded from its original 3,000 acres, there are now 6,217 acres of wetland habitat, which includes lakes, sloughs, and managed marshes. The refuge provides habitat for western pond turtles, raccoons, striped skunks, beaver, muskrat, and over 200 varieties of bird species, including ducks, geese, shorebirds, coots, wading birds, and cranes. Pintail ducks and lesser snow geese are the most common waterfowl on the refuge. Swainson's hawks are known to nest near the refuge and to use the refuge for foraging. Other special-status species known to occur on the refuge include the giant garter snake and delta button celery (Reclamation 1997b).

Merced National Wildlife Refuge

The Merced National Wildlife Refuge was established in 1951 to alleviate crop depredation and provide waterfowl habitat (Reclamation 1997a). Originally a farm, the

original 2,562-acre refuge has expanded over the years. The refuge now totals 8,234 acres, including the 2,464 Arena Plains Unit. This refuge is one of the most important wintering areas in California, supporting snow and Ross' geese, sandhill cranes, and variety of shorebirds. Public use facilities at the refuge include observation platforms, interpretive panels, and a public hunting area, which is open during the hunting season. The Merced National Wildlife Refuge is located approximately 13 miles east of the Del Puerto Water District.

North Grasslands Wildlife Management Area

The North Grasslands Wildlife Management Area was purchased by the State of California in April 1990 and is managed by the CDFG (Reclamation 1997a). It is located within five miles of the Del Puerto Water District and includes three separate units. The China Island and Salt Slough units contain 5,556 acres of primarily agricultural land and pasture, but also have extensive river and slough channels with riparian edges. These two units receive water directly from the CVP (Wilbur 2000); however, the Salt Slough unit does not have a firm historical water supply. North Grasslands Wildlife Management Area provides habitat for a variety of wildlife species. Ducks are the most common waterbirds using the refuge, but sandhill cranes, shorebirds, and geese, including the Aleutian Canada goose, are also common. Agricultural crops irrigated with water from the Delta-Mendota Canal feed wintering migratory birds.

San Luis National Wildlife Refuge Complex

The 26,609-acre San Luis National Wildlife Refuge Complex is located approximately six miles east of the Del Puerto Water District. The refuge is a mixture of managed seasonal and permanent wetlands, riparian habitat associated with three watercourses and native grasslands, alkali sinks and vernal pools. The San Luis National Wildlife Refuge buys water from the CVP to irrigate seasonal wetlands and cereal crops (Chouinard 2000). The refuge provides habitat for waterfowl, including ducks, geese, and shorebirds, as well as tule elk and other endangered species. The largest concentration of mallard-pintails and green-winged teal in the San Joaquin Valley is also found here. Major public use occurs in the refuge complex, including interpretive wildlife observation programs, hiking, fishing, waterfowl and pheasant hunting.

San Joaquin National Wildlife Refuge

The San Joaquin National Wildlife Refuge is located approximately 10 miles west of Modesto on Highway 132 and within the floodplain of the confluence of the San Joaquin, Stanislaus, and Tuolumne Rivers. Refuge lands consist of oak-cottonwood-willow riparian forest, pastures, agricultural fields, and wetlands. This refuge was established in 1987 with an original land base of 1,638 acres. Through recent land acquisitions, the refuge has

increased to 6,642 acres with an approved refuge boundary of 12,877 acres. The San Joaquin River National Wildlife Refuge played a key role in the recovery and March 2001 delisting of the Aleutian Canada goose by providing critical habitat for the species. The lands in the refuge form a mosaic of riparian habitat, wetlands, and agricultural fields. It is the primary wintering site of 98 percent of the Aleutian Canada geese that winter in the valley, plus it is a major wintering and migration area for lesser and greater sandhill cranes, cackling Canada geese, and white-fronted geese. Because the refuge is near large population centers, opportunities exist for future public use, including wildlife observation and nature interpretation and education.

Volta Wildlife Management Area

The 3,000-acre Volta Wildlife Management Area is located approximately five miles east of the Centinella Water District. The refuge maintains more than 1,800 acres of wetlands, including 1,400 acres of moist soil plants; 720 acres of alkali sink habitat are preserved on the refuge as a rare ecological community (Reclamation 1997a). The Volta Wildlife Management Area provides habitat for a variety of bird species, including ducks, geese, shorebirds, coots, and wading birds. Black-necked stilts, sandpipers, dunlins, and dowitchers dominate shorebird species.

CURRENT GENERAL PLAN PROTECTIVE AND MANAGEMENT MEASURES

Measures to mitigate or offset impacts to sensitive species and communities have been developed and implemented by the cities and counties in the project area as part of their general plans. Some of these goals and policies are currently being reviewed and modified by city and county agencies as part of the general plan environmental impact report process. The most current measures for the affected cities and counties in the project area are described below.

Stanislaus County

Documentation supporting the Conservation/Open Space Element of the Stanislaus County General Plan emphasizes the conservation and management of economically productive natural resources and conservation of open space lands (any parcel or area of land or water that is essentially unimproved). The element (1) promotes the protection, maintenance, and use of the county's natural resources, with special emphasis on scarce resources and those that require special control and management; (2) prevents wasteful exploitation, destruction, and neglect of natural resources; (3) recognizes the need for natural resources to be maintained for their ecological values as well as for their direct benefit to people; (4) preserves open space lands for outdoor recreation including scenic, historic, and cultural areas; and (5) preserves open space for public health and safety, including areas

subject to landslides, flooding, and high fire risk, and areas required for the protection of water and air quality.

Goal One encourages the protection and preservation of natural and scenic areas throughout the county by:

- Maintaining the natural environment in areas dedicated as parks and open space.
- Ensuring compatibility between natural areas and development.
- Protecting from development areas of sensitive wildlife habitat and plant life (e.g., vernal pools, riparian habitats, flyways, and other waterfowl habitats) including those habitats and plant species listed in the General Plan Support Documentation or by state or federal agencies.
- Protecting and enhancing oak woodlands and other native hardwood habitat.

San Joaquin County

Implementing the Natural Resources Regulations as identified in the Draft General Plan 2010 would protect important biotic resources within San Joaquin County. The county's policies and implementation measures related to the protection and management of biological resources include special-status species, sensitive natural communities, and fisheries.

The final environmental impact report on the San Joaquin County Comprehensive Planning Program (Baseline Environmental Consulting 1992) recommends that the county (1) develop an integrated vegetation management program for properties owned and maintained by the county and (2) protect habitat areas large enough to be minimally affected by urban development including maintaining connection of habitat and restoring and enhancing degraded ecosystems such as historic salmon runs on the Mokelumne and Calaveras Rivers.

City of Tracy

The City of Tracy plans to conserve natural resources through the protection and enhancement of permanently preserved open space. For actions associated with the policies listed below, refer to *City of Tracy General Plan: An Urban Management Plan* (City of Tracy and the Planning Center 1993).

The City of Tracy will minimize impacts of development on waterways, riparian corridors, and adjacent buffer areas and will seek opportunities to preserve or establish wildlife

habitat, in conjunction with other uses and developments within the Tracy Urban Management Plan Area.

