SECTION 3.6: 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 San Luis Unit. Information in this section has been updated, as appropriate, for more recent changes in air quality standards.

AFFECTED ENVIRONMENT

The San Luis Unit is located within the San Joaquin Valley Air Basin (SJVAB), which includes the southern portion of the Central Valley and the lower slopes of the surrounding mountain ranges. With an area of about 27,000 square miles, the air basin represents approximately 16 percent of the geographic area of California. It is the second largest air basin in California and has an estimated population of 3.2 million persons. Major urban centers in the air basin include Bakersfield, Fresno, Modesto, and Stockton. Air quality in the SJVAB is regulated by the San Joaquin Valley Unified Air Pollution Control District.

CLIMATE AND METEOROLOGY

Hot, dry summers and cool, rainy winters characterize the Mediterranean-like climate of the area. Most of the San Joaquin Valley is in the rain-shadow of the Coast Range and depends for its precipitation on cold, unstable northwesterly flows, which produce showers following frontal passages. Rainfall on the main San Joaquin Valley floor is relatively light. Approximately 90 percent of the rainfall occurs between November and April with little or no precipitation occurring from late spring to early fall (NOAA 2004).

The average mean temperature over a 30-year period is 64° Fahrenheit (F). High daily temperature readings in the summer average 95°F in the valley. In autumn, daytime temperatures decrease dramatically and significant air stagnation occurs under these conditions (Unger and Gibson 1974). The valley experiences mild winters with an average daily low temperature of 45°F. The spring is transitional, with some showery weather; summerlike conditions appear in late spring. Over the last 30 years, the valley averaged 106 days with temperatures of at least 90°F, and 40 days a year with temperatures of at least 100°F. The valley averages over 260 sunny days per year.

Winds in the San Joaquin Valley blow generally from the north except in the winter when winds are usually calm or southerly (Hayes et al. 1984). Average wind speeds at the Fresno Air Terminal are usually between 1 and 5 miles per hour. Higher speeds usually occur in the afternoon and evening, particularly during the summer, when average speeds climb to about 9 miles per hour in the evening. Near Los Banos, summer wind speeds are variable and gusty because of nearby mountain passes.

During the summer, the topography and climate of the air basin create a high potential for air inversions (i.e., when air of one temperature is contained beneath a layer of air of another temperature and air circulation is impeded). Semi-permanent systems of high barometric pressure fronts frequently establish themselves over the SJVAB, deflecting low-pressure systems that might otherwise bring cleansing rain and winds. The strength and duration of the inversion determines the amount of atmospheric mixing that will occur, which subsequently contributes in the SJVAB to concentrations of particulate matter less than 10 microns in diameter (PM_{10}). Low wind speeds, combined with low inversion layers in the winter, create a climate conducive to high PM_{10} concentrations (SJVUAPCD 1994). The surrounding mountains and upper watersheds are above the summer inversion layers. As a result, the SJVAB is highly susceptible to pollutant accumulation over time (SJVUAPCD 1992).

REGIONAL AIR POLLUTANTS

Air pollutants are substances occurring within or emitted to the atmosphere that may result in adverse effects on humans, animals, vegetation, and/or property (e.g., stone structures and automobile paint). "Criteria" air pollutants are airborne pollutants for which an acceptable level of human exposure has been determined and for which an ambient air quality standard (AAQS) has been set by either state or federal agencies. Criteria air pollutants include ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and particulate matter (PM). Air pollutants common to the SJVAB are described below.

Ozone

Ozone is a strong-smelling, pale blue, reactive, toxic chemical gas consisting of three oxygen atoms. It exists both in the upper atmosphere ozone layer and near the earth's surface. Ozone near the earth's surface can cause numerous adverse health effects and is a criteria air pollutant. Ozone is not directly emitted, but is a product of a photochemical process involving sunlight. Hydrocarbons and oxides of nitrogen, either occurring naturally or resulting from human activities, contribute to the formation of low-level O_3, which is a primary component of smog.

Carbon Monoxide

Carbon monoxide is a colorless, odorless gas that results from the incomplete combustion of fossil fuels. Motor vehicles contribute over 80 percent of the CO emitted in urban areas. Carbon monoxide can interfere with the blood's ability to carry oxygen to body tissues and can result in numerous adverse health effects. Carbon monoxide is a criteria air pollutant.

Nitrogen Oxides

Nitrogen oxides (NO_x) is a general term that pertains to compounds of nitric oxide, nitrogen dioxide, and other oxides of nitrogen. Nitrogen oxides, which are typically created during combustion processes, are major contributors to smog formation and acid deposition. Nitrogen dioxide may cause numerous adverse health effects. Nitrogen dioxide is also a criteria air pollutant.

Sulfur Dioxide

Sulfur dioxide is a strong-smelling, colorless gas formed by the combustion of fossil fuels. Power plants that burn coal or high-sulfur oil can be major sulfur dioxide sources. Sulfur dioxide and other sulfur oxides contribute to the problem of acid deposition in some parts of the United States. Sulfur dioxide is also a criteria pollutant.

Particulate Matter

PM_{10} is a major air pollutant consisting of tiny solid or liquid particles of soot, dust, smoke, fumes, and mists. Their small size allows them to easily enter air sacs deep in the lungs, where they may result in adverse health effects. PM_{10} also reduces visibility and is a criteria air pollutant.

The San Joaquin Valley Air Pollution Control District (SJVAPCD) recently determined that many owners and operators of agricultural facilities/lands in the San Joaquin Valley will be required to develop and implement Conservation Management Practice (CMP) plans to reduce PM_{10} fugitive dust from on-farm sources (SJVAPCD 2004a). CMP measures may include: elimination or reduction in need to move or disturb soil, protection of soil from wind erosion, and application of dust suppressants as well as other measures. CMPs were to be identified for each agricultural operation by December 2004 and implemented in 2005.

The U.S. Environmental Protection Agency (USEPA) has recently determined that high concentrations of particulate matter less than 2.5 microns in diameter ($PM_{2.5}$) may exacerbate respiratory symptoms, especially in the young and elderly.

Fugitive Dust

Fugitive dust is composed of airborne dust particles (including particulate matter as discussed above) that are introduced into the air through certain activities such as soil cultivation and operation of vehicles or equipment on open fields or dirt roadways.

Reactive Organic Gas

Reactive organic gas is a reactive chemical gas composed of hydrocarbons that may contribute to the formation of smog. Within the San Joaquin Valley, a large portion of the stationary source reactive organic gas emissions is fugitive emissions from oil and gas production operations.

Volatile Organic Compounds

Volatile organic compounds are hydrocarbon compounds that exist in the ambient air and often have an odor. Volatile organic compounds contribute to the formation of smog and may have harmful biological effects. Emission sources include evaporation of gasoline, alcohol, and solvents used in paints.

Smog

Smog is a combination of smoke, O_3, hydrocarbons, NO_x, and other chemically reactive compounds that, under certain conditions of weather and sunlight, may result in a murky brown haze that causes adverse health effects and reduces visibility. In California, the primary source of smog is motor vehicles. However, within the SJVAB, smoke from agricultural burning can contribute substantially to the formation of smog during certain times of the year. Although smog is not a criteria pollutant, criteria pollutant emissions can contribute to the formation of smog.

Smoke

Smoke is a form of air pollution consisting primarily of particulate matter of varying sizes. Other components of smoke include gaseous air pollutants such hydrocarbons, NO_x, and CO. Sources of smoke within the SJVAB include fossil fuel combustion, agricultural burning, forest fires in adjacent mountain ranges, and other combustion processes.

REGULATORY SETTING

Air quality is regulated through both federal and California AAQSs. The California Air Resources Board (CARB), an agency within the California Environmental Protection Agency, regulates air quality within California. In conjunction with its associated regional air quality districts (discussed below), CARB is responsible for monitoring and regulating air emissions within California for compliance with both state and federal AAQSs.

Both national AAQSs (NAAQSs) and California AAQSs (CAAQSs) have been developed for certain air pollutants. These health- and welfare-based NAAQSs and CAAQSs for outdoor air identify the maximum acceptable average concentrations of criteria air

pollutants during a specified period of time. Table 3.6-1 lists the federal and state standards.

Table 3.6-1
Federal and State Ambient Air Quality Standards

Pollutant	Averaging Time	Federal Standards[1]	California Standards[2]
Ozone	1 hour 8 hours	0.12 ppm (235 μg/m^3) 0.08 ppm (157 μg/m^3)	0.09 ppm (180 μg/m^3) None
Carbon monoxide	8 hours 1 hour	9 ppm (10 mg/m^3) 35 ppm (40 mg/m^3)	9 ppm (10 mg/m^3) 20 ppm (23 mg/m^3)
Nitrogen dioxide	Annual arithmetic mean 1 hour	0.53 ppm (100 μg/m^3) None	None 0.25 ppm (470 μg/m^3)
Sulfur dioxide	Annual 24 hours 3 hours 1 hour	0.03 ppm (80 μg/m^3) 0.14 ppm (365 μg/m^3) 0.5 ppm (1,300 μg/m^3) None	None 0.04 ppm (105 μg/m^3) None 0.25 ppm (655 μg/m^3)
Respirable particulate matter (PM_{10})	Annual geometric mean 24 hours Annual arithmetic mean	None 150 μg/m^3 50 μg/m^3	20 μg/m^3 50 μg/m^3 None
Fine particulate matter ($PM_{2.5}$)	24 hours Annual arithmetic mean	65 μg/m^3 15 μg/m^3	None None
Sulfates	24 hours	None	25 μg/m^3
Lead	30-day average Calendar quarter	None 1.5 μg/m^3	1.5 μg/m^3 None
Hydrogen sulfide	1 hour	None	0.03 ppm (42 μg/m^3)
Visibility-reducing particles	8 hour	None	In a sufficient amount to produce an extinction coefficient of 0.23/kilometer or visibility of $\geq$ 10 miles

Source: CARB 2003.

[1]Federal standards (other than those for ozone or particulate matter and those based on annual averages or annual arithmetic mean) are not to be exceeded more than once a year.

[2]California standards for ozone, carbon monoxide, sulfur dioxide (1 hour and 24 hours), nitrogen dioxide, suspended particulate matter, and visibility-reducing particles, are values that are not to be exceeded. All others are not to be equaled or exceeded.

ppm = parts per million; mg/m^3 = milligrams per cubic meter; μg/m^3 = micrograms per cubic meter.

Regions in which NAAQSs or CAAQSs are currently met for a given pollutant, as determined by air monitoring, are considered attainment areas for that pollutant. Regions in which these standards are not met are considered non-attainment areas for a given pollutant. Because of the differences between some of the federal and California standards, an area can be an attainment area for a NAAQS but a non-attainment area for a CAAQS. The CAAQSs for O_3, CO, NO_2, SO_2, PM_{10}, and lead (Pb) are more stringent than the corresponding NAAQSs.

California has been divided into 15 air basins for the purpose of managing its air resources on a regional basis. Areas within each air basin are considered to share the same air masses and are, therefore, expected to have similar ambient air quality. The San Luis Unit lies within the SJVAB. Air quality in the SJVAB is regulated by the SJVUAPCD, which consists of Merced, Madera, Fresno, Kern, Kings, San Joaquin, Stanislaus, and Tulare counties.

Within each air basin, air quality management districts and air pollution control districts regulate stationary, indirect, and area sources of air pollution within their respective jurisdictions. The districts issue air emission permits as part of a program directed towards controlling emissions from stationary sources of air pollution. They also implement transportation control measures for their respective regions. Air pollution control districts have the authority to regulate such sources of air pollution as power plants, highway construction, and housing developments within a given county. Each district adopts its own rules and regulations to combat the particular air quality problems within its region.

Under the California Clean Air Act of 1988, each air pollution control district or air quality management district that is designated as a non-attainment area for a specified criteria air pollutant must prepare a triennial Air Quality Management Plan for the purpose of bringing the district into compliance with the requirements of the NAAQS and CAAQS for that pollutant. These plans are incorporated into the State Implementation Plan, which has been prepared by the State of California in accordance with the federal Clean Air Act, as amended.

RECENT AIR QUALITY CONDITIONS

Most of the air pollutants in the area of the San Luis Unit are associated with both urban and agricultural land uses. Land uses in the San Luis Unit fall into four general categories: irrigated agriculture; dryland agriculture (dry-cropped, fallow, idle, or grazed); urban and industrial; and undeveloped (natural). The primary air pollutants associated with these four general land uses include PM and hydrocarbons or organic gases that may serve as O_3 precursors.

Pollutants commonly associated with agricultural land uses include PM, CO, NO_x, and O_3 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 released by and fuel combustion in vehicles and farm equipment. Particulate emissions may also occur when fallow fields do not have a crop cover to inhibit wind erosion. Carbon monoxide is released to the atmosphere during field burning and by fuel combustion in farm equipment. Nitrogen 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 urban and industrial practices result in hydrocarbon and PM emissions. Sources of hydrocarbon emissions include fuel combustion in vehicles and industrial equipment, painting and solvent use, and residential heating. Sources of PM emissions include dust entrained in pavement, structural and automobile fires, construction and demolition, residential fuel combustion, and fuel consumption in vehicles.

In undeveloped areas, hydrocarbon emissions result primarily from wildfires, and particulate emissions result from windblown dust and wildfires. No clear relationship exists between agricultural acres and the occurrence of O_3 and PM in the atmosphere. Several variables other than land use can affect air quality conditions, and these variables may change over time.

Table 3.6-2 lists the various attainment statuses for the SJVAB. The entire SJVAB is designated non-attainment with respect to the federal and state O_3 and PM_{10} standards (CARB 1998). According to monitoring data, exceedances of the 24-hour standard are generally seasonal and occur during the fall and winter months.

Table 3.6-2
Ambient Air Quality Standards and
San Joaquin Valley Air Pollution Control District Attainment Status

Pollutant	Designation or Classification	
	Federal Standards	State Standards
Ozone		
1-hour	Non-attainment/Extreme	Non-attainment/Severe
8-hour	To be determined	No state standard
PM_{10}	Non-attainment/Serious	Non-attainment
$PM_{2.5}$	To be determined	No state standard
Carbon monoxide		
Fresno urbanized area	Attainment[1]	Non-attainment[2]/Moderate
Remainder of Fresno County	Unclassified/Attainment	Attainment
Merced, Madera, and Kings Counties	Unclassified/Attainment	Unclassified
Kern (SJVAB portion), Tulare, Stanislaus, San Joaquin Counties	Unclassified/Attainment	Attainment
Nitrogen dioxide	Unclassified/Attainment	Attainment
Sulfur dioxide		
Kern County (SJVAB portion)	Attainment	Attainment
All other counties	Unclassified	Attainment
Lead (particulate)	No designation	Attainment
Hydrogen sulfide	No federal standard	Unclassified
Sulfates	No federal standard	Attainment
Visibility-reducing particles	No federal standard	Unclassified

Source: CARB 2001; SJVUAPCD 2001.
[1]40 CFR Parts 52 and 81—Fresno Urbanized Area, Bakersfield Metropolitan Area, Stockton Urbanized Area and Modesto Urbanized Area
[2]Area has reached attainment status. The request for redesignation was approved by the CARB on September 24, 1998. The redesignation became final upon action by the California Office of Administrative Law on August 26, 1999.

ENVIRONMENTAL CONSEQUENCES

This section describes the potential environmental consequences or impacts the project alternatives could have on air quality in the region. Long-term contract renewal alternatives are not anticipated to affect air pollutants associated with the relatively minor urban and industrial uses in the San Luis Unit. Therefore, this section focuses on potential impacts to air quality conditions that would result from changes in agricultural land uses.

The following methods and criteria were used to assess the general potential for the action alternatives to result in adverse air quality impacts when compared to the No Action Alternative. For this analysis, potential impacts were identified if air emissions would result in any of the following:

- Contribute substantially during construction to the violation of an existing or projected air quality standard within the study area from the emission of PM_{10} and O_3 precursors (i.e., reactive organic gases and NO_x).
- Expose sensitive receptors to substantial pollutant concentrations.
- Produce emissions of criteria pollutants during construction that would lead to the exceedence of NAAQS or CAAQS in attainment areas for a given pollutant.
- Produce emissions of criteria pollutants during operation that would lead to exceedence of NAAQS or CAAQS in attainment areas for a given pollutant.

The SJVAPCD recommends the following thresholds for adverse air quality impacts:

- Reactive organic gases and NO_x should not exceed 10 tons per year.
- Complying with the SJVAPCD's Regulation VIII reduces potential impacts from PM 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 exceedence of federal and state ambient CO standards. This is to be 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 one. 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 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 construction.

IMPACT ASSESSMENT

This section presents the assessment of potential impacts that the alternatives considered in this document could have on air quality in the region, as compared to the No Action Alternative. Particulate sources that could be affected by long-term contract renewals relate to dust sources associated with the retirement and fallowing of agricultural land, the use of heavy farm equipment, and the application of pesticides and fertilizers.

No Action Alternative

Under the No Action Alternative, long-term contract renewals would not require the construction of any new facilities or result in construction or land-disturbing activities that would contribute to particulate emissions. However, the implementation of the CVPIA Land Retirement Program, a voluntary program through which contractors may remove a portion of their irrigated lands from production in exchange for compensation, may, over time, lead to reductions in irrigable lands within the San Luis Unit project area. Land retirement may contribute to negligible increases in PM due to wind erosion on non-irrigated lands—if such lands are left in a condition susceptible to wind erosion.

Continued water deliveries would support both existing and future urban and agricultural land uses. The current land uses contribute to air pollutants, including emissions of reactive organic gases creating O_3, particulates, and other pollutants.

Actively farmed lands and fallowed lands can serve as a source of fugitive dust 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, because agricultural water deliveries would remain the same under the No Action

Alternative as those currently being experienced under existing conditions, emissions from farm equipment and transportation of agricultural materials are similarly expected to remain similar under the No Action Alternative when compared to existing conditions. Therefore, the No Action Alternative would not be expected to result in adverse impacts to air quality beyond those occurring under existing conditions.

Preferred Alternative

The Preferred Alternative would not result in adverse impacts to air quality when compared to existing conditions or the No Action Alternative. As with the No Action Alternative, land uses under the Preferred Alternative would include similar crops and cropping patterns as those described in Section 3.3, Agriculture. It is assumed that retired or fallowed lands would go to seed with grasses and would be grazed by livestock or occasionally dry farmed. These acreages and cultivation measures are similar to those areas and practices used on lands that have been historically fallowed as a result of crop rotation or periodic cropping pattern changes. Because indirect changes in land use may be limited, it is anticipated that the level of wind erosion potential would not increase under the Preferred Alternative as compared to the No Action Alternative. Therefore, the Preferred Alternative would not result in adverse impacts to air quality when compared to the No Action Alternative and/or existing conditions.

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 Section 3.3, Agriculture. It is assumed that retired or fallowed lands would go to seed with grasses and would be grazed by livestock or occasionally dry farmed. These acreages and cultivation measures are similar to those areas and practices used on lands that have been historically fallowed as a result of crop rotation or periodic cropping pattern changes. Because indirect changes in land use may be limited, it is anticipated that the level of wind erosion potential would not increase under Alternative 1 as compared to the No Action Alternative. Therefore, Alternative 1 would not result in adverse impacts to air quality when compared to the No Action Alternative and/or existing conditions.

Alternative 2

As previously described in Table 3.3-6, 1,100 total acres could be taken out of production as a result of implementing Alternative 2 under the dry-average hydrologic sequence, as compared to the No Action Alternative under average water year conditions. This would be a short-term impact because, in the long run, hydrology will likely reflect average levels. In addition, the decisions to take land out of or put into agricultural or other uses

reside with the landowners and local jurisdictions and are not solely attributable to agricultural impacts that may (or may not) result from long-term contract renewals. Other factors (e.g., crop price support levels, general plan policies, and agricultural profitability, among many others) also contribute to these decisions. The only long-term impact would result from comparing the total acres that may be taken out of production under the average-average hydrologic sequences with the No Action Alternative average water year conditions. As described in Table 3.3-6, no land would necessarily be taken out of production as a result of implementing Alternative 2 under the average-average hydrologic sequences, as compared to the No Action Alternative under average water year conditions.

Fugitive dust could be generated until native plants, weeds, or grasses provide natural cover for land that may be taken out of production. As with all impacts within the San Luis Unit, the concentration of impacts to a smaller geographic area within San Luis Unit increases the relative impact, while a more uniform dispersion of impacts across the San Luis Unit decreases the relative impact. It is unlikely that the amount of dust generated would constitute an adverse impact of any measurable level when considered in the context of an air basin-wide impact or when compared to impacts occurring under the No Action Alternative. To the extent that land taken out of production is concentrated in a smaller geographic area, impacts could be larger to those areas directly adjacent to barren lands. These impacts associated with local land use decisions are usually made at the landowner and/or local land use planning levels and involve several criteria and decisions including, but also beyond the price and availability of CVP water. In addition, fugitive dust emissions from irrigated lands are not substantially different from dry-farmed lands or fallowed 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. CARB continues to pursue additional incentives to reduce air pollution from agricultural sources, including incentives in Assembly Bill 923 recently signed by Governor Schwarzenegger. Additional CARB programs include 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. This legislation requires CARB, 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 CARB 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 CARB 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 CARB are designed to address ongoing air quality issues in the study area.

IRREVERSIBLE AND/OR IRRETRIEVABLE COMMITMENT OF RESOURCES

Based on this analysis, no irreversible and/or irretrievable commitments of air quality resources in the San Luis Unit were identified from long-term contract renewals.

SECTION 3.7: SOILS AND GEOLOGY

AFFECTED ENVIRONMENT

This section describes the soils and geology conditions found within the San Luis Unit. Information in this section was summarized from the Draft CVPIA PEIS, Groundwater, Technical Appendix Volume 2 (Reclamation, 1997a) and the San Luis Drainage Feature Re-evaluation DEIS (Reclamation 2005).

The affected area for soils and geology is delineated by the boundaries of the San Luis Unit. Trends associated with the migration of soil and associated contaminants such as selenium are addressed in the No Action alternative discussions within the sections analyzing Drainage and Water Quality (section 3.2) and Groundwater (section 3.8).

SOILS

The soils of the San Joaquin Valley are divided into four physiographic groups: valley land soils, valley basin land soils, terrace soils, and upland soils. Valley land and valley basin land soils occupy most of the San Joaquin Valley floor. Valley land soils in the vicinity of the San Luis Unit consist of deep alluvial and aeolian soils that make up some of the best agricultural land in California. Valley basin land soils consist of organic soils of the Delta, poorly drained soils, and saline and alkali soils in the valley trough and on the basin rims (University of California 1980). Areas above the San Joaquin Valley floor consist of terrace and upland soils that are not as productive as the valley land and valley basin land soils.

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 west side of the valley, 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.

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 of the confining clay layers under the shallow groundwater aquifer.

Valley Land Soils

Valley land soils are well-drained agricultural soils generally found on flat to gently sloping surfaces such as on alluvial fans. These soils are composed of alluvial- and aeolian-deposited soils.

Alluvial-deposited valley land soils include the calcic brown, noncalcic brown, and gray desert soils. Calcic brown and noncalcic brown alluvial soils are found on deep alluvial fans and floodplains of intermediate rainfall (10 to 20 inches annually). These two soils tend to be brown to light brown with a loam texture that forms soft clods. Calcic brown soil is calcareous; noncalcic soil is usually neutral or slightly acid. These soils are highly valued for irrigated crops.

Gray desert alluvial soil, a light-colored calcareous soil low in organic matter, is found on alluvial fans and floodplains of low rainfall (4 to 7 inches annually). These soils are too dry to produce crops without irrigation.

Valley Basin Land Soils

Valley basin land soils occupy the lowest parts of the San Joaquin Valley. The two general groups found in the San Luis Unit area are imperfectly drained soils and saline/alkaline soils.

Imperfectly drained soils are found in the troughs of the San Joaquin Valley. They generally contain dark clays and have a high water table or are subject to overflow. These soils tend to be gray to dark gray with a high clay content that forms clods and may be neutral to slightly calcareous.

Saline and alkali soils are characterized by excess salts, excess sodium, or both. Saline soils often form a white crust on the surface while the surface of soils with excess sodium

appears black. Many of these soils are irrigated with CVP or SWP surface waters or with slight to moderately saline groundwater. In addition, salts are added through the application of fertilizers or other additives needed for cropping. Saline soils form a crust on top of other soils, change the chemical characteristics of the soils in the root zone, and reduce the capability of the soil to transfer applied moisture to the roots. To minimize salinity problems, irrigators apply water to the soil before seeding or planting to leach salts from the root zone. Poor drainage, low permeability, and high sodium content complicate leaching. Leaching increases salinity in the groundwater aquifers, which further exacerbates the salinity problem as the more saline groundwater is used for irrigation. Because of the increase in groundwater salinity, the areas with soil salinity problems have increased. Increased leaching also increases the salinity in flows from subsurface drains, which affects the quality of surface waters that receive the return flows.

Status of Agricultural Lands

The San Luis Unit currently contains more than 350,000 acres suitable for growing any crop and about 250,000 acres suitable for only salt-tolerant crops. Based on the Westlands 2002 crop report (www.westlandswater.org), it appears that about 100,000 acres of land within the district are now idle or fallowed. Many of these lands are likely idle because of salinity and drainage problems. However, water supply constraints also limit the number of irrigated acres. Some of these lands were classified as non-arable by Reclamation and have never been irrigated with CVP water. A large number of arable acres in the Westlands Water District are idle in dry years because of inadequate water supply. About 1,000 acres of basin floor and fan skirt lands have soils that are not suited to grow any crop and were never completely reclaimed from native conditions.

During the past 80 years, irrigation has changed some characteristics of the San Luis Unit soils. Cultivation has generally decreased and redistributed soil organic matter in the top few inches of soil. Land subsidence and water erosion have changed the character of some slopes from simple to complex, and accelerated wind erosion has occurred on some of the sandier soils (Arroues 1998). The primary effect of irrigation on soils has been that deep percolation incidental to irrigation has caused the water table to rise into the root zone of many crops. Capillary rise of water and associated excess salts has salinized many formerly nonsaline soils. Increased soil salinity is nearly always accompanied by an increase in soil sodicity due to the greater solubility of sodium salts compared to calcium salts in the increasingly concentrated soil solution.

Over the years, some lands have been retired from agriculture because the groundwater drainage problem was too severe. Reclamation has purchased some of those lands, and Westlands has purchased others. As of 2001, 2,091 acres had been retired from

commercial irrigation. Land retirement is being addressed in several separate forums, including ongoing programs being administered by Reclamation and Westlands, and as a potential alternative method of providing drainage service to the San Luis Unit.