Fresno County

Policies in the Fresno County General Plan seek to protect riparian and wetland habitats while allowing compatible uses where appropriate. Related policies are included in Section LU-C, River Influence Areas; Section OS-A, Water Resources; Section OS-E, Fish and Wildlife Habitat; and Section OS-F, Vegetation.

- To conserve the function and values of wetland communities and related riparian areas throughout Fresno County while allowing compatible uses where appropriate. Protection of these resource functions positively affects aesthetics, water quality, floodplain management, ecological function, and recreation/tourism. Policies in this section seek to protect natural areas and to preserve the diversity of habitat in the county. Related policies are included in Water Resources, Forest Resources, Wetland and Riparian Areas, Vegetation, and River Influence Areas elements.

- To help protect, restore, and enhance habitats in Fresno County that support fish and wildlife species so that populations are maintained at viable levels. Policies in this section seek to protect native vegetation resources primarily on private land within the county.

- To preserve and protect the valuable vegetation resources of Fresno County.

For more detailed information on the direction of the goals listed below, refer to the Fresno County General Plan Background Report (County of Fresno 2000a).

Merced County

Merced County has the following goals and objectives regarding conservation of natural resources.

- Habitats that support rare, endangered, or threatened species are not substantially degraded. Rare and endangered species are protected from urban development and are recognized in rural areas.

- Local, state, and federal managed lands are recognized.

For more information on the policies developed for these goals and objectives, refer to the Merced County Year 2000 General Plan (Merced County 1990).

ENVIRONMENTAL CONSEQUENCES

Impacts to biological resources would be considered adverse if special-status species or their habitats, as designated by federal, state, or local agencies, were affected directly or indirectly by project-related activities. These potential impacts are evaluated in other documents, as previously described. In addition, impacts to biological resources would be considered significant if substantial loss, reduction, degradation, disturbance, or fragmentation occurred in native species habitats or in their populations. These impacts could be short- or long-term impacts. For example, short-term or temporary impacts may occur during project implementation, and long-term impacts may result from the loss or change of vegetation and thereby loss of the capacity of habitats to support wildlife populations.

NO-ACTION ALTERNATIVE

Requirements of the CVPIA biological opinion (Reclamation and Service 2000) would be met under the No-Action Alternative, including continuation of ongoing species conservation programs. The renewal of long-term contracts would not involve construction of new facilities or installation of structures that would alter current land uses. The renewal of CVP contracts for the project area would only continue water deliveries that accommodate current land uses. Implementation of the No-Action Alternative would not impact the production of agricultural crops or current land uses that support habitat. No habitat that supports species would be converted to agricultural or M&I use as a direct result of the renewal of long-term water service contracts. As a result, renewal of the water service contracts under the No-Action Alternative would not result in adverse effects on fish, vegetation, or wildlife resources located in the DMC Unit.

ALTERNATIVE 1

Similar to the discussion above for the No-Action Alternative, Alternative 1 would not result in adverse impacts on biological resources, including fish, vegetation, and wildlife, in the DMC Unit study area. The renewal of CVP contracts for the study area would only continue water deliveries that accommodate current land uses. Implementation of Alternative 1 would not substantially impact the production of agricultural crops or current land uses that support habitat. No habitat that supports species would be converted to agricultural or M&I use as a direct result of the renewal of long-term water service contracts. As a result, renewal of the water service contracts under Alternative 1 would not result in adverse effects on fish, vegetation, or wildlife resources located in the DMC Unit.

ALTERNATIVE 2

Similar to the discussion above for the No-Action Alternative, Alternative 2 would not result in adverse impacts on biological resources, including fish, vegetation, and wildlife, in the DMC Unit study area. The renewal of CVP contracts for the study area would only continue water deliveries that accommodate current land uses. Implementation of Alternative 2 would not substantially impact the production of agricultural crops or current land uses that support habitat. No habitat that supports species would be converted to agricultural or M&I use as a direct result of the renewal of long-term water service contracts. As a result, renewal of the water service contracts under Alternative 2 would not result in adverse effects on fish, vegetation, or wildlife resources located in the DMC Unit.

CUMULATIVE IMPACTS

Long-term contract renewals, when added to other past, present, and reasonably foreseeable future actions, would not cause a cumulative impact on the biological resources of the DMC Unit. Long-term contracts provide for the delivery of water for refuge habitat and will continue to be used in conjunction with and to the benefit of ongoing wetland and riparian habitat conservation programs, including the Central Valley Habitat Joint Venture and the San Joaquin River Riparian Habitat Restoration Program. The renewal of long-term contracts in the DMC Unit obligate the delivery of the same contractual amount of water to the same lands without the need for additional facility modifications or construction and will not incrementally contribute to any physical impacts to study area biological resources.

SECTION 3.10: CULTURAL RESOURCES

This section discusses the potential effects that the alternatives considered in Chapter 2 would have on cultural resources in the DMC Unit.

AFFECTED ENVIRONMENT

Renewal of the long-term water service contracts between Reclamation and the 20 DMC Unit contractors constitutes an "undertaking" under federal definitions. Therefore, potential impacts to cultural resources are being considered in this EA in compliance with a number of federal rules and regulations, as discussed below under Regulatory Setting.

For cultural resources, the area of potential effect of the undertaking consists of the contract service areas of the 20 DMC Unit contractors. The district service areas, which are previously described in Section 3.1, Contractor Service Area Descriptions, incorporate extensive areas along the western portion of the San Joaquin Valley and the interface between the valley and the lower reaches (eastern margin) of the Diablo Range.

The remainder of this section details the potential effects of the undertaking to cultural resources that are considered eligible or potentially eligible for inclusion on the National Register of Historic Places (NRHP) and that are located or may be present within the contract service areas of the 20 DMC Unit contractors. Included at the end of this section are recommendations for actions that the DMC Unit contractors should take and that, if adopted, will ensure that any effects of the undertaking are reduced to less than adverse levels.

INFORMATION SOURCES AND BACKGROUND DATA FOR AFFECTED ENVIRONMENT

This section provides a brief overview of environmental, prehistoric, ethnographic, and historic contexts for the area encompassed by the DMC Unit. Much of this background information has been derived from anthropological, archaeological, and historical studies conducted over the past several decades on both public and private lands within the service areas of the 20 DMC Unit contractors. Also discussed are the types of cultural resources known or suspected of being present within these service areas.

In order to secure information concerning the types and general distribution of known archaeological and historical sites and to estimate whether additional sites may remain undiscovered within individual district lands, the following sources were consulted:

- A search of archaeological survey, site, and other records and documents maintained by the California Historical Resources Information System, Central

California Information Center (CSU-Stanislaus), and the Southern San Joaquin Valley Information Center (CSU-Bakersfield).

- A review of selected published and unpublished archaeological, ethnographic, and historical reports and documents available for the overall project area.
- A review of the NRHP.
- The California Register of Historical Resources.
- The California Inventory of Historic Resources (1976).
- The California Historical Landmarks (1996).
- The California Points of Historical Interest listing (May 1992 and updates).
- The Historic Property Data File (Office of Historic Preservation current list).
- The CALTRANS Local Bridge Survey (1989).
- The Survey of Surveys (1989).