Prime and Unique Farmlands

As defined by the U.S. Department of Agriculture, Prime Farmlands consist of soils that are best suited to producing food, seed, forage, fiber, and oilseed crops. Such soils have properties that are favorable for the production of sustained high yields of crops. The soils need only to be treated and managed using acceptable farming methods. Adequate moisture and a sufficiently long growing season are required. Prime Farmland soils produce the highest yields with minimal inputs of energy and economic resources, and farming these soils results in the least damage to the environment.

Since 1958, the San Luis Unit has experienced the reclassification of approximately 121,000 acres of lands previously qualified as Prime Farmland. This is predominantly due to increased problems related to soil drainage and salinity. While these lands are no longer classified as Prime Farmland, the acreage is still classified as Farmlands of Statewide Importance and remains in production. About 5,000 acres of Prime Farmland soils have been lost due to excessive sediment deposition in the Huron area. Arroyo Pasajero floodwaters back up on the San Luis Canal and deposit large quantities of sediment. These sediment deposits have resulted in Prime Farmlands being retired from agriculture. Westlands' conceptual land use plans call for a flood channel and detention basin on downslope poorly drained retired lands. Creating a flood channel and detention basin would greatly improve this situation and minimize the further degradation of Prime Farmlands in the well-drained Huron area. Minor urbanization, feedlot development, and commercial development near major Interstate 5 interchanges have also removed Prime Farmlands from agricultural production in the San Luis Unit.

The remaining Prime Farmlands are generally present on the well-drained middle and upper alluvial fans and on some of the more topographically favorable fan remnants near the western edge of the unit. Nearly all of these lands are considered Prime Farmland. These lands can be used for any climatically adapted crops including valuable vegetable and orchard crops. Recent changes in Westlands' priority area water distribution policies and the availability of water supplies from downslope retired, idle, and fallowed lands have given these well-drained lands an increased and more reliable water supply. Land fallowing has decreased on these lands, and the acreage of orchards, vineyards, and salt-sensitive vegetable crops has increased. Irrigation suitability factors such as soil salinity and soil quality remain favorable on these lands (Reclamation 2005).

Irrigation suitability of these lands is currently rated as excellent based on Reclamation's most current land classification specifications for the area.

Farmlands of Statewide Importance (FSI)

The State of California standard environmental reference definition of FSI is "land other than Prime Farmland which has a good combination of physical and chemical characteristics for the production of crops, and has been used for the production of crops within the last 3 years." About 300,000 acres of basin floor, fan skirt, and inter-fan areas have been designated as FSI. Although this FSI in its present state lacks the productive capacity associated with Prime Farmlands, it is still suited for some crops and is considered a valuable natural resource worthy of analysis for environmental effects.

No drainage outlet currently exists for most of these lands, and soil salinity is generally increasing to the point that crop production is limited. While salt-tolerant crops such as cotton can be produced at near-maximum yields, other climatically adapted crops, such as many vegetables, are not produced due to reduced yields associated with excess salts. The presence of better lands upslope and the uncertainty about future drainage solutions also tend to discourage the use of FSI for orchard crops. Large areas currently appear idle both in and out of land retirement areas.

The occurrence of high salinity in surface soils complicates crop emergence and crop stand establishment, especially on vegetable crops. Soil quality is generally decreasing as sodium salts tend to concentrate in surface soils. Excess sodium tends to reduce soil friability, aggregate stability, and tilth.

About 2,000 acres of FSI are currently managed for wildlife habitat, and many more acres are idle, dry farmed, or grazed. Preliminary data for some of these lands indicate that shallow groundwater levels are steadily receding and surface soil salinities are decreasing somewhat on these retired lands (Lee, pers. comm. 2003). Three years after land retirement, ECe values range from 1 to 9 dS/m with an average of 4 to 5 dS/m. Soil quality trends are difficult to evaluate; some of the soils tend to form a dry bog-type crumb structure as they dry. Deep, wide cracks are also present in wildlife habitat areas during dry periods. Surface soil organic matter levels are currently about 3 to 4 percent and are expected to decline somewhat over time as less crop residue is returned to the soils.

GEOLOGY

The San Joaquin Valley is part of a large, northwest-to-southeast-trending asymmetric trough of the Central Valley that 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 Range Mountains on the west and the Sierra Nevadas on the east and extends northwestward from the San Emigdo and Tehachapi Mountains to the Delta near the City of Stockton. The Valley is 250 miles long and 50 to 60 miles wide. The relatively flat alluvial floor is interrupted occasionally by low hills.

The San Luis Unit, which lies within the San Joaquin Valley, is bounded on the west by the Coast Range Mountains and on the east by the San Joaquin Valley trough. The foothills adjacent to the unit on the west are composed of folded and faulted beds of mainly marine shale in the north and sandstone and shale in the south (Prokopovich 1989). The valley deposits consist of marine and continental deposits that are as much as six miles thick (Page 1986).

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 east side 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 largest of these are found beneath the Tulare Lake bed where up to 3,600 feet of lacustrine and marsh deposits form the Tulare Formation. This formation is composed of widespread clay layers, the most extensive being the Corcoran clay member, which is found in the western and southern portion of the San Joaquin Valley. This deposit notably affects the groundwater and its confinement. This clay bed 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. The lower confined zone consists of poorly consolidated floodplain, deltaic, alluvial, and lacustrine deposits.

The Corcoran Clay, a clay layer 20 to 200 feet thick that underlies all but a small part of the San Luis Unit, was formed as a lakebed about 600,000 years ago and is an important geologic feature of the San Joaquin Valley. Lying as much as 850 feet deep along the Coast Ranges and 200 to 500 feet deep in the valley trough, the Corcoran Clay effectively divides the ground-water system into two major aquifers – a confined aquifer below it and a semi-confined aquifer above it (Page, 1986).

In the San Joaquin Basin, the semi-confined aquifer can be divided into three geohydrologic units, based on the sources of the soils and sediments. These are Coast Range alluvium, Sierra Nevada sediments, and flood-basin deposits. The Coast Range alluvial deposits, which range in thickness from 850 feet along the slopes of the Coast Range to a few feet along the valley trough, were derived largely from the erosion of marine rocks that form the Coast Ranges and contain abundant salt. Some of the marine sediments contain elevated concentrations of selenium and other trace elements. The Sierra Nevada sediments on the eastern side of the valley generally do not contain elevated selenium concentrations. The flood-basin deposits are a relatively thin layer in areas of the valley trough that have been created in recent geologic time. These three geohydrologic units differ in texture, hydrologic properties, chemical characteristics, and oxidation state.

The marine sediments from which most soils in the study area are derived contain salts and potentially toxic trace elements, such as arsenic, boron, molybdenum, and selenium. When these soils are irrigated, the substances dissolve and leach into the shallow ground water (Gilliom, et al., 1989a). Selenium toxicity is to a great extent a toxicity issue only on the west side of the San Joaquin Valley. Soils derived from Coast Range sediments are generally far saltier than soils formed from Sierra sediments occurring on the east side of the valley. In fact, selenium in livestock feed grown in some areas of the eastern side of the valley is so low that it must be added to the livestock diet. Most soluble selenium has been leached from the soils over the past 30 to 40 years, and it now occurs in solution in the shallow ground water.

SOIL-RELATED ISSUES OF CONCERN AND ONGOING TRENDS

Wind Erosion

Soil erodibility, local wind speeds, soil moisture, soil surface roughness, width of field, and quantity of vegetative cover affect levels of soil wind erosion. The more moisture in the soil, the less susceptible the soil is to wind erosion. Aeolian-deposited soils are more susceptible to wind erosion than alluvial soils. Soils taken out of irrigation and allowed to remain barren with no vegetative cover are also more susceptible to wind erosion than those same soils under irrigated crop production.

There are several concerns about wind-eroded soils. Wind erosion makes the soil shallower and can remove organic matter and needed plant nutrients. In addition, blowing soil particles can damage plants, particularly young plants. Blowing soils can also cause off-site problems such as reduced visibility and increased allergic reaction to dust. Some of the soils on the west side of the San Joaquin Valley have naturally occurring asbestos.

If these soil particles become airborne, the local population and any nearby water bodies could be affected.

Water Erosion

In order of increasing erodibility, the several types of water-based soil erosion are sheet, splash, and rill and gully erosion. Soils factors that influence the erodibility of soils include land slope percentage and length, surface texture and structure, infiltration rate, permeability, particle size, and the presence of organic or other cementing materials. Level land erodes less than sloped land because flow velocities are lower. Based on this factor alone, soils on the valley floor are less susceptible to water erosion than terrace and upland soils.

Soil Salinity

Soil salinity problems occur primarily in the western and southern portions of the San Joaquin Valley. Most soils in this region contain salts and potentially toxic trace elements such as arsenic, boron, molybdenum, and selenium. Soil salinity problems are intensified by poor soil drainage, insufficient water supply for adequate leaching, poor quality (high salinity) irrigation water, high water table, and an arid environment.

Soil salinity was first recognized as a problem in the San Joaquin Valley in the 1880s. Drainage and soil salinity problems have persisted in the San Joaquin Valley. Soil salinity occurs when salts concentrated in the high groundwater table are left behind as water evaporates from the soil surface. Backlund and Hoppes (1984) estimated that about 2.4 million of the 7.5 million acres of irrigated cropland in the Central Valley were salt-affected. These saline soils generally exist in the valley trough and along the western side of the San Joaquin Valley. The San Joaquin Valley Drainage Program Management Plan projected that by the year 2000, up to 918,000 acres of San Joaquin Valley farmland would be affected by a water table existing less than five feet from the ground surface (SJVDP 1990). In addition, the San Luis Unit Drainage Program Draft EIS projected losses of between 5,000 to 10,000 acres to increased salinity by the year 2007 if current irrigation, farming, and drainage practices were to continue (Reclamation 1991).

Soil Selenium

Soil selenium is primarily a concern on the west side of the San Joaquin Valley. When the soils in this area are irrigated, selenium and 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

(SJVDP 1990). Selenium 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 soils 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. To maintain agricultural production, drainage from these soils must be removed from the area.

GEOLOGY-RELATED ISSUES OF CONCERN AND ONGOING TRENDS

Subsidence and Uplift

Land surface subsidence can result from both natural and human-caused factors. Natural causes include subsidence resulting from tectonic deformation and seismically induced settlements, soil subsidence due to consolidation, subsidence due to oxidation or dewatering of organic-rich soils, and subsidence related to subsurface cavities. Subsidence, or settlement related to human activities include subsidence caused by decreased pore pressure due to the withdrawal of subsurface fluids, including water and hydrocarbons.

Land subsidence in San Joaquin Valley became a major issue beginning in the late 1960s. Over-drafting of shallow groundwater resources has caused the water table to drop from just below the surface in many areas to nearly 30.5 meters (100 feet) below ground surface in central San Joaquin Valley and over 61 meters (200 feet) in the southern San Joaquin Valley. Land subsidence has occurred on nearly 13,500 km^2 (5,212 square miles) of land, approximately 50 percent of San Joaquin Valley land mass, and ground-surface elevations in areas have dropped as much as 10 meters (33 feet) in the last 80 years (Poland and Lofgren 1984).

Three types of land subsidence have been documented in the valley: (1) subsidence due to the compaction of aquifer units from excessive withdrawal of groundwater; (2) hydro-compaction, which is subsidence due to the compaction of fine-grained moisture-deficient deposits when water is applied; and (3) subsidence due to the extraction of oil deposits beneath the surface (Poland and Lofgren 1984).

Over-drafting of groundwater supplies has been occurring since the middle 1920s when agriculture became the main industry in the San Joaquin Valley. With the invention of the

deep wall turbine pump and abundant water supplies, farmers were encouraged to convert the native land and grow more crops on a yearly basis. The continued pumping of groundwater eventually caused a reduction in pore pressure within the water bearing, coarse-grained sediments beneath the valley. Through the years, more groundwater was pumped and used for irrigation than those volumes naturally recharged through yearly flooding and precipitation. As the water was drained from the aquifer, the sediments compacted and permanently reduced its pore space. The compaction of these coarse grained sedimentary units caused the majority of the land subsidence in San Joaquin Valley. However, since the importation of surface water for irrigation, the rate of land subsidence due to the draining of aquifers has declined sharply (Poland and Lofgren 1984).

ENVIRONMENTAL CONSEQUENCES

This section describes the potential environmental consequences or impacts the alternatives described in Chapter 2 would have on the soils and geology in the region.

The following criteria were used to assess the general potential for the various alternatives to result in adverse soils and geology impacts. Potential impacts were identified they could:

- Expose people or structures to major geologic hazards.
- Result in or expose people to potential impacts involving fault rupture; strong seismic ground shaking; seismic-related ground failure including liquefaction; landslides, lateral spreading, or mudflows; erosion, changes in topography, or unstable soil conditions from excavation or grading for fill; land subsidence; expansive soils; or unique geologic or physical features.
- Use energy and mineral resources in a wasteful and inefficient manner or result in the loss of availability of known mineral resources.

NO ACTION ALTERNATIVE

The No Action Alternative would consist of reasonably foreseeable future conditions without Reclamation-supported drainage service until 2010, but with drainage actions initiated by the districts. Average long-term agricultural water deliveries to contractors under the No Action Alternative are expected to be similar to deliveries that contractors have received under recent historical conditions. Because of similar levels of average agricultural water deliveries to the San Luis Unit, and to the extent that water deliveries are one factor affecting current trends associated with ongoing issues of concern for soils and geology, future trends are not expected to differ substantially from present and ongoing

trends. Present rates of soil degradation from increased levels of salts and sodium may be slowed if conditions evolve such that water that had previously been applied to retired lands is instead used to increase the reliability of deliveries of CVP water applied to higher quality lands remaining in production that are not characterized by higher contribution of salts and sodium under irrigation.

Portions of the additional 65,000 acres of land acquired by Westlands (Sagouspe settlement) and retired from CVP irrigation water deliveries could be irrigated with groundwater or other non-CVP water sources. Salt-tolerant crops such as cotton, grains, and sugar beets would be grown on these lands. Irrigation of these lands with groundwater would provide some drainage relief for the entire drainage-impaired area and reduce the potential for salt sink development. These lands would still meet the criteria for Farmlands of Statewide Importance, but soil salinity would be too elevated for some crops. It is anticipated that up to 17,000 acres of these lands would be irrigated in any given year. The average acreage irrigated is assumed to be 6,500 acres (10 percent of acquired lands). It is further assumed that these acres would be rotated so that about 15,000 acres of lands would be irrigated in any consecutive 3-year period. Based on this assumption, the 15,000 acres would still qualify as Farmlands of Statewide Importance.

Under the No Action Alterative, long-term contract renewals would also not involve the construction of any new facilities or result in land-disturbing activities that would contribute to soil or geologic impacts. The implementation of tiered pricing under the No Action Alternative may decrease the volume of CVP water delivered during periods when tiered pricing is in effect and may increase the volume of groundwater pumping during these periods. This condition would increase the volume of salts contained in the applied water and could increase soil salinity if leaching practices were not modified to compensate for the increase in applied salt. The potential reduction in applied surface water and increase in groundwater pumping due to tiered pricing could also lead to an increase in land subsidence over present rates. At this time the impacts of tiered pricing on soils and geology remain speculative. Because contract renewals would obligate the same amount of water as historically obligated, growers could respond to tiered pricing by conserving to avoid paying for upper tier water, paying for and applying upper tier water, or substituting water from other sources (e.g., groundwater) for upper tier CVP deliveries. Under any of these scenarios, the No Action Alternative is expected to have no adverse impacts on soils and geology when compared to existing conditions.

PREFERRED ALTERNATIVE

The tiered pricing provisions under the Preferred Alternative are similar to those of the No Action Alternative. Provisions in the Preferred Alternative that differ from those of the No

Action Alternative are expected to have no direct or indirect impacts on soils or geology of the affected area. Therefore, although historically observed rates of soil salinization and land subsidence are expected to continue, the Preferred Alternative is expected to result in no adverse impacts on soils and geology when compared to the No Action Alternative.

ALTERNATIVE 1

Tiered pricing is not included in Alternative 1. Therefore, it is likely that applications of surface water during years when tiered pricing is in effect for other alternatives would be higher under Alternative 1 and pumping of groundwater would be correspondingly lower. As a result, implementation of Alternative 1 may result in lower rates of soil salinization and land subsidence than may occur under the No Action Alternative. Alternative 1 is expected to have no adverse impacts on soils and geology when compared to the No Action Alternative.

ALTERNATIVE 2

The tiered pricing provisions under Alternative 2 are similar to those of the No Action Alternative. Provisions under Alternative 2 that differ from those of the No Action Alternative are expected to have no adverse impacts on soils or geology of the affected area.

As in the No Action Alternative, groundwater pumping and land subsidence are expected to continue in the affected area as they have historically and soil salinity may increase. However, because contract renewals would obligate the same amount of water as historically obligated, during years when tiered pricing is in affect, growers will have the choice of conserving water, paying for and applying water at higher priced tiers or substituting water from other sources (e.g., groundwater, for higher priced CVP water). As a consequence, implementation of Alternative 2 is expected to have no adverse impacts on the soils and geology of the affected area when compared to the No Action Alternative.

CUMULATIVE IMPACTS

Long-term contract renewal alternatives, when considered in combination with other past, present, and reasonably foreseeable future actions, are unlikely to result in cumulative impact to soils and geologic resources. Some San Luis Unit soils may be subject to growth and development pressures that indirectly lead to land clearing and the conversion of their current uses to commercial, residential, or industrial uses. However, these decisions are made at the individual and local levels and are difficult to anticipate 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 will continue the delivery of water to predominately irrigated lands in the San Luis Unit. Deliveries will support continued erosion control measures practiced by San Luis Unit farmers that conserve topsoil rich in nutrients and water holding capacity – qualities that are expensive to replace – thereby maintaining the agricultural quality of potentially affected soil resources that are not already drainage-impaired.

Prime Farmland acreage is decreasing throughout the San Luis Unit, California, and the nation. Urbanization and sediment deposition unrelated to contract renewal have removed about 6,000 acres of Prime Farmland from agricultural production during the past 30 years in the San Luis Unit. Urbanization and retirement of irrigated lands due to lack of water supplies are the primary causes of Prime Farmland losses in California. Recent reports from the California Department of Conservation (CDC 2001) indicate that 44,000 acres of Prime Farmland were lost between 1998 and 2000, and a total of 91,000 acres of land water urbanized. The loss of Prime Farmlands and FSI would reduce the long-term food security of the nation, but is an impact independent of long-term contract renewal alternatives.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The No Action Alternative is expected to continue existing drainage trends that will irreversibly commit some soil resources to "drainage-impaired" and ultimately unusable conditions for agriculture. Current estimates presented in the San Luis Drainage Feature Re-evaluation (Reclamation 2005) estimate from 44,106 to 308,000 acres that will need to be retired from agricultural production because of these lands' inability to economically support crop growth. The irreversible and irretrievable nature of these resource commitments applies only to such resources' ability to support agricultural production. Upon retirement, the affected lands and soils will be potentially usable as habitat, recreational open space, or other uses consistent with landowner and local land use planning decisions. The action alternatives will result in similar levels of irreversible and irretrievable commitments of resources because each of them will similarly continue the delivery of irrigation waters to some drainage-impaired lands that ultimately may need to be retired.

SECTION 3.8: GROUNDWATER

This section discusses the potential effects that the alternatives considered in Chapter 2 would have on the groundwater resources within the San Luis Unit. Information in this section was summarized from the Draft CVPIA PEIS, Groundwater, Technical Appendix Volume 2 (Reclamation, 1997a) and the San Luis Drainage Feature Re-evaluation DEIS (Reclamation 2005).

AFFECTED ENVIRONMENT

The southern two-thirds of the Central Valley regional aquifer system covers over 13,500 square miles and extends from just south of the Delta to just south of Bakersfield. It is referred to as the San Joaquin Valley basin (DWR 1975).

The San Joaquin Valley basin has been identified as containing 26 groundwater basins with nine of the basins classified as significant sources of groundwater. The total area of the nine groundwater basins is approximately 13,700 square miles, of which the San Joaquin Valley alone comprises about 13,500 square miles. The California Department of Water Resources (DWR) estimates an annual overdraft of approximately 205,000 af of groundwater. This over-drafting of groundwater has caused ground subsidence since the mid-1920s. By 1970, 5,200 square miles of the valley were affected and maximum subsidence exceeded 28 feet in an area west of Mendota. Much of this area is now served by the CVP's San Luis Unit (USBR 2005).

HYDROGEOLOGY

The San Joaquin Valley basin has accumulated up to six vertical miles of unconsolidated continental and marine sediment in a structural trough. The top 2,000 feet of these sediments consist of continental deposits that generally contain freshwater (Page 1986). As these sediments accumulated over the last 24 million years, large lakes periodically filled and drained, resulting in the deposition of laterally extensive clay layers that form significant barriers to the vertical movement of groundwater in the basin (Westlands Water District 1995). The most extensive of these is the Corcoran clay, which is a clay layer up to 160 feet thick, found from 100 to 400 feet below the land surface in the San Joaquin River Region. Other clay layers are present above and below the Corcoran clay and may have local impacts on groundwater conditions.

Much of the western portion of the San Luis Unit is underlain by the Corcoran clay, 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). The groundwater aquifers under the San Luis Unit include three zones of water: (1) a semi-confined zone of

water of varying quality; (2) a confined zone of water of varying quality; and (3) a saline body of water underlying the confined zone of freshwater (Belitz 1988).

The semi-confined aquifer can be divided into three geohydrologic units based on the source of sediment: Coast Range alluvium, Sierra Nevada sediments, and flood basin deposit. The Coast Range alluvial deposits are thickest along the western edge of the valley and taper off to the east as they approach the center of the valley floor. These sediments are high in salts and contain a large proportion of silt and clay and elevated concentrations of selenium and other trace elements. The Sierra Nevada sediments on the eastern side of the region are derived primarily from granite rock. These deposits make up most of the total thickness of sediments along the valley axis and gradually thin to the west. These sediments are relatively permeable with hydraulic conductivities three times that of the Coast Range deposits (Belitz et al. 1993). The floodplain deposits are relatively thin (5 to 35 feet thick) and occur along the center of the valley floor (Westlands Water District 1995).

Recharge to the semi-confined upper aquifer generally occurs from stream seepage, deep percolation of rainfall, and subsurface inflow along basin boundaries. As agricultural practices have expanded in the region, recharge has been augmented with deep percolation of applied agricultural water and seepage from the distribution systems used to convey this water. 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.

Through about the mid-1950s, the interaction of groundwater movement and surface water flows resulted in net gains to the streams. Since that time, groundwater level declines have caused some stream reaches to lose flow through seepage to the groundwater systems below. Where the hydraulic connection has been maintained, the amount of seepage has varied as groundwater levels and stream flows have fluctuated.

Large-scale groundwater use during the 1960s and 1970s, combined with the introduction of imported surface water supplies, have modified the natural groundwater flow pattern. Groundwater pumping and recharge from imported irrigation water has resulted in a change in regional flow patterns. Flow largely occurs from areas of recharge toward areas of lower groundwater levels due to groundwater pumping (Bertoldi et al. 1991). The vertical movement of water in the aquifer has been altered in this region as a result of thousands of wells constructed with perforations above and below the Corcoran clay member, which, where present, provide a direct hydraulic connection (Bertoldi et al. 1991).

GROUNDWATER STORAGE AND PRODUCTION

The usable groundwater storage capacity for the San Joaquin River Hydrologic Region has been estimated to be approximately 24 million acre-feet (DWR 1994). The most recent estimate of the perennial yield is approximately 2.9 million acre-feet (DWR 2003). The 1987–1992 drought resulted in substantial deficiencies in surface water deliveries and corresponding increases in groundwater pumping. Water levels declined by 20 to 30 feet throughout most of the central and eastern parts of the San Joaquin Valley (Westlands Water District 1995).

Pumping has caused depressions to form, resulting in subsidence, and has altered regional groundwater flow patterns, recharge, and discharge. Annual groundwater pumping in the San Joaquin River Region exceeds recent estimates of perennial yield by approximately 200,000 acre-feet. All the sub-basins within the San Joaquin River Region have experienced some overdraft (DWR 1994).

The aquifer system below the Corcoran clay has historically been the most important source of groundwater in the San Luis Unit. Before deliveries from the San Luis Canal began, about 85 to 90 percent of the total groundwater pumpage came from this aquifer system. The groundwater is of relatively good quality and has about 1,100 milligrams per liter of total dissolved solids (SJVDP 1990).

The more than 1,000 active irrigation wells reported in the Los Banos-Kettleman City area tap the upper (semi-confined) and lower (confined) freshwater-bearing zones (Miller et al. 1971). The depth of wells into the groundwater reservoir generally decreases from west to east. They range in depth from less than 200 feet near Fresno Slough to more than 1,000 feet in the southwestern part of the area along the west border of the valley. Until surface water became available, groundwater was a major source of water supply. Pumping then dropped significantly, except during the drought of 1976–1977, when more than 400,000 acre-feet of groundwater was pumped (Belitz 1988). Seasonal pumping estimates vary from 80,000 to 700,000 acre-feet, depending on available surface water supplies (Reclamation 1991).

In the western and central parts of the San Luis Unit, most wells tap both the upper and lower water-bearing zones, although many tap only the lower zone because the water quality is better (Reclamation 1991). In the western portion of the San Luis Unit south of Panoche Creek, the deepest wells within the area must generally be drilled to depths of more than 1,200 feet to reach more permeable underlying floodplain and deltaic deposits. In the eastern part of the San Luis Unit, from Tranquillity south to the Kings River, the average well depth is 400 to 600 feet, tapping the highly permeable Sierra micaceous sand

above the Corcoran clay. The water there was reported to be of good quality (Miller et al. 1971).

Description of the Westside Subbasin

Groundwater conditions of the San Luis Unit are typified by those of the Westside Sub-basin. This sub-basin consists mainly of lands in Westlands Water District and is located between the Coast Range foothills on the west and the San Joaquin River drainage and Fresno Slough on the east. The sub-basin is bordered on the southwest by the Pleasant Valley Groundwater Sub-basin and on the west by Tertiary marine sediments of the Coast Ranges, on the north and northeast by the Delta-Mendota Groundwater Sub-basin, and on the east and southeast by the Kings and Tulare Lake Groundwater Sub-basins.

Primary recharge to the aquifer system is from seepage of Coast Range streams along the west side of the sub-basin and deep percolation of surface irrigation. Flood basin deposits along the eastern sub-basin have caused near surface soils to drain poorly thus restricting the downward movement of percolating water. This restricts drainage of irrigation water and results in the development of irrigation problem areas.