The background research and records searches were undertaken in September 2000, with specific results summarized below under Natural Environmental Context, Cultural Environmental Context, and Current Inventory of Cultural Resources.

NATURAL ENVIRONMENTAL CONTEXT

The service areas of the 20 DMC Unit contractors include primarily valley and lower foothill lands located within the central and southern San Joaquin Valley, along the western margin of the valley at the interface of the valley and the lower reaches of the Diablo Range.

This area contains a variety, but a limited number of water sources and resource zones. Prehistoric use and occupation focused on these features, particularly around the confluences of streams and within the ecotones created at the interface of foothill/valley lands. Drainages and associated natural levees and benches were moderately to intensively utilized, while uplands were visited for oak and other resources on a more seasonal basis.

Much of this area has been affected by ranching for over 100 years and by agriculture during the past 50 to 100 years. The most recent impacts derive primarily from the construction of water distribution facilities, major transportation routes (Interstate 5 in particular), and agricultural equipment and storage buildings.

PREHISTORIC CONTEXT

The CVPIA project area, inclusive of the area of potential effect, has a long and complex cultural history with distinct regional patterns that extend back more than 11,000 years. The first generally agreed-upon evidence for the presence of prehistoric peoples in the CVPIA area is represented by the distinctive fluted spear points, termed Clovis points, found on the margins of extinct lakes in the San Joaquin Valley. The Clovis points are found on the same surface with the bones of extinct animals such as mammoths, sloths, and camels. Based on evidence from elsewhere, the ancient hunters who used these spear points existed during a narrow time range of 10,900 BP to 11,200 BP.

The next cultural period represented, the Western Pluvial Lakes Tradition, thought by most to be after the Clovis period, is another widespread complex that is characterized by stemmed spear points. This poorly defined early cultural tradition is regionally known from a small number of sites in the Central Coast Range, San Joaquin Valley lake margins, and Sierra Nevada foothills. The cultural tradition is dated to between 8,000 and 10,000 years ago and its practitioners may be the precursors to the subsequent cultural pattern.

About 8,000 years ago, many California cultures shifted the main focus of their subsistence strategies from hunting to seed gathering, as evidenced by the increase in food-grinding implements found in archeological sites dating to this period. This cultural pattern is best known for southern California, where it has been termed the Milling Stone Horizon (Wallace 1954, 1978), but recent studies suggest that the horizon may be more widespread than originally described and is found throughout the CVPIA area. Radiocarbon dates associated with this period vary between 8,000 and 2,000 BP, although most cluster in the 6,000 to 4,000 BP range (Basgall and True 1985).

Cultural patterns as reflected in the archeological record, particularly specialized subsistence practices, became codified within the last 3,000 years. The archeological record becomes more complex, as specialized adaptations to locally available resources were developed and populations expanded. Many sites dating to this time period contain mortars and pestles and/or are associated with bedrock mortars, implying the intense exploitation of the acorn. The range of subsistence resources utilized and exchange systems expanded significantly from the previous period. Along the coast and in the Central Valley, archeological evidence of social stratification and craft specialization is indicated by well-made artifacts such as charmstones and beads, often found as mortuary items. Ethnographic lifeways serve as good analogs for this period.

ETHNOGRAPHIC CONTEXT

As noted above, the service areas of the 20 DMC Unit contractors are nearly coterminous with lands claimed by the Penutian-speaking Northern Valley Yokuts at the time of their initial contact with European-American populations, circa AD 1850 (Kroeber 1925; Wallace 1978). These Yokuts occupied an area extending from the crest of the Coast Diablo Range easterly into the foothills of the Sierra Nevada, north to the American River, and south to the upper San Joaquin River.

The basic social unit for the Yokuts was the family, although the village may also be considered a social, as well as a political and economic unit. Often located on flats adjoining streams, villages were inhabited mainly in the winter because it was necessary to go out into the hills and higher elevation zones to establish temporary camps during food-gathering seasons (i.e., spring, summer, and fall). Villages typically consisted of a scattering of small structures, numbering from four or five to several dozen in larger villages, each house containing a single family of from three to seven people. Larger villages, with from 12 to 15 or more houses, might also contain an earth lodge.

As with most California Indian groups, economic life for the Yokuts revolved around hunting, fishing, and collecting plants, with deer, acorns, and avian and aquatic resources representing primary staples. The Yokuts used a wide variety of wooden, bone, and stone artifacts to collect and process their food. The Yokuts were very knowledgeable of the uses of local animals and plants and the availability of raw materials that could be used to manufacture an immense array of primary and secondary tools and implements. However, only fragmentary evidence of their material culture remains, due in part to perishability and in part to the impacts to archaeological sites resulting from later (historic) land uses.

Resource Considerations, Native American Sites

The discussion of regional prehistory and ethnography provides insight into the types of Native American sites already known or likely to be present within the service areas of the 20 DMC Unit contractors, with the most frequently occurring types including the following:

- Large village sites located along the margins of all permanent streams, particularly at confluences, and other natural surface water sources (springs, marshes, and other wetlands). Additional large village sites have been documented along smaller stream courses, especially where streams merge, and particularly at the interface between major ecotones.

- Surface scatters of lithic artifacts without buried cultural deposits, resulting from short-term occupation and/or specialized economic activities.
- Petroglyphs, often in the form of cupped boulders, at or close to village sites or encampments.
- Bedrock food-processing (milling) stations, including mortar holes and metate slicks.
- Trails, often associated with migratory game animals.
- Mortuary sites, often but not exclusively associated with large village complexes.
- Isolated finds of aboriginal artifacts and flakes.

HISTORIC CONTEXT

Interior California was initially visited by Anglo-American fur trappers, Russian scientists, and Spanish-Mexican expeditions during the early part of the nineteenth century. These early explorations were followed by a rapid escalation of European-American activities, which culminated in the massive influx fostered by the discovery of gold at Coloma in 1848. The influx of miners and others during the Gold Rush set in motion a series of major changes to the natural and cultural landscape of California that would never be reversed.

Early Spanish expeditions arrived from Bay Area missions as early as 1804, penetrating the northwestern San Joaquin Valley (Cook 1976). By the mid-1820s, hundreds of fur trappers were annually traversing the valley on behalf of the Hudson's Bay Company (Maloney 1945). By the late 1830s and early 1840s, several small permanent European-American settlements had emerged in the Central Valley and adjacent foothill lands, including ranchos in the interior Coast Range.

With the discovery of gold in the Sierra Nevada, large numbers of European-Americans, Hispanics, and Chinese arrived in and traveled through the general project area. The mining communities' demand for hard commodities led quickly to the expansion of ranching and agriculture throughout the valley and logging within the foothill and higher elevation zones of the Sierra Nevada. Stable, larger populations arose and permanent communities slowly emerged in the Central Valley at this time, particularly along major transportation corridors. Of particular importance was the transformation brought about by construction of railroad lines.