Groundwater levels in the Westside Sub-basin were generally at their lowest levels in the late 1960s, prior to importation of surface water. After the CVP began delivery to the San Luis Unit in 1967-68, water levels gradually increased to a maximum in about 1987-88, falling briefly during the 1976-77 drought. Water levels began dropping again during the 1987-92 drought. Through a series of wet years after the drought, 1998 water levels recovered nearly to 1987-88 levels. The fluctuations in water levels illustrate both the importance of CVP deliveries in sustaining groundwater levels and the continuing influence of local and CVP-wide hydrologic conditions on surface water availability and, hence, on groundwater conditions.

Westlands Water District, Panoche Water, Pacheco Water District and San Luis Water District all have approved groundwater management plans, an indication of the districts involvement in management of their groundwater resources.

IMPACTS OF AGRICULTURE

Irrigated agriculture has altered both groundwater flow and quality. Significant portions of the groundwater in the unit exceed the CWA's recommended TDS concentration. The dissolved solids content of the groundwater averages about 500 ppm, but ranges from 64 to 10,700 ppm. Calcium, magnesium, sodium, bicarbonates, selenium, sulfates, and chlorides are all present in significant quantities (USBR 2005).

The highest groundwater salinity and selenium concentrations occur in areas of the highest native soil salinity. Harradine (1950) characterized western San Joaquin Valley soils in the 1940s. Alluvial fan soils are derived from the Diablo Range of the California Coast Range, which borders the San Luis Unit to the west. The Diablo Range consists of an exposed Cretaceous and upper Jurassic marine core assemblage overlain by and juxtaposed with Cretaceous and tertiary marine and continental deposits. The soils in the basin trough at the eastern edge of the study area are of mixed origin; Sierra Nevada igneous and metamorphic rocks and Diablo Range sediments. Soils are generally coarse-grained in the upper- and middle-alluvial fan areas and fine-grained in the lower alluvial fan and basin trough areas.

In the western San Joaquin Valley, soil salinity problems and inadequate drainage have limited agricultural production for more than a century, making some lands unusable as far back as the 1880s and 1890s. Irrigation of grains with water from the San Joaquin and Kings rivers in the 1870s and 1880s led to rising water tables, increased soil salinity and removal of some land from production. Many of the soils are naturally saline and high in clay content, which restricts drainage.

Under natural conditions, the shallow water table existed in areas along the valley floor and adjacent to the San Joaquin River. Groundwater recharge occurred primarily by infiltration of runoff in Coast Range streams. Groundwater discharge was primarily by evapotranspiration and seepage to the San Joaquin River.

During the past 40 years, recharge increased dramatically as a result of imported irrigation water. Irrigated agriculture has altered both groundwater flow and quality. Percolation of irrigation water past crop roots, pumpage of groundwater from deep wells, and imported surface water used for irrigation have combined to create large downward hydraulic-head gradients. The salts in the irrigation water, and soil salts leached from the unsaturated zone, increased salt and selenium concentrations in groundwater (Dubrovsky and Deverel 1989). In low-lying areas of the valley, and where the water table is within seven feet of land surface, evaporation from the shallow water table further increase salt and selenium concentrations.

Soil salts in the San Luis Unit contain calcium, sulfate, sodium, magnesium and inorganic carbon. Prior to irrigation, soils contained sodium, magnesium, sulfate evaporite salts such as thenardite (sodium sulfate), mirabolite (sodium sulfate) and bloedite (magnesium, sodium sulfate) (Presser et al. 1990) and calcium sulfate (gypsum) and calcium carbonate. Irrigation dissolves the more soluble evaporite salts and substantial amounts of calcite (calcium carbonate) and gypsum (calcium sulfate) remain in irrigated soils (e.g., Tanji et

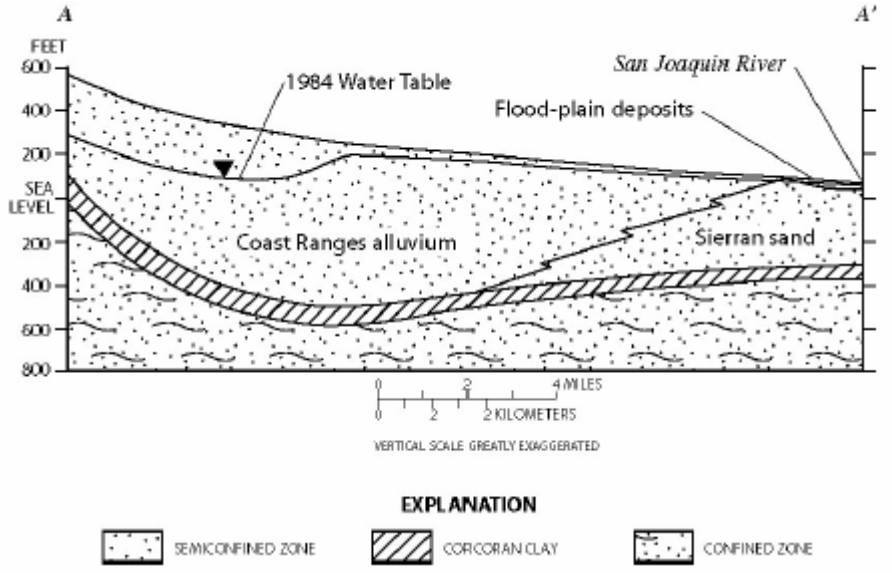
al. 1977). Presser et al. (1990) reported selenium concentrations ranging from 1 to 25 ppm in these evaporite salts present in the saline and seleniferous geological formations in the Diablo Range and in unirrigated soils. In contrast, Deverel and Fujii (1988) reported that selenium is probably not present in gypsum. Irrigation of saline soils dissolved soluble soil salts and selenium and moved them to the groundwater. Subsequent rises in the groundwater table further increased groundwater salinity and selenium concentrations (Deverel and Fujii 1988; Deverel and Fio 1991).

Percolation of irrigation water past crop roots, pumping of groundwater from deep wells, and imported surface water used for irrigation have combined to create large downward hydraulic gradients. As a result, the soil salts and selenium in the irrigation water are leaching from the unsaturated soil zone and increase salt and selenium concentrations in the groundwater. However, drinking water wells are typically over 300 feet deep and several layers of aquifers and clay lenses lie between the upper levels affected by irrigation and the drinking water aquifer.

A USGS report (Dubrovsky and Deverel 1989) indicated that irrigation had affected the upper 20 to 200 feet of the saturated groundwater zone. This poor quality groundwater zone is moving downward in response to recharge from above the water table and pumping from deep wells. In 1994 Belitz and Phillips estimated the downward velocity of the poor quality groundwater at about 0.6 foot/year, which suggests that most of the regions groundwater would be affected within 200 to 930 years. Based on an analysis of groundwater quality in subregions, Quinn et al. (1990) estimated that the useable average life of the aquifer in Westlands was from 110 to 114 years.

In the western San Joaquin Valley, the groundwater system is divided into a lower confined zone and upper semiconfined zone, separated by the Corcoran Clay (Figure 3.8-1). The water table is located within the semi-confined zone. In the upslope areas, the water table is typically located several hundred feet below land surface. In contrast, most downslope areas are underlain by a shallow water table within seven feet of land surface (Belitz and Heimes 1990).

Figure 3.8-1
Geohydrologic Section of Western San Joaquin Valley
Modified from Belitz and Heims 1990



LAND SUBSIDENCE

Pumping, largely for crop irrigation, has heavily developed groundwater in the San Joaquin Valley. As a result of this heavy pumping, groundwater level declines have caused land subsidence throughout the valley. The DWR reported measured land subsidence between 1990 and 1995 of up to 2.0 feet along the San Luis Canal in Westlands Water District (Reclamation 1997a).

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 (DWR 1977). The maximum land subsidence levels recorded in the Central Valley occurred within Fresno County. Land subsidence levels 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 pumpage. 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 wells decreased. The marked decrease in pumpage has allowed a recovery in hydraulic head. The rise in the

potentiometric surface[1] from 1967 to 1984 was nearly one-half of the drawdown that occurred from predevelopment conditions to 1967. 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 pumpage, 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.

GROUNDWATER QUALITY

Groundwater quality conditions vary throughout the San Joaquin Valley. Total dissolved solids, boron, nitrates, arsenic, selenium, and dibromo-chloropropane are parameters of concern for agricultural and municipal uses in the San Joaquin River Region. Agricultural use of groundwater is impaired as a result of elevated boron and total dissolved solids concentrations in western Fresno and Kings Counties (SWRCB 1991).

The high TDS content of west side groundwater is due to recharge of stream flow originating from marine sediments in the Coast Range. The high TDS content in the trough of the valley is the result of concentration of salts due to evaporation and poor drainage. Nitrates may occur naturally or as a result of disposal of human and animal waste products and fertilizer. Boron and chloride are likely a result of concentration from evaporation near the valley trough. Organic contaminants contributed by agriculture have been detected in groundwater throughout the region but primarily in areas east of the San Luis Unit where soil permeability is higher and depth to groundwater is shallower. In the central and west-side portions of the valley, where the Corcoran Clay confining layer exists, water quality is generally better beneath the clay than above it.

Total Dissolved Solids

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 to greater than 2,000 milligrams per liter (Bertoldi et al. 1991). The concentrations in excess of 2,000 milligrams per liter commonly occur above the Corcoran clay layer. These high levels have impaired groundwater for irrigation and municipal uses in the western portion of the San Joaquin Valley. Contractors in the San

[1] *Potentiometric surface* is defined as the level to which water from the confined aquifer would rise in a tightly cased well completed in the confined aquifer.

Luis Unit with 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 the installation of groundwater monitoring wells.

Beneath the shallow groundwater, a change occurs in the chemical composition of the dissolved solids. The groundwater in the upper semi-confined aquifer generally contains high concentrations of calcium, magnesium, and sulfate (Miller et al. 1971). As depth increases toward the Corcoran clay, the total dissolved solids decline and the percentage of sodium increases. The confined aquifer below the Corcoran clay contains predominantly sodium-sulfate water. Groundwater immediately above and below the Corcoran clay is fresh enough for irrigation use. The saline waters underlying the confined aquifer at depths ranging from 800 to 1,500 feet are predominantly affected by sodium chloride salts (Miller et al. 1971).

Selenium

High selenium concentrations in the soils of the west side of the San Joaquin Valley are of considerable concern because subsurface irrigation return flows could leach selenium from the soil into the groundwater and into receiving surface waters (Bertoldi et al. 1991). Selenium concentrations vary considerably across the valley, but seem to correlate to total dissolved solids concentrations (Deverel and Millard 1988).

Selenium occurs naturally in soils and groundwater on the west side of the San Joaquin River Region. Selenium concentrations in shallow groundwater along the west side of the region have been highest in the central and southern area south of Los Banos and Mendota with median concentrations of 10,000 to 11,000 micrograms per liter (Bertoldi et al. 1991).

The Draft EIS for the San Luis Unit Drainage Future Re-evaluation reports minimum and maximum selenium concentrations of less than 1 and 21 micrograms per liter, respectively, above the mouth of the Merced River and 0.1 and 23 micrograms per liter below (Reclamation 1991). Use of groundwater to support aquatic species is impaired by the elevated selenium concentrations between Los Banos and Mendota in the western San Joaquin River Region (SWRCB 1991).

Other Contaminants

Boron, molybdenum, and arsenic are also among the elements of primary concern (SJVDP 1990). Elevated concentrations of vanadium, chromium, and mercury have also been observed in the shallow groundwater in the San Luis Unit (Deverel et al. 1984).

ENVIRONMENTAL CONSEQUENCES

This section describes the potential environmental consequences or impacts the long-term contract renewals could have on groundwater resources in the San Luis Unit and the affected area.

The following criteria were used to assess the general potential for the various alternatives to result in adverse groundwater impacts. Potential impacts were identified if one or more of the action alternatives would result in any of the following when compared to the No Action Alternative:

- Degraded water quality, degraded or depleted groundwater resources, or substantial interference with groundwater recharge.
- Reduced groundwater quantity, altered direction of groundwater flow, impacted groundwater quality, or reduced volume of groundwater available for public water supplies.
- Declining groundwater elevations that cause land subsidence.

NO ACTION ALTERNATIVE

The level of water deliveries to contractors under the No Action Alternative are expected to be similar to the level of deliveries that contractors have received under recent historical conditions. For this reason, current trends in the impacts of water deliveries on groundwater are expected to be highly representative of future trends under the No Action Alternative.

Urban expansion and increasing M&I use of water in the San Luis Unit represent reasonably foreseeable conditions that are likely to accelerate under the No Action Alternative. These conditions are expected to cause increasing volumes of contracted water to be shifted from agricultural to M&I purposes but are expected to have little impact on total deliveries to the San Luis Unit. However, increasing urbanization and the increase in impervious surface area that typically accompanies urbanization is expected to reduce the proportion of delivered water that percolates to groundwater and to reduce the mass of salts, selenium and other contaminants that are introduced into the groundwater.

Urbanization is not expected to result in substantial changes in groundwater recharge or in groundwater quality because the municipalities within the San Luis Unit are small and are expected to experience limited growth relative to the total area of the San Luis Unit.

Under the No Action Alternative land retirement is expected to have a larger impact on groundwater conditions than urban growth. Land retirement is also expected to lead to less deep percolation of applied water and less transport of salts and other contaminants to groundwater. Water not delivered to retired land is likely to be used to increase the reliability of water deliveries to lands that continue under irrigation. Thus, the reduction in deep percolation on retired lands may be partially or entirely offset by increased deep percolation on lands receiving more water than they would have absent land retirement. In addition, by increasing the reliability with which contracted water can be delivered to lands remaining in production, land retirement is likely to reduce the requirement to pump groundwater to meet crop requirements. This substitution of contracted water for groundwater constitutes in-lieu recharge that will help maintain groundwater levels throughout the San Luis Unit during periods when hydrology or regulatory conditions restrict surface water deliveries.

The tiered-pricing provisions under the No Action Alternative are intended to conserve CVP water. However, because higher rates are associated with water likely to be available only in years when high proportions of contracted water are available, the impact of tiered pricing may be to conserve CVP water during periods when it is most available. Implementation of tiered pricing during these years may reduce application of irrigation water and aquifer recharge induced by surface water applications. In addition, tiered pricing may increase pumping of groundwater during years of high CVP water availability.

The reasonably foreseeable conditions that are likely to exist under the No Action Alternative are not expected to induce land subsidence.

PREFERRED ALTERNATIVE

The Preferred Alternative is not expected to produce changes in groundwater conditions that can be distinguished from those that would occur under the No Action Alternative. This is because the tiered pricing provisions of the Preferred Alternative are identical to those of the No Action Alternative. Distinctions between the Preferred Alternative and the No Action Alternative, such as the difference in measurement requirements, are not expected to have any significant impact on groundwater conditions.

ALTERNATIVE 1

Alternative 1 differs from the No Action Alternative in that it does not include provisions for tiered pricing. This is expected to lead to slightly greater application of CVP water during years when tiered pricing is in effect and slightly reduced groundwater pumping during those years. Both increased application of CVP water and reduced groundwater

pumping are expected to augment groundwater supplies relative to the No Action Alternative.

ALTERNATIVE 2

Alternative 2 is not expected to produce changes in groundwater conditions that can be distinguished from those that would exist under the No Action Alternative. This is because the distinctions between the Alternative 2 and the No Action Alternative with respect to tiered pricing are minor and differences in other areas are not expected to impact groundwater.

CUMULATIVE IMPACTS

Long-term contract renewal alternatives, when considered in combination with other past, present, and reasonably foreseeable future actions and projects, are unlikely to result in further adverse cumulative impacts to groundwater levels and quality when compared to the No Action Alternative and existing conditions. Much of the cumulative effects arising from the combination of long-term contract renewals and other past and present activities have already occurred and are expressed in this EIS as existing conditions and ongoing trends within the Affected Environment and/or No Action Alternative descriptions. The cumulative effects of long-term contract renewals and the continued application of irrigation water to agricultural lands (and for M&I purposes) will contribute indirectly to the continuation of groundwater conditions and trends as a result of decisions to be made regarding the levels of deliveries that the CVP can provide as the CVPIA continues to be implemented. This is particularly true when considering cumulative impacts resulting from all other CVP projects analyzed in the OCAP in combination with long-term contract renewals—levels of deliveries will dictate potential levels of irrigation applications, which will in turn increase the amount of potential adverse groundwater impacts within San Luis Unit. If deliveries are curtailed, such effects will likely be proportionally reduced to the extent they are directly related to irrigation applications. Future drainage management, habitat restoration, land acquisition, land retirement, water conservation, and related CVP programs are expected individually and in combination with long-term contract renewals to reduce cumulative drainage and water quality impacts to receiving waters if implemented as intended.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The No Action Alternative is expected to continue existing groundwater trends that will irreversibly commit some soil and groundwater resources to “drainage-impaired” and ultimately unusable conditions for agriculture when compared to existing conditions. Current estimates presented in the San Luis Drainage Feature Re-evaluation (Reclamation

2005) estimate from 44,106 to 308,000 acres that will need to be retired from agricultural production because of these lands' inability to economically support crop growth. The irreversible and irretrievable nature of these resource commitments applies only to such resources' ability to support agricultural production. Upon retirement, the affected lands, soil and groundwater resources will be potentially usable as habitat, recreational open space, or other uses consistent with landowner and local land use planning decisions. The action alternatives will result in similar levels of irreversible and irretrievable commitments of resources because each of them will similarly continue the delivery of irrigation waters to some drainage-impaired lands that ultimately may need to be retired.

SECTION 3.9: SURFACE WATER RESOURCES

This section discusses the potential effects that the alternatives considered in Chapter 2 would have on the surface water resources within the San Luis Unit.

AFFECTED ENVIRONMENT

CENTRAL VALLEY PROJECT WATER SUPPLY

Prior to the CVP, irrigators in the San Joaquin Valley depended primarily on groundwater for agricultural irrigation. As 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 long-term water supply to augment existing groundwater resources.

CVP water is used for the irrigation of agricultural areas, for M&I uses, for the restoration of fisheries and aquatic habitat in the waterways that have been affected by water development, for wildlife refuges, and for other factors. 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.

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 San Luis Unit service area, contractors without a sufficient CVP water supply may extract groundwater if pumping is feasible or negotiate water transfers with other contractors. Alternative supplies from groundwater pumping and/or transfers are accessed as supply sources when CVP surface water deliveries become more expensive than pumping or transfer costs.

WATER DELIVERY CRITERIA

The amount of CVP water available each year for contractors is based, among other considerations, on the storage of winter precipitation and the control of spring runoff in the Sacramento and San Joaquin River basins. The schedule of CVP water conveyed to and diverted from these rivers 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 USFWS 1999)

and the impact that meeting these obligations has had on south-of-Delta water deliveries is greater than was foreseen in the CVPIA PEIS (Reclamation and USFWS 1999).

WATER DELIVERY CONDITIONS UNDER CVPIA IMPLEMENTATION

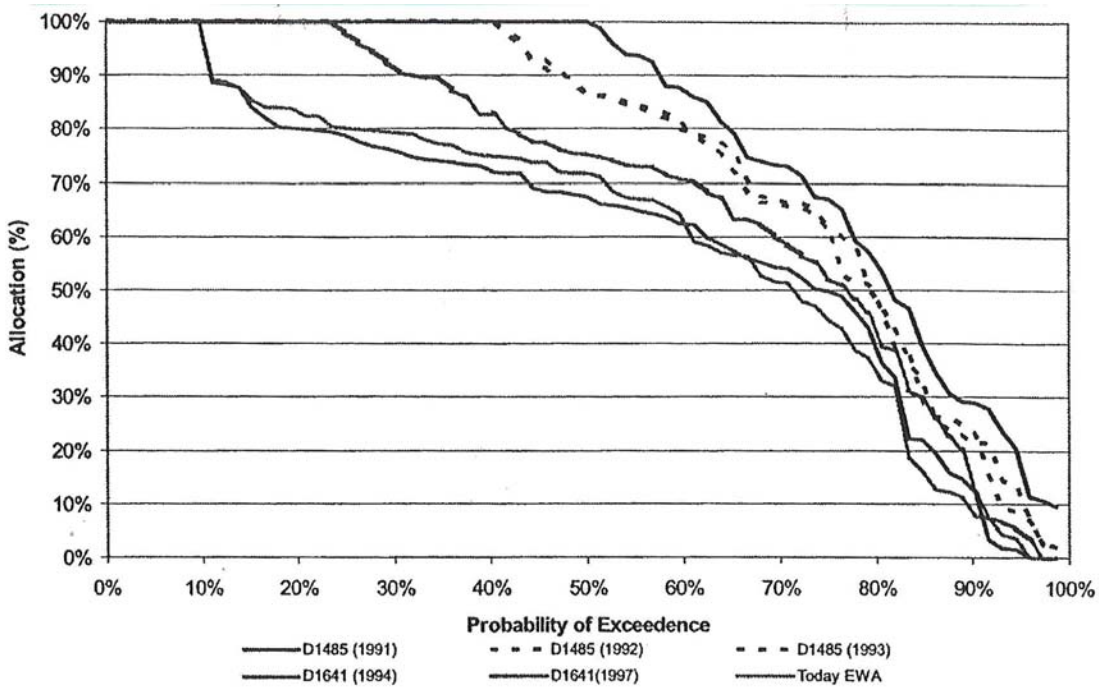
Impacts to CVP water service contractors associated with CVPIA implementation were discussed in the CVPIA PEIS (Reclamation and USFWS 1999). Under the CVPIA PEIS No Action Alternative, average annual deliveries from the CVP would be 5,700,000 acre-feet, including deliveries to refuges, water rights holders, Sacramento River Settlement Contractors, San Luis Exchange Contractors, and CVP water service contractors.

Total CVP water deliveries would decrease under most alternatives, including the Preferred Alternative, by about 10 percent as a result of the allocation of CVP water to Level 2 refuge water supplies, allocation of water to uses supported by Section 3406(b)(2) of the CVPIA, and reduced Trinity River exports to the Central Valley. These impacts were addressed fully in the CVPIA PEIS (Reclamation and USFWS 1999) and have been observed to have been over 10 percent reduced deliveries to agricultural contractors in the years since the CVPIA was first implemented.

With the implementation of the CVPIA PEIS Preferred Alternative and under conditions in the late 1990s, CVP agricultural water service contractors south of the Delta would receive an average of 59 percent of their current total contract amounts, based upon a hydrologic pattern similar to that of the last 70 years of hydrology and described in Technical Appendix, Volume 2, of the Draft CVPIA PEIS (Reclamation 1997a). These conditions would 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.

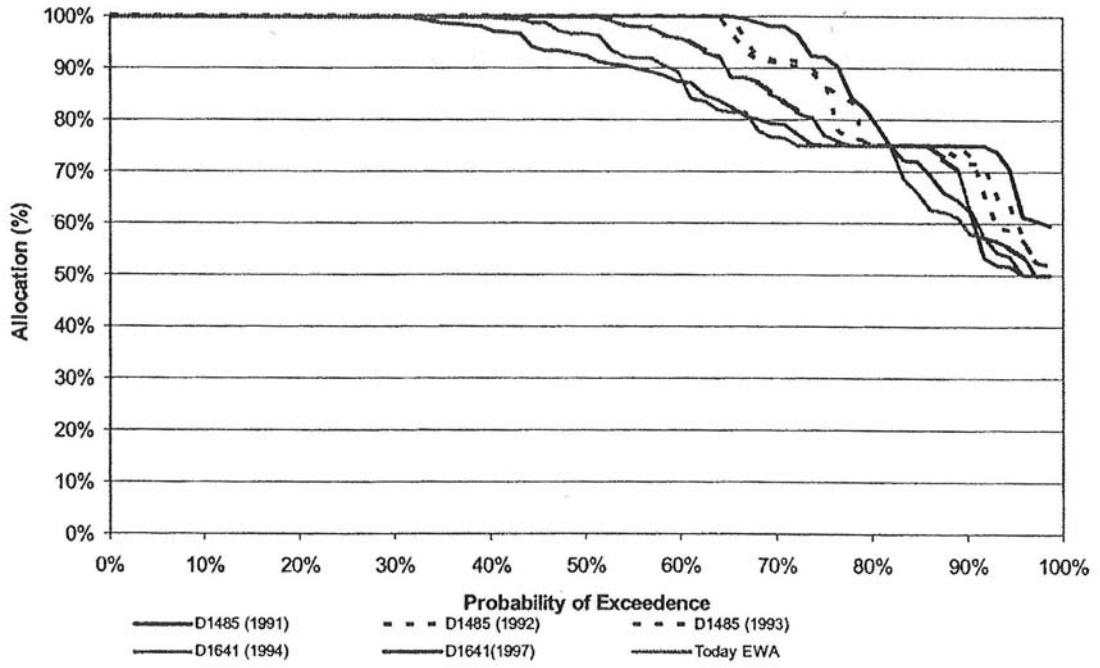
The Biological Assessment for the CVP OCAP (Reclamation 2004b) projects that under current operation of the Environmental Water Account, agricultural contractors located south of the Delta would receive their total contracted amount approximately 50 percent of the time (Figure 3.9-1). The same conditions would result in delivery of total contract amounts to M&I water service contractors located south of the Delta approximately 65 percent of the time (Figure 3.9-2). Minimum deliveries of 50 percent would occur only in extremely critically dry years.

Figure 3.9-1
CVP South of Delta Agricultural Allocation Exceedance Chart



Source: Reclamation 2004b.

Figure 3.9-2
CVP South of Delta M&I Allocation Exceedance Chart



Source: Reclamation 2004b.

STATE AND FEDERAL COORDINATION

Surface water supply deliveries to the CVP contractors in the San Luis Unit are influenced by:

- Hydrology and storage upstream
- Operations in the Delta, including consideration for Endangered Species Act (ESA) compliance and other instream needs
- Legislated processes
- Implementation of water management programs or project to increase CVP yield
- Water quality standards in the Delta to meet established water quality objectives

The management of San Luis Unit facilities is substantially influenced by the management of the northern CVP facilities. About half of the CVP's annual water supply is delivered through the Delta-Mendota Canal and San Luis Unit facilities. To accomplish the objective of providing water to CVP contractors in the San Joaquin Valley, four conditions must be considered:

- Water demands for CVP water service contractors and exchange contractors must be determined.
- A plan to fill and draw down San Luis Reservoir must be made.
- Plans for the coordination of Delta pumping and San Luis Reservoir operations must be established.
- Project operations must conform to environmental objectives to support fisheries and maintain water quality in the San Joaquin River.

The CVP operation of the San Luis Unit requires coordination with the SWP because some of the facilities are joint federal-state facilities. Similar to the CVP, the SWP also has water demands it must meet with limited water supplies and facilities. Coordinating the operations of the two projects avoids inefficient situations (for example, one entity pumping water into San Luis Reservoir while the other is releasing water).