The Southern Pacific and Central Pacific Railroads and a host of smaller interurban lines to the north around the City of Stockton began intensive projects in the late 1860s. By the turn of the century, nearly 3,000 miles of lines connected the cities of Modesto and Stockton with points south and north. Many of the valley's larger cities, including many in San Joaquin County and adjacent counties, were laid out as isolated railroad towns in the 1870s and 1880s by the Southern Pacific, which not only built and settled, but continued to nurture the infant cities until settlement was successful. The Southern Pacific main line proceeds through or adjacent to the entire project area.

Intensive agricultural development soon followed, since railroads provided the means for product to be transported to a much larger market. Agricultural land conversion began long before the development of water supply projects. By the end of the twentieth century, a substantial portion of the valley was being intensively cultivated, with increasing mechanization through all of the twentieth century and substantial expansion of cultivated acreage with the arrival of water from the CVP.

Resource Considerations, Historic Resources

Historic overviews for the region generally document the presence of a wide range of historic site and feature types and complexes, with types known or most likely to be present with the project area including the following:

- Historic railroad alignments.
- Two-track historic trails/wagon roads and now-paved historic road corridors.
- Water distribution systems, including levees and small and large ditch, canal, and channel systems.
- Occupation sites or homesteads and associated features such as refuse disposal sites, privy pits, barns, and sheds.
- Commercial undertakings.
- Refuse disposal site(s) associated with early communities.
- Ranch features, including standing structures, structural remnants, stock ponds, and corrals.

CURRENT INVENTORY OF CULTURAL RESOURCES

A total of 89 archaeological and historic sites are currently documented within the service areas of the 20 DMC Unit contractors. These include sites that contain exclusively prehistoric material, sites with only historic material, and sites with mixed prehistoric and historic components and structures.

Prehistoric sites are represented by large habitation areas (village sites) in which both habitation and special-use activity areas are represented; mortuary sites, usually associated with habitation sites; specialized food-procurement and food-processing sites including milling areas; and other site types representing a variety of specialized activities.

Historic sites are represented by a range of types, including buildings and structures dating to the nineteenth century; historic transportation features; water distribution systems; occupation sites and homesteads with associated features such as refuse disposal sites, privy pits, barns, and sheds; historic disposal sites associated with historic communities; and ranch complexes.

Some of these prehistoric and historic sites have been determined eligible for inclusion on the NRHP through consultation between a federal agency and the State Historic Preservation Office. Others remain unevaluated in relation to NRHP eligibility criteria.

In addition to formally recorded sites, it is clear that a large number of both prehistoric and historic sites remain undiscovered within the overall project area simply because for many areas, especially undeveloped ranch and farm lands, a formal archaeological inventory survey has never been undertaken.

Table 3.10-1 summarizes the current cultural resources inventory by DMC Unit contractor. The table also provides information concerning the cultural resource inventory within each district, as follows:

- The number of documented archaeological and historic sites that have been assigned State Trinomials, Primary Record, or State Landmark designations.
- An estimate of the land area within the district that has been surveyed for cultural resources.
- A conclusion as to whether district lands are known to contain or, if subjected to formal archaeological survey, would be likely to be discovered to contain important prehistoric or historic sites or other cultural features. This conclusion or assessment is based on (a) the results of the formal records search, (b) previous

consultation with Native American groups and historic societies as summarized in existing documents, (c) the results of prior surveys in the general or immediate vicinity, and (d) an assessment of archaeological sensitivity based on stream courses and other critical variables present within unsurveyed district lands.

Table 3.10-1
Summary of Previous Studies and Cultural Properties

Entity Name	Recorded Sites and Landmarks	Percentage Surveyed to Date	Are Undocumented Sites Likely To Be Present in District?
The West Side Irrigation District	7	30%	Yes
Plain View Water District	6	60%	Yes
City of Tracy	15	20%	Yes
Banta-Carbona Irrigation District	5	10%	Yes
West Stanislaus Irrigation District	3	1%	Yes
Patterson Water District	3	5%	Yes
Del Puerto Water District	22	35%	Yes
Centinella Water District	0	20%	Yes
Laguna Water District	0	0%	Yes
Eagle Field Water District	0	0%	Yes
Oro Loma Water District	0	0%	Yes
Mercy Springs Water District	0	0%	Yes
Widren Water District	0	1%	Yes
Broadview Water District	0	0%	Yes
Coelho Family Trust*	1	1%	Yes
Reclamation District #1606*	1	1%	Yes
Fresno Slough Water District	0	0%	Yes
Tranquillity Irrigation District*	1	2%	Yes
Tranquillity Public Utilities District	25	3%	Yes
James Irrigation District	0	25%	Yes
Total	**89**		

*District contains no sites with State Trinomial or number designations, but contains one State Historic Landmark herein counted as a “site."

ISSUES IDENTIFIED

The primary issues involving cultural resources include (a) what types of archaeological and historic sites are present within the service areas for the 20 DMC Unit contractors that could be affected by the undertaking, (b) what is the basis for determining the significance or importance of identified sites, (c) what effects might the undertaking have on important or significant sites located within the project areas, and (d) what steps might be taken to avoid, minimize, or mitigate any adverse impacts to such significant sites.

The identification of archaeological sites was resolved through (a) an evaluation of records and documents, including archaeological survey reports and archaeological site documents on file at California Historical Resources Information Centers and elsewhere, (b) archaeological and historic overview of the project area, and (c) the results of previous consultations with Native American groups and historical societies as documented in reports and files at the California Information Centers.

The significance or importance of archaeological sites located within the service areas for the 20 DMC Unit contractors has been addressed by using established procedures outlined in 36 CFR 60.4 and discussed below.

The final cultural resource issue revolves around possible impacts to archaeological and historic sites that might be determined eligible or potentially eligible for listing on the NRHP and how best to minimize or reduce such possible impacts to less than adverse levels. These issues are discussed below under Potential Effects of the Undertaking to Cultural Resources and under Mitigation Measures.

REGULATORY SETTING

Evaluation of the potential impacts of an undertaking to archaeological and historic sites must conform with Section 106 of the National Historic Preservation Act and its implementing regulations (36 CFR Part 800), Section 2(b) of Executive Order 11593, Section 101(b)(4) of NEPA, the Archaeological Resources Protection Act, the Native American Grave Protection and Repatriation Act of 1990 (if federal lands are involved), and other rules and regulations, including applicable state laws (especially, the CEQA Guidelines, as amended in October 1998). Reclamation is responsible for ensuring compliance with the federal laws, rules, and regulations.

ENVIRONMENTAL CONSEQUENCES

The objectives of this section are (a) to describe the basis for determining which cultural resources located within the service areas for the 20 DMC Unit contractors have been included, are considered potentially eligible for inclusion, or might be found to be eligible for inclusion on the NRHP and whether additional such resources may remain undiscovered within the service areas, (b) to identify and assess the potential effect of the project on eligible or potentially eligible or significant cultural resources, and (c) to outline appropriate measures that can be taken to avoid, minimize, or mitigate adverse impacts to any eligible cultural properties that could be affected by the undertaking.