The total San Luis Unit annual water supply is contingent on coordination with the SWP's needs and capabilities. When the SWP excess capacity is used to support CVP by the use

of a joint point of diversion, it may be of little consequence to SWP operations, but extremely critical to CVP operations. The availability to the CVP of excess SWP capacity is contingent on the SWP's ability to meet its SWP contractors' water supply commitments. Additionally, close coordination by the CVP and SWP is required to ensure that water pumped into O'Neill Forebay does not exceed the CVP's capability to pump into San Luis Reservoir or into the San Luis Canal at the Dos Amigos Pumping Plant.

During spring and summer, water demands generally exceed the capability to pump water at CVP and SWP project facilities, and water stored in San Luis Reservoir is used. Because the reservoir has very little natural inflow, water is stored there when the Tracy and Banks Pumping Plants can export more water from the Delta than is needed for contracted water needs.

SAN LUIS RESERVOIR OPERATIONS

Two means of moving water from its source in the Delta are available: Reclamation's Tracy Pumping Plant, which pumps water into the Delta-Mendota Canal, and the state's Banks Pumping Plant, which pumps water into the California Aqueduct. During spring and summer, water demands and schedules are greater than Reclamation's and the DWR's capability to pump water at these two facilities, and water stored in San Luis Reservoir must be used to make up the difference.

San Luis Reservoir has little natural inflow; therefore, if it is to be used for a water supply, the water must be stored during the fall and winter, when the two pumping plants can export more water from the Delta than is needed for scheduled water demands. Because the amount of water that can be exported from the Delta is limited by the available water supply, Delta constraints, and the capacities of the two pumping plants, the fill and drawdown cycle of San Luis Reservoir is an important element of CVP operations.

Adequate storage in San Luis Reservoir must also be maintained to ensure delivery capacity through the Pacheco Pumping Plant to the San Felipe Division. Lower reservoir elevations can also result in turbidity and water quality treatment problems for the San Felipe Division users.

A typical San Luis Reservoir annual operation cycle starts with the CVP's share of the reservoir storage nearly empty at the end of August. Irrigation demands decrease in September, and the opportunity to begin refilling the reservoir depends on the available water supply in the northern CVP reservoirs and the pumping capability at Tracy Pumping Plant that exceeds water demands. The plant generally operates at the maximum diversion rates until early spring, unless San Luis Reservoir is filled or the Delta water supply is unavailable. As outlined in Interior's Decision on Implementation of Section 3406 (b)(2)

of the CVPIA (Interior 2003), Tracy Pumping Plant diversion rates during the fill cycle of San Luis Reservoir may be reduced for fishery management.

In April and May, export pumping from the Delta is limited by the San Joaquin River pulse period standards in the State Board's Water Rights Decision 1641 and CVIPA Section 3406(b)(2)/Environmental Water Account (EWA) fishery management. During this same time, CVP and SWP irrigation demands increase. Consequently, by April and May, San Luis Reservoir operators have begun the annual drawdown cycle. In some exceptionally wet conditions (e.g., when excess floodwater supplies from the San Joaquin River or Tulare Lake basin occur in the spring), San Luis Reservoir operators may not begin its drawdown cycle until late spring.

In July and August, Tracy Pumping Plant diverts at its maximum capability, and CVP water may be exported at the Banks Pumping Plant as part of a joint point of diversion operation. Irrigation demands are greatest during this period, and the reservoir's storage capability continues to decrease until it reaches a low point late in August, when the cycle begins anew.

Power scheduling at the joint facilities is also a joint coordination concern. Because of time-of-use power cost differentials, both entities will likely want to schedule pumping and generation simultaneously. When facility capabilities of the two projects are limited, equitable solutions can be achieved between the operators of the SWP and CVP.

SAN LUIS UNIT FACILITIES

The San Luis Unit is part of the West San Joaquin Division of the CVP and also part of the State of California Water Plan. The principal federal facilities of the San Luis Unit include four storage dams that form reservoirs with a total active capacity of 2,013,370 acre-feet, 115 miles of canals, 1.8 miles of tunnels, 26 pumping plants, 84 miles of drains, two pumping-generating plants, and three substations.

Reclamation constructed this unit, certain facilities of which were are operated jointly by Reclamation and the State of California. Of the joint-use facilities, 55 percent of the total cost is attributed to the State of California and the remaining 45 percent to the United States. The joint-use facilities are O'Neill Dam and Forebay, B.F. Sisk (San Luis) Dam, San Luis Reservoir, William R. Gianelli Pumping-Generating Plant, Dos Amigos Pumping Plant, Los Banos and Little Panoche Reservoirs, and San Luis Canal from O'Neill Forebay to Kettleman City, together with the necessary switchyard facilities.

The federal-only facilities that are within the San Luis Unit include the O'Neill Pumping Plant and Intake Canal, Coalinga Canal, Pleasant Valley Pumping Plant, and San Luis

Drain. San Luis Reservoir serves as the major storage reservoir and the O'Neill Forebay acts as an equalizing water basin for the upper stage, dual-purpose pumping-generating plant. Pumps located at the base of O'Neill Dam take water from the Delta-Mendota Canal through an intake channel (a federal feature) and discharge it into the O'Neill Forebay. The California Aqueduct (a state feature) flows directly into O'Neill Forebay. The Gianelli pumping-generating units lift the water from the O'Neill Forebay and discharge it into San Luis Reservoir. When not pumping, these units generate electric power by reversing flow through the turbines. Water for irrigation is released into the San Luis Canal and flows by gravity to Dos Amigos Pumping Plant, where it is lifted more than 100 feet to permit gravity flow to its terminus at Kettleman City. During irrigation months, water from the California Aqueduct flows through the O'Neill Forebay into the San Luis Canal instead of being pumped into the San Luis Reservoir. Two detention reservoirs, Los Banos and Little Panoche Reservoirs, control cross drainage along the San Luis Canal. The reservoirs provide recreation and flood control benefits. Major project facilities and their operations are described in greater detail in Appendix B.

SURFACE WATER RESOURCES – NATURAL WATERCOURSES

San Luis Unit surface waters originate in the western San Joaquin Valley and flow predominantly eastward towards, and contributory to the San Joaquin River as direct surface flows or as contributions to east-trending groundwater flows. The San Joaquin River provides the major drainage outlet from the San Joaquin Valley. The San Joaquin river flows north along the valley trough and converges with the southerly flowing Sacramento River in the Sacramento-San Joaquin Bay-Delta. From there the water flows through the Suisun Bay and Carquinez Strait into San Francisco Bay and out to the Pacific Ocean. Water supply for purposes other than drinking water is mainly derived from runoff from the mountains and foothills of the Coast Ranges and the Sierrra Nevada foothills. The primary use of surface water in the area is for agriculture. Surface water supplies have been developed by local irrigation and water districts, county agencies, private companies, and state and federal agencies.

Flows in the San Joaquin River are controlled mostly by dams on east-side tributaries and on the main stem upstream of Fresno. Water supply developments on the major east-side tributaries have reduced the San Joaquin River flow (SJVDP 1990). Major contributors of flow to the San Joaquin River include upstream flows in the San Joaquin River above the Salt Slough confluence, Salt and Mud sloughs, the major west side tributaries of the San Joaquin River, and the Merced River. By far the largest of these sources is the Merced River, which accounts for 50 to 75 percent of the flow of the San Joaquin River measured at Crows Landing. Releases from Friant Dam located on Millerton Reservoir upstream from the drainage area are not generally a major source of flow at Crows Landing except

during flood releases. Additional detail on San Joaquin River flows is provided in section 3.2 of this EIS.

There are 18 separate named arroyos[1] and creeks originating in the Coast Range that flow westward into and/or across San Luis Unit, but rarely reaching the San Joaquin River. Much of the flow of these arroyos and creeks is intermittent, typically resulting in little or no flow in the late summer and early fall months. The seven major creeks indicated on Figure 3.9-3 total approximately 267 miles in length, ranging from Little Panoche Creek (24 miles long) to Los Banos and Los Gatos Creeks, each of which is approximately 73 miles long. Silver Creek joins Panoche Creek at a confluence west of the San Luis Unit.

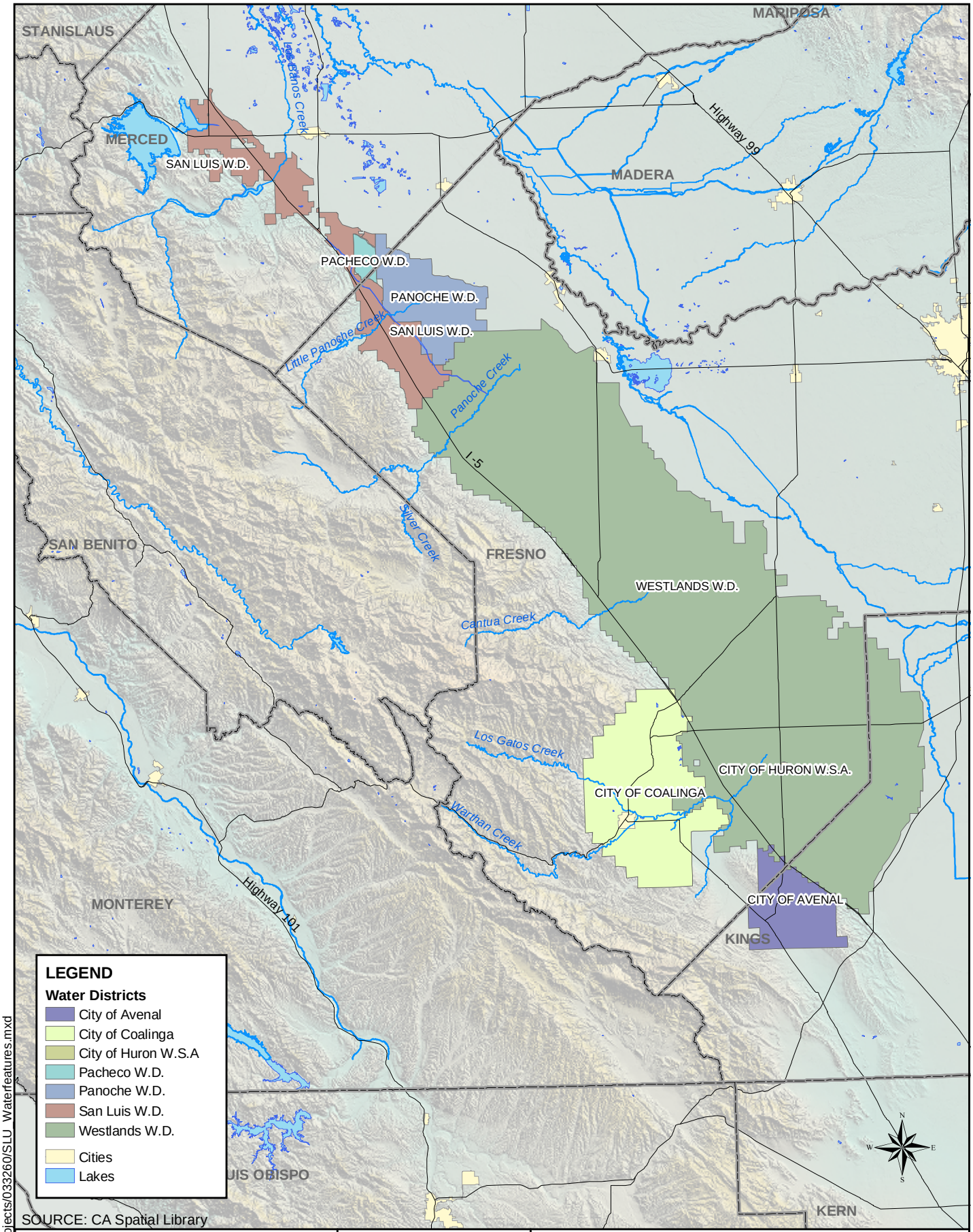
During flood events, the creeks flowing eastward out of the Inner Coast Range deposit large amounts of sediment onto the alluvial fan. When there are larger flow events, many problems are created, ranging from the down cutting of gullies to large deposits of sediment throughout affected infrastructure associated with irrigated cropland, roads, water districts, urban areas, power transmission lines, gas and oil pipelines, and the California Aqueduct.

The Los Banos Valley is an elongate northwest-southeast trending basin in the Coast Range Mountains of western Merced County. Los Banos Creek is located in Merced County, drains about 156 square miles of the Diablo Range, (one of the coast ranges of California) and flows a total of approximately 73 miles, of which about 3 miles flow through the San Luis Unit.

Los Banos Reservoir and Detention Dam are on Los Banos Creek, about seven miles southwest of the City of Los Banos. The Dam and reservoir were constructed in 1965, and are located at a constriction in the Los Banos Creek Canyon where the creek leaves the Coast Range and flows across the San Luis Water District and into the San Joaquin Valley. The dam provides flood protection for San Luis Canal, Delta-Mendota Canal, City of Los Banos, and other downstream developments.

Little Panoche Creek originates in the uplands west of the San Luis Water District, draining an area of approximately 82 square miles. It flows eastward 24 miles into the Panoche Water District area, with approximately seven miles flowing within the San Luis Unit. The

[1] The 11 named arroyos (and creeks) are fed by several other ephemeral and intermittent tributaries in the uplands of the Coast Range hills located west of the San Luis Unit. They total 80 miles in length, and include Surprise Arroyo, and Arroyos Chico, Doblegado, Finito, Hondo, Largo, Larguito, Pequeno, Robador, Seco, and Somero. Silver Creek above its confluence with Panoche Creek is not within the San Luis Unit until its flows have merged with those of Panoche Creek.