SIGNIFICANCE OR IMPORTANCE OF CULTURAL RESOURCES

According to federal regulations and guidelines, significant or important cultural resources are those prehistoric and historic sites, districts, buildings, structures, and objects, as well as properties with traditional religious or cultural importance to Native Americans, that are listed or are eligible for listing on the NRHP (historic properties), according to the criteria outlined in 36 CFR 60.4. Historic properties must possess integrity of location, design, workmanship, feeling, and association and must meet at least one of the following criteria:

- Associated with events that have made significant contributions to the broad patterns of United States history.

- Associated with the lives of people significant in United States history.

- Embody the distinctive characteristics of a type, period, or method of construction, or represent the work of a master, or possess high artistic value, or represent a significant and distinguishable entity whose components may lack individual distinction.

- Has yielded or is likely to yield information important in prehistory or history.

Archaeological sites with "cultural" or traditional value are evaluated under guidelines prepared by the Advisory Council on Historic Preservation (Advisory Council on Historic Preservation 1985). The guidelines define *cultural value* as "... the contribution made by an historic property to an on-going society or cultural system. A traditional cultural value is a cultural value that has historical depth." The guidelines further specify that "… [a] property need not have been in consistent use since antiquity by a cultural system in order to have traditional cultural value."

As noted above, although numerous archaeological and historic sites have been documented within the service areas for the 20 DMC Unit contractors, not all of them have been evaluated for NRHP eligibility. As well, intensive-level pedestrian surveys have been undertaken within only a portion of the overall service areas.

POTENTIAL EFFECTS OF THE UNDERTAKING TO CULTURAL RESOURCES

Impacts to archaeological and historic sites occur from activities affecting the characteristics that qualify a property for inclusion on the NRHP. The criteria for assessing effects are available in the Advisory Council on Historic Preservation's Regulations for the Protection of Historic Properties at 36 CFR 800.9. Significant impacts are those considered to have an adverse effect on historic properties. Adverse effects may include, but are not limited to:

- Physical destruction, damage, or alteration of all or part of a historic property.

- Isolation of a historic property or alteration of the character of its setting when that character contributes to the property's eligibility for the NRHP or its cultural significance.

- Introduction of visual, audible, or atmospheric elements that are out of character with the property or that alter its setting.

Important archaeological sites within the project area include documented and undocumented prehistoric and historic sites and features, some of which may contain subsurface (buried) accumulations of cultural material.

Virtually all of the actions associated with the renewal of long-term water service contracts are within the range of "existing conditions" with respect to land use. Currently, most of the lands within the contractors' boundaries are being farmed, an activity that has been ongoing for decades. There are presently no specific plans to modify or substantially alter current land use within contract service areas on the basis of long-term water service contract renewals. Specifically, contract renewals will not alter the area of use, types of use, range of river flows, or reservoir fluctuations. No additional infrastructure will be constructed, there will be no increase in deliveries, and there will be no conversion of natural habitat into farmland or other uses.

Future needs could possibly result in proposals by one or more districts to (1) bring new lands into irrigation and/or incorporate new land into district boundaries (inclusions) or (2) substantially alter current land uses within district boundaries. Reclamation would need to consider the effects of either one of the above to historic properties for actions it approves. The measures discussed below are designed to ensure that these actions, which could affect historic properties, comply with requirements under Section 106 of the National Historic Preservation Act and other relevant federal rules and regulations.

NO-ACTION ALTERNATIVE

As indicated above, long-term water service contract renewal itself will not result in impacts to eligible or potentially eligible prehistoric or historic sites or districts within the service areas for the 20 DMC Unit contractors. Land use changes, including the addition of lands to districts or the conversion of land from agricultural to M&I use, are made at the local level, according to California land use planning law and as described further in Section 3.4, Land Use. There are no plans at the federal level to either add lands to districts or to effect land use conversions through the long-term water service contract renewal process.

It is possible that one or more of the contracted districts could petition Reclamation to expand agricultural activities served by contracted water within district lands or to substantially alter land use within the district utilizing available contracted water. Under these circumstances, Reclamation would comply with Section 106 of the National Historic Preservation Act and other rules and regulations governing effects or potential effects of new undertakings to cultural resources determined or considered potentially eligible for inclusion on the NRHP.

ALTERNATIVE 1

Similar to the discussion above for the No-Action Alternative, Alternative 1 would not result in impacts to eligible or potentially eligible prehistoric or historic sites or districts within the service areas for the 20 DMC Unit contractors. There are no plans at the federal level to either add lands to districts or to effect land use conversions through the long-term water service contract renewal process that could result in an impact to these resources. Therefore, Alternative 1 would not result in adverse impacts to cultural resources.

ALTERNATIVE 2

Similar to the discussion above for the No-Action Alternative, Alternative 2 would not result in impacts to eligible or potentially eligible prehistoric or historic sites or districts within the service areas for the 20 DMC Unit contractors. There are no plans at the federal level to either add lands to districts or to effect land use conversions through the long-term water service contract renewal process that could result in an impact to these resources. Therefore, Alternative 2 would not result in adverse impacts to cultural resources.

EFFECTS NOT FOUND TO BE SIGNIFICANT

To date, while archaeological and historical sites have been documented within district lands comprising the DMC Unit, continuation of current land uses is not considered adverse, and no specific mitigation measures are necessary. For substantial land use changes involving federally contracted water, the required Section 106 consultation would consider potential effects to eligible historic properties pursuant to relevant federal law, rules, and regulations.

CUMULATIVE IMPACTS

Long-term contract renewals, when added to other past, present, and reasonably foreseeable future actions, will not result in impacts to cultural resources. The contracts call for the delivery of the same quantities of water to the same lands, with no additional facility modifications or construction that could directly or indirectly lead to physical impacts to cultural resources.

SECTION 3.11: RECREATIONAL RESOURCES

This section discusses the potential effects that the alternatives considered in Chapter 2 would have on the recreational resources within the DMC Unit. Information in this section is summarized from the Draft CVPIA PEIS, Recreation, Technical Appendix, Volume 4 (Reclamation 1997c).

AFFECTED ENVIRONMENT

Recreation sites that could be affected by the renewal of long-term water service contract in the DMC Unit include San Luis Reservoir, the O'Neill Forebay, Pacheco State Park, the San Joaquin River, and various wildlife refuges and areas located near the DMC Unit. The Delta-Mendota Canal itself also provides limited recreational opportunities and, therefore, is treated as a potentially affected recreational area.

RESERVOIRS

San Luis Reservoir and the adjacent O'Neill Forebay provide reservoir-related recreational resources in the vicinity of the service areas of the DMC Unit contractors. The reservoirs are located west of Interstate 5 near State Route 152. They are within the San Luis Reservoir State Recreation Area, operated by the California Department of Parks and Recreation (CDPR). Visitor attendance to the San Luis Reservoir State Recreation Area in fiscal year 2001 and 2002 was 514,096 (California Department of Parks and Recreation 2004). This included 469,478 day-users and 44,618 campers.

San Luis Reservoir

When it is full, San Luis Reservoir covers approximately 12,700 surface acres. Recreational activities include boating, water-skiing, fishing, picnicking, camping, hunting, and hiking. Reservoir facilities consist of one campground and two concrete boat ramps and boarding docks. The reservoir has no designated swimming or lakeside beach areas. Boat and shore fishing occur throughout San Luis Reservoir. Migratory waterfowl hunting is permitted on most of the reservoir. Hunting for deer and wild pig is also allowed on the northwest shoreline of the San Luis Reservoir State Recreation Area.

Water-enhanced activities account for the largest portion of reservoir use. Relaxing and camping are the most popular of the water-related activities. Seventy-seven percent of annual use occurs between April and September. Recreation at the reservoir is optimized at a pool elevation 544 feet above mean sea level. Use of the two boat ramps becomes impaired between 340 and 360 feet above mean sea level. Swimming activities are

unaffected by reservoir surface water fluctuations because the reservoir has no designated swimming facilities.

San Luis Reservoir and Los Banos Creek State Recreation Area Joint General Plan and Resource Management Plan

Reclamation, in cooperation with the CDPR, is preparing draft environmental documentation for the San Luis Reservoir and Los Banos Creek State Recreation Area Joint General Plan and Resource Management Plan (Fed. Reg 68:26:6509–6510).

San Luis Reservoir is approximately five miles west of the city of Los Banos, adjacent to State Route 152, in Merced County, California. Los Banos Creek State Recreation Area is located about five miles southwest of the city of Los Banos, south of State Route 152 and just west of Interstate 5. Reclamation, the NEPA lead agency, and CDPR, the CEQA lead agency, are preparing a joint draft programmatic environmental impact statement/report, which is due in March 2005. The purpose of the general plan is to guide future development activities and management objectives at the recreation area. CDPR is preparing the general plan portion and Reclamation is developing the resource management plan of the combined document. Reclamation and CDPR are cooperating to prepare the joint plans in a consolidated planning process to solicit agency and stakeholder participation for both efforts simultaneously. The project areas for each plan will vary, based on differences in management and ownership; however, there will be common components within the joint plans.

The San Luis Reservoir and the Los Banos Creek Retention Dam were built in 1965 as part of the CVP on lands owned by Reclamation. The lands are jointly managed by DWR and CDPR. CDPR is responsible for recreation and resource management while DWR manages the water supply facilities. The CDFG manages additional tracts of land in the vicinity of the San Luis Reservoir that were set aside to mitigate for construction impacts. These DFG-managed lands will not be part of the general plan or the environmental documents because the CDPR does not have management jurisdiction over these lands. The San Luis Reservoir and O'Neill Forebay Wildlife Areas, federally owned lands managed by the CDFG, will be included in the resource management plan and the environmental documentation.

The objectives of the joint plans are to establish management objectives, guidelines, and actions to be implemented by Reclamation directly or through its recreation contract with CDPR to:

- Protect the water supply and water quality functions of the reservoirs.

- Protect and enhance natural and cultural resources in the state recreation area, consistent with federal law and Reclamation policies.

- Provide recreational opportunities and facilities consistent with the CVP purposes

The joint plans will be the primary management guideline for defining a framework for resource stewardship, interpretation, facilities, visitor use, and services. The joint plans will define an ultimate purpose, vision, and intent for management through goal statements, guidelines, and broad objectives. They will be long-term plans that will guide future specific actions at the state recreation area. Subsequent specific actions will be the subject of future environmental analysis as required.

O'Neill Forebay

The O'Neill Forebay is located immediately east of San Luis Reservoir and 2.5 miles downstream of the San Luis Dam. The O'Neill Forebay covers about 2,250 acres of surface area and 14 miles of shoreline and was developed in part to accommodate recreational use that may be lost when San Luis Reservoir is drawn down. Recreational facilities consist of two boat ramps, two picnic areas, a campground, and a swimming area. O'Neill Forebay recreational features also include the Medeiros recreation area, which provides picnicking, camping, and boat ramp access, and the San Luis Creek day-use area, which provides picnicking, swimming, and boat ramp access. Facilities accommodate boating, fishing, swimming, wading, camping, and sightseeing. In addition, the O'Neill Forebay is nationally known for windsurfing.

The recreational facilities at O'Neill Forebay provide more diverse recreational opportunities than those at San Luis Reservoir. The most popular activities are swimming, wading, and relaxing. The majority of visits occur between April and September. Visitor origins include San Luis Reservoir, including coastal and bay counties to the west, and valley and foothill counties to the east.

Recreational use at O'Neill Forebay is generally unaffected by water level fluctuations because pool elevations are usually maintained at constant levels. However, minor drops in surface elevation may affect beach use because a relatively large amount of the shoreline would be exposed.

PACHECO STATE PARK

Pacheco State Park is adjacent to the San Luis Reservoir to the west. Because Paula Fatjo, a direct descendant of Francisco Pacheco for whom Pacheco Pass is named, wanted her ranch, El Rancho San Luis Gonzaga, to be kept intact for the enjoyment of people who shared her love of horses and the beauty of the unspoiled land itself, she donated the

parklands to the State of California. Pacheco State Park has beautiful displays of spring wildflowers, scenic vistas, and excellent hiking, mountain biking, and horse trails. The 28 miles of designated trails offers several loop options to give visitors the choice of a hike or ride from one to 20 miles or more. Visitors on the park's trails can enjoy beautiful views of the San Luis Reservoir and the San Joaquin Valley and, in the spring, blossoming wildflowers. Pacheco State Park is home to tule elk, deer, bobcat, coyote, fox, hawks, eagles, and a variety of smaller animals. Among the historic features of the park are an old line shack used by Henry Miller's cattle company in the late 1800s and part of the old Butterfield stage line route.

Only the western 2,600 acres are currently open for public use. The eastern portion of the park that adjoins San Luis Reservoir remains closed to the public until additional trail systems have been developed and the safety concerns associated with a wind turbine farm can be addressed.

SAN JOAQUIN RIVER

The San Joaquin River is approximately 100 miles long and extends from Millerton Lake to the Delta. Table 3.11-1 lists some of the recreational facilities and activities located on the San Joaquin River near the DMC Unit.

Table 3.11-1
San Joaquin River Recreational Facilities and Activities near the Delta-Mendota Canal Unit

San Joaquin River Locations	Facilities and Activities
Millerton Lake to Merced County line near State Route 152	No major public recreation features; public access at several road and state highway crossings
Merced County	San Luis National Wildlife Refuge Fremont Ford State Recreation Area
Stanislaus County	Las Palmas fishing access site Laird County Park Numerous public access points
San Joaquin County	Durham Ferry State Recreation Area Mossdale Landing County Park Dos Reis County Park Numerous public road crossings

Recreational use estimates for the 100 miles of the lower San Joaquin River are not available. However, based on information provided by recreation sites on the river, boating and fishing activities are estimated to total about 157,000 six-hour recreation visitor-days (California Department of Parks and Recreation 1990). Most of the San Joaquin River visitors are assumed to originate from nearby counties.

Recreational use on the San Joaquin River has been substantially affected by operation of Millerton Lake and diversions from the Merced and Chowchilla Canals east of the Mendota Pool. The San Joaquin River flow is somewhat intermittent downstream of the Mendota Pool to the Merced River confluence, with flows fed mainly by irrigation return flows.

DELTA-MENDOTA CANAL

Fishing access to the Delta-Mendota Canal is provided at Delta-Mendota Canal Site 2A in Stanislaus County and Delta-Mendota Canal Site 5 in Fresno County. Both sites provide parking areas and restrooms (Reclamation 1992). Fishing access to the Delta-Mendota Canal is limited to the developed access points (Reclamation 1993). Fishing is the only recreational activity allowed at both access sites.

Fishing use at the two sites has been estimated at 23,000 visitor-days (Reclamation 1997c). Canal Site 5 accounted for approximately 99 percent of this total in 1991. An estimated 85 percent of the visitors to the fishing sites originate in the local area (Reclamation 1981). Because no water-contact activities are allowed on the canal, fluctuations in the water level or flow do not directly affect recreational opportunities.

WILDLIFE REFUGES

Wildlife refuges in the vicinity of the Delta-Mendota Canal service area include the San Luis and Kesterson National Wildlife Refuges; the Mendota, Merced, San Luis National, San Joaquin National, Volta, Los Banos, and North Grasslands (Salt Slough and China Island) Wildlife Management Areas; Upper and Lower Cottonwood Wildlife Areas; Action Plan Lands (Freitis and West Bear Creek); and the Grassland Resource Conservation District. The Wildlife Management Areas listed above are discussed in more detail in Section 3.9, Biological Resources.

PRIVATE HUNTING CLUBS

The 176 private waterfowl hunting clubs in the San Joaquin River Region cover about 96,800 acres. About 33,900 acres are flooded annually. Waterfowl hunting activity was estimated at 241,000 hunter-days in 1992.

ENVIRONMENTAL CONSEQUENCES

Impacts to recreational resources would be considered adverse if they result in a decline in the quality or quantity of recreational facilities or services, exceed adopted state or local recreation planning standards, or involve the installation of new facilities that could adversely impact the recreational environment.

NO-ACTION ALTERNATIVE

San Luis Reservoir could be affected by water level fluctuations during one or more dry or wet years. Boating would be constrained and shoreline activities would decline for two or more peak-season months as compared to the Affected Environment. During consecutive wet years, boat ramps would be unusable for one more peak-season month, boating would

be constrained, and shoreline activities would decline for two more peak-season months and one more off-season month. Additional use could decrease about 1 percent during dry years and about 4 percent during wet years.

Because pool elevations in O'Neill Forebay are maintained at constant levels, water level fluctuations would not be affected. Increased stream flows on the San Joaquin River could increase recreational opportunities. Recreational opportunities provided by the Delta-Mendota Canal are expected to be similar to No-Action Alternative conditions because water levels in the canal are held constant. Wildlife refuges will receive increased water supplies as a result of Level 2 refuge water supplies, thereby maintaining refuge recreational opportunities at current or enhanced levels, especially for wildlife observation activities.

ALTERNATIVE 1

Similar to the discussion above for the No-Action Alternative, Alternative 1 would not result in adverse impacts on recreational resources. The facilities would continue to operate as in the past. Recreational opportunities and annual use levels at the O'Neill Forebay, San Joaquin River, Delta-Mendota Canal, and wildlife refuges are not expected to change from current conditions as a result of long-term contract renewals.

ALTERNATIVE 2

Similar to the discussion above for the No-Action Alternative, Alternative 2 would not result in adverse impacts on recreational resources. The facilities would continue to operate as in the past. Recreational opportunities and annual use levels at the O'Neill Forebay, San Joaquin River, Delta-Mendota Canal, and wildlife refuges are not expected to change from current conditions as a result of long-term contract renewals.

CUMULATIVE IMPACTS

Long-term contract renewals, when added to other past, present, and reasonably foreseeable future actions, will not cause or contribute to impacts to recreational opportunities or resources. Contract renewals call for the same quantities of water to be delivered to the same lands, with no additional facility modifications or construction. Water storage and conveyance facilities that provide recreational opportunities will not be incrementally affected by long-term contract renewals; reductions in water surface elevations are attributable to other operational decisions independent of the renewal of long-term water service and repayment contracts.

SECTION 3.12: VISUAL RESOURCES

This section discusses the potential effects that the alternatives considered in Chapter 2 would have on the visual resources in the DMC Unit. Information in this section is summarized from the Draft CVPIA PEIS, Visual Resources, Technical Appendix, Volume 6 (Reclamation 1997e).

AFFECTED ENVIRONMENT

The San Joaquin River Region is lowland with predominantly flat and gently sloping terrain bordered by hills and low mountains. The valley is semi-arid to arid, and there are few natural lakes or perennial streams. The San Joaquin River is the principal water feature. A number of wetlands used as wildlife refuges are also located in the region. The valley area is developed predominantly for agricultural uses. It is sparsely to moderately populated, having one large urban area (metropolitan Fresno) and scattered small communities. The northern area of the region near the city of Tracy is developing rapidly.

There are CVP facilities within and in the vicinity of the DMC Unit that are visual resources. They include the San Luis Reservoir and O'Neill Forebay within the Los Banos Creek State Recreation Area. The landscape in this area is considered common scenic to minimal scenic quality. Recreational sites are discussed in further detail in Section 3.11, Recreational Resources.

The area surrounding the DMC Unit is predominantly of minimal scenic quality, with some areas of common scenic quality (U.S. Forest Service 1976). Interstate 5 provides panoramic view opportunities in some of the DMC Unit, some segments of which are designated scenic highways. Views of the Delta-Mendota Canal and California Aqueduct are the basis for the designation of Interstate 5 as a scenic highway. Similarly, views of San Luis Reservoir are important reasons for State Route 152 being designated a scenic highway.

Wildlife refuges in the region near the DMC Unit project area are considered to have landscape variety that ranges from common scenic to distinctive scenic quality (U.S. Forest Service 1976). These areas provide visual contrast with surrounding agricultural lands primarily because of their vegetation and water. The scenic quality is enhanced seasonally by the large numbers and variety of waterfowl and seasonal wildflower displays, which attract substantial visitation, thereby increasing the viewer sensitivity of the area. The CVP, through its wildlife refuges, creates visual benefits.

ENVIRONMENTAL CONSEQUENCES

A visual resource impact would be considered adverse if it interfered with existing scenic views, blocked visibility, or produced light and glare inconsistent with existing areas. Impacts in the DMC Unit project area depend on (1) changes in cropping patterns, which may result in increased fallowed land and the associated modified agricultural viewshed, and (2) releases from storage reservoirs, which may result in a "bathtub ring" effect caused by the appearance of unvegetated soil at the shoreline between the water surface and the high water line.

NO-ACTION ALTERNATIVE

Under the No-Action Alternative, irrigated acreage would be reduced by only a small amount (see Section 3.2, Agriculture). The visual character of lands irrigated in the past for agricultural purposes would not be substantially altered. Because of the combined use of surface and groundwater, the general cultivated and fallowed acreage patterns would be similar to historical patterns, and agricultural viewsheds would not substantially change. Neither scenic views nor visibility would be adversely impacted. Therefore, the No-Action Alternative would not adversely impact visual resources.

If San Luis Reservoir is operated to increase end-of-month storage in September, the occurrence of the present "bathtub ring" effect would be beneficially reduced as compared to the Affected Environment, particularly during the summer months when the reservoir experiences substantial use.

ALTERNATIVE 1

Similar to the discussion above for the No-Action Alternative, Alternative 1 would not result in adverse impacts on visual resources. General cultivated and fallowed acreage patterns would be similar to historical patterns, and agricultural viewsheds would not change. Neither scenic views nor visibility would be adversely impacted.

ALTERNATIVE 2

Similar to the discussion above for the No-Action Alternative, Alternative 2 would not result in adverse impacts on visual resources. General cultivated and fallowed acreage patterns would be similar to historical patterns, and agricultural viewsheds would not change. Neither scenic views nor visibility would be adversely impacted.

CUMULATIVE IMPACTS

Long-term contract renewals, when added to other past, present, and reasonably foreseeable future actions, would not affect visual resources in the DMC Unit. Long-term

contract renewals will obligate delivery of the same quantities of water to the same lands, without additional facility modifications or construction that could affect viewsheds in the study area. Other reasonably foreseeable future actions that could affect water surface elevations, the visual quality of current rural and agricultural viewsheds, the conversion of lands to other developed uses, and other independent CVP operational and land use decisions will occur to the same degree regardless of long-term contract renewals, and, therefore, the action of renewing long-term contracts would not cumulatively add to these impacts arising independently.

SECTION 3.13: PUBLIC HEALTH

This section discusses the potential effects that the alternatives considered in Chapter 2 would have on public health within the DMC Unit. Information in this section was summarized primarily from the Final CVPIA PEIS (Reclamation and Service 1999).

AFFECTED ENVIRONMENT

In addition to being persistent pests, mosquitoes can carry various strains of diseases known as arboviruses (or, more specifically, encephalitis). They are also known to transmit malaria (a parasitic blood disease) to humans and heartworms (a parasite) to dogs. Because the viruses often go unreported until patients develop acute symptoms, the prevalence of the viruses is also subsequently underreported. According to the CVPIA PEIS, outbreaks have been reported in the San Joaquin Region (Reclamation and Service 1999).

Any environment in which water is allowed to stand in shallow areas can serve as breeding ground for mosquitoes. These environments include wetlands, wildlife refuges, pastures, streams, canals, reservoirs, and other areas where water is relatively still. The main features near the project area that carry water include the San Joaquin River, Delta-Mendota Canal, and Mendota Pool. Some of these features could provide breeding grounds for mosquitoes. Also, sloughs and wildlife refuges that are near the project area typically serve as mosquito breeding grounds.

The major project features either within or near the project area with the greatest likelihood of attracting mosquito populations include the San Joaquin River, Delta-Mendota Canal, and Mendota Pool. A higher potential for breeding would occur in standing water near the San Joaquin River, which is a natural channel, and the Mendota Pool, which serves a reservoir. It is expected that mosquito breeding would be less or nonexistent along the Delta-Mendota Canal because the water typically flows swiftly as it is distributed throughout the Central Valley. Open canals and ditches associated with contractors' distribution systems and the reuse of tailwater could provide breeding ground for mosquitoes.

The majority of the 20 DMC Unit contractors have distribution systems to transport their CVP water supply. These distribution systems generally consist of varying lengths of lined and unlined canals, lift stations, underground pipelines, and open ditches. Much of these systems are gravity-fed, open canals. Also, as discussed in Section 3.1, Contractor Service Area Descriptions, many of the contractors within the DMC Unit reuse drainage or tailwater to eliminate offsite drainage. This tailwater is most often transported through

unlined ditches and returned onto a field for irrigation or into a district's distribution system for reuse. The moving water does not serve as a breeding area for mosquitoes.

Local mosquito control agencies have been developed to control mosquitoes and other vectors in an effort to control epidemics of human encephalitis and malaria. The mosquito abatement districts and control agencies adapt their practices in response to hydrologic conditions and the extent of areas supporting appropriate breeding habitat (Reclamation and Service 1999).

ENVIRONMENTAL CONSEQUENCES

NO-ACTION ALTERNATIVE

As described in Chapter 2, the No-Action Alternative provides baseline conditions for comparing the action alternatives and represents future conditions at a projected level of development without the implementation of any action alternative.

The implementation of the No-Action Alternative is not expected to increase flows or the incidence of standing water in project features and, therefore, would not result in an increase in mosquito populations above those already in existence. Because no direct increase in mosquito populations is anticipated, it is assumed that CVP contractors will continue to implement local vector abatement programs to control mosquito breeding conditions and protect public health. One practice that would continue is the removal of aquatic weeds from open ditches and canals. Areas with heavy aquatic weed growth can contribute to creating an environment attractive to mosquitoes. The majority of the 20 DMC Unit contractors remove aquatic weeds by applying chemical herbicides. Other contractors use mechanical practices to remove weeds from canals.

The implementation of tiered pricing under this alternative could result in contractors seeking alternative, more affordable water supply sources. As a result, groundwater pumping and water transfers could increase. Increased groundwater pumping is not expected to directly contribute to an increase in the mosquito population, because the facilities used to pump and distribute groundwater are primarily underground and would not result in standing water.

Increased water transfers are also not expected to directly contribute to an increase in the mosquito population. It is assumed that no additional distribution facilities or expansions of any facilities would be constructed as a result of long-term water service contract renewals. It can be assumed that water will be transferred through the current distribution facilities and will not expand the mosquito population.

As the quantities of CVP water deliveries are decreased, the environment contributing to mosquito breeding will also correspondingly decrease to the extent that standing water is decreased.

ALTERNATIVE 1

Similar to the discussion above for the No-Action Alternative, Alternative 1 would not directly result in an increase in mosquito populations or have an adverse impact on public health. The implementation of Alternative 1 is not expected to increase flows or the incidence of standing water in project features and, therefore, would not result in an increase in mosquito populations.

ALTERNATIVE 2

Similar to the discussion above for the No-Action Alternative, Alternative 2 would not directly result in an increase in mosquito populations or have an adverse impact on public health. The implementation of Alternative 2 is not expected to increase flows or the incidence of standing water in project features and, therefore, would not result in an increase in mosquito populations.

CUMULATIVE IMPACTS

Long-term contract renewals, when added to other past, present, and reasonably foreseeable future actions, would not incrementally increase the incidence of standing water or increase mosquito breeding conditions beyond conditions already existing under current delivery quantities and storage and conveyance management and operations. Long-term contract renewals will obligate delivery of the same quantities of water to the same lands, without additional facility modifications or construction that could affect public health conditions in the study area.