08-03-05 S:/GIS/Projects/033260/SLU_Waterfeatures.mxd

San Luis Unit Central Valley, California	NAVIGANT CONSULTING	San Luis Unit Surface Water Resources - Natural Water Courses
US Bureau of Reclamation		AUGUST 2005 FIGURE 3.9-3

Little Panoche Detention Dam is located 20 miles south of Los Banos, and creates Little Panoche Reservoir, which provides flood protection by detaining flood flows until downstream facilities can safely convey them.

The Panoche-Silver Creek Watershed is located on the west side of the San Joaquin Valley. Two major streams drain the watershed - Panoche Creek and Silver Creek (Figure 3.9-3). Silver Creek drains the southern portion of the watershed, and Panoche Creek drains the central, western, and northern portions of the watershed. The confluence of these two creeks is located approximately 4 to 5 miles upstream of I-5. Their combined flow is referred to as Panoche Creek and drains into the Fresno Slough and, subsequently, to the San Joaquin River 35 miles west of Fresno. The watershed is approximately 300,000 acres in size and ranges in elevation from 137 feet at the confluence of Panoche Creek with the San Joaquin River to approximately 5,000 feet above sea level on the ridge of the Diablo Range, which is part of the Central Coastal Ranges (McCulley Frick et al 1998).

Panoche Creek has a historical problem with erosion and sediment transport throughout the watershed and beyond to the San Joaquin River. The principal source of sediment transported to the lower Panoche Creek fan is from mainstem stream bank and streambed erosion that occurs near the confluence of Panoche Creek and Silver Creek. Natural hillslope erosion has been accelerated by livestock-related denudation of vegetation in upland and riparian areas of the Silver Creek drainage. However, the effect of livestock on sediment loading to Panoche and Silver Creeks appears to be small in most areas, relative to the magnitude of stream bank and streambed erosion. Stream bank and streambed erosion occurs in other portions of the Panoche-Silver Creek Watershed, but not to the extent observed near their confluence. Panoche Creek between I-5 and the California Aqueduct generally has been a reach of sediment deposition with only localized bank erosion (McCulley Frick et al 1998).

Eighteen miles of Panoche Creek (from Silver Creek to Belmont Avenue) is listed on the 2002 Clean Water Act Section 303 (d) List of Water Quality Limited Segment[s] ("CWA 303(d) List") for Mercury (source: resource extraction), Sedimentation/Siltation (sources: agriculture, agriculture-grazing, highway/road bridge construction), and Selenium (sources: agriculture, agriculture-grazing, highway/road bridge construction).

There is also severe down cutting in the Panoche Creek channel and severe erosion throughout the approximate 12-mile stretch from the I-5 bridge to Belmont Avenue. Once at Belmont Avenue, the channel abruptly stops and the creek flow events flow down Belmont Avenue to the City of Mendota, surrounding irrigated cropland, then flowing overland into the facilities of the Firebaugh Canal Water District (Westside RCD 2000).

Monitoring activities in the Panoche-Silver Creek Watershed were conducted from 2001 through 2004 as part of CALFED grant 2000-E02. Work included a three-year monitoring effort to provide data for the characterization of watershed hydrology, water quality, and the effectiveness of sediment and erosion control Best Management Practices.

Cantua, Los Gatos, and Warthan Creeks also originate in the Coast Range uplands west of the San Luis Unit and flow into the Westlands Water District area. They are similar in character to Los Banos and Panoche Creeks- characterized by intermittent flow volumes that peak during seasonal storm and flood flow events, but often diminish to minimal or no-flow conditions in the late summer and fall months. Los Gatos Creek drains an area of approximately 96 square miles, and is characteristic of these southern-most drainage basins – generally similar with respect to topography, climate, and flow characteristics. The combined watershed area of these and other nearby creeks is approximately 344 square miles. Despite the lack of year round flow, these creeks are capable of producing exceptional flows as evidenced by the massive washout of Interstate-5 by the Arroyo Pasajero on March 9-10, 1995. There are numerous smaller streams and associated drainage basins sandwiched between the four larger drainage basins. Some of these include Moreno Gulch, Arroyo Ciervo, Arroyo Hondo, Salt Creek, Martinez Creek and Domengine Creek.

CVP WATER SERVICE CONTRACTS

Reclamation has substantially completed negotiating the provisions of long-term water supply contracts with the San Luis Unit contractors. Reclamation recognizes that the capacity to deliver CVP water has been constrained in recent years because of several hydrologic, regulatory, and operational uncertainties, and that these uncertainties may exist or become more constraining in the future as competing demands for water resources intensify. Therefore, the likelihood of contractors receiving the amount of water set out in the draft long-term contracts in any given year is uncertain, but likely similar to, or less than levels of historic deliveries.

CVP water service contracts in the San Luis Unit are between the United States and individual water users or districts and provide for an allocated supply of CVP water to be applied for beneficial use. The purposes of a water service contract are to stipulate provisions under which a water supply is provided, to produce revenues sufficient to recover an appropriate share of capital investment, and to pay the annual operation and maintenance costs of the CVP.

Typical water service contracts include provisions that establish the following:

- The maximum quantity of water to be made available.

- The types of water delivered, such as irrigation or M&I.
- Water shortage criteria.
- Acreage limitations.
- Water conservation requirements.
- Water and air pollution control regulatory requirements.
- Rate setting.

The San Luis Unit supports two types of water service contracts: (1) agricultural and (2) municipal and industrial. The differences between these two types of contracts are discussed below.

The CVPIA PEIS (Reclamation and USFWS 1999) developed estimates of maximum water contract deliveries for the year 2026. These estimates were based on previous use, existing contract amount, and appropriate existing general plan environmental documentation relevant to CVP water use. The estimates that depend on water rights status and 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.
- **M&I Water Service Contracts:** Total demand based on 2020 demands in DWR Bulletin 160-93 (DWR 1994) or the current shortage criteria, which allows a maximum shortage of 25 percent of the contractor's historical use, with certain adjustments, up to the CVP projected M&I demand as of September 30, 1994 (Reclamation 2001). 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).
- **Wildlife Refuge Contracts:** These contracts provide water supplies to specific lands managed for wildlife purposes. Under critically dry conditions, the CVP contract water supply can be reduced by up to 25 percent.

The water needs assessment summaries for seven San Luis Unit contractors are provided in Appendix C. These summaries provide information on:

- Contractor water supply sources and quantities.
- Contractor agricultural water demands.
- Contractor M&I water demands.
- Total supply, total demand, and unmet demand.

As appropriate, information is provided for 1995 and 1997 and estimated for 2025. During the development of the Water Needs Assessments, beneficial and efficient future water demands were identified for each contractor. The demands were compared to available non-CVP water supplies to determine the need for CVP water. If the negative amount (unmet demand) is within 10 percent of their total supply for contracts of greater than 15,000 acre-feet per year, or within 25 percent for contracts less than or equal to 15,000 acre-feet per year, the test of full future need of the water supplies under the contract was deemed to be met. Because the CVP was initially established as a supplemental water supply for areas with inadequate supplies, the needs for most contractors were at least equal to the CVP water service contract and frequently exceeded the previous contract amount. Increased total contract amounts were not included in the needs assessment because the CVPIA stated that Reclamation cannot increase contract supply quantities. The analysis for the Water Needs Assessment did not consider that the CVP's ability to deliver CVP water has been constrained in recent years and may be constrained in the future because of many factors including hydrologic conditions and implementation of federal and state laws. The likelihood of contractors actually receiving the full contract amount in any given year is uncertain.

Within the San Luis Unit, even at full contract entitlement and utilization of groundwater, the total water supply falls short of the total water need because the CVP contract is subject to shortages caused by drought and environmental and regulatory actions such as the CVPIA, the Endangered Species Act, and Bay-Delta water quality actions. Thus, San Luis Unit contractors and individual landowners, when possible, must obtain supplemental water to help make up this deficiency (Reclamation 2004f). For this reason, contractors in the San Luis Unit frequently transfer water to meet their annual needs. Many of these transfers are with other San Luis Unit contractors. Overall, San Luis Unit contractors conduct ongoing discussions and enter into transfers frequently to help one another respond to annual deficiencies.

The largest San Luis Unit water user, Westlands Water District, currently has a CVP contract for 1,150,000 acre-feet per year. However, as a result of recent congressional, regulatory, and environmental actions, the reliability of this CVP supply has been reduced significantly. In 1999, Reclamation stated that the estimated average long-term supply for

Westlands Water District was 70 percent of its water supply contract, or about 805,000 acre-feet per year. Prior to 1990, its average CVP water supply, including interim CVP water when it was available, was approximately 1,250,000 acre-feet per year, and associated groundwater pumping in the district averaged approximately 150,000 acre-feet per year. The needs analysis completed by Reclamation in July 2000 estimated that the unmet demand in Westlands Water District for 2025 would be approximately 74,287 acre-feet per year.

The three periods of water service contracts listed below are used in the CVP:

- Long-term contracts, which have a term of more than 10 years. The Reclamation Project Acts of 1956 and 1963 provide for renewal of these contracts at the contractor's request.

- Short-term contracts, which have a term of more than five but less than 10 years. Reclamation law does not provide for renewal of these contracts.

- Temporary contracts, which have a term not to exceed five years. As with short-term contracts, these are no provisions within Reclamation law for renewing temporary contracts.

Because only long-term water service contracts are eligible for renewal, only these contracts were included in the CVPIA PEIS analyses. Therefore, this EIS addresses the renewal of long-term CVP water service contracts for the eight San Luis Unit contractors. The service area descriptions in Section 3.1, Contractor Service Area Descriptions, provide information on each contractor's facilities and water use, including the use of CVP water, use of other available water supplies, and relevant operating rules and regulations.

ENVIRONMENTAL CONSEQUENCES

This section describes the potential environmental consequences or impacts the long-term contract renewals could have on surface water resources in the San Luis Unit and the affected area. The study area is the San Luis Unit, and other surface water resources that could be affected by the continuation of ongoing deliveries to the San Luis Unit.

NO ACTION ALTERNATIVE

Under the CVPIA PEIS No Action Alternative, average annual deliveries from the CVP would be 5,700,000 acre-feet, including deliveries to refuges, water rights holders, Sacramento River Settlement Contractors, San Luis Exchange Contractors, and CVP water service contractors. Total CVP water deliveries would decrease under most alternatives, including the Preferred Alternative, by about 10 percent as a result of the allocation of

CVP water to Level 2 refuge water supplies, allocation of water to Section 3406(b)(2) of the CVPIA, and reduced Trinity River exports to the Central Valley. These impacts were addressed fully in the CVPIA PEIS (Reclamation and USFWS 1999) and have been observed to have been over 10 percent to agricultural contractors in the years since the CVPIA was first implemented.

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.

The OCAP modeling estimates that the 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 3.9-1 indicates predicted average south-of-Delta water supply allocations under the six alternatives modeled in the OCAP (Reclamation 2004j). The CALSIM modeling conducted for the OCAP analyses ran those six studies to project future deliveries based on historic deliveries. Those six studies were developed for the purposes of evaluating the impacts to the CVP and SWP system as operating regimes have changed since the 1992 OCAP.

Table 3.9-1
Long-Term Averages for the Six OCAP CALSIM II Studies

	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 Central Valley Project Improvement Act (CVPIA) Section 3406(b)(2) (1997)

[4] CVPIA Section 3406(b)(2) with Environmental Water Account (EWA) (2004)

[5] Total includes canal losses due to evaporation

The studies looked at the period from 1922 through 1994, and made specific analyses of the drought years of (water years) 1929-1934. It is important to note that CALSIM II cannot completely capture the policy-oriented operation and coordination of the 800,000 af of dedicated CVPIA 3406(B)(2) water and the CALFED EWA. Because the model is set up to run each step of the 3406(B)(2) on an annual basis and because the WQCP and Endangered Species Act actions are set on a priority basis that can trigger actions using 3406(b)(2) water or EWA assets, the model will exceed the dedicated amount of 3406(b)(2) water that is available. Moreover, the 3406(b)(2) and EWA operations in CALSIM II are just one set of plausible actions aggregated to a monthly representation and modulated by year type. However, they do not fully account for the potential weighing of assets versus cost or the dynamic influence of biological factors on the timing of actions. The monthly time step of CALSIM II also requires day-weighted monthly averaging to simulate VAMP actions, export reductions, and X2-based operations that occur within a month. This averaging can either under- or over-estimate the amount of water needed for these actions.

The CALSIM modeling is an estimate of future deliveries based on an analysis of historic deliveries and is not in any way a mandated delivery schedule. The OCAP modeling is an attempt to demonstrate what the *likely* deliveries will be, not what they are designated to be. Table 3.9-2 shows likely ranges in San Luis Unit Contractor deliveries for each of the six studies.

Table 3.9-2
Modeled/Likely Deliveries to the San Luis Unit Contractors
From Six OCAP CALSIM II Studies

District	Contract Amt (afy)	Study 1	Study 2	Study 3	Study 4	Study 5	Study 6
CDFG (Mendota WMA) (M&I)	10	9	9	9	9	9	9
City of Avenal (M&I)	3,500	3,290	3,220	3,220	3,150	3,045	3,045
City of Coalinga (M&I)	10,000	9,400	9,200	9,200	9,000	8,700	8,700
City of Huron (M&I)	3,000	2,820	2,760	2,760	2,700	2,610	2,610
Pacheco Water District (Ag)	10,080	8,064	6,129	7,661	6,955	6,149	6,149
Panoche Water District (Ag)	94,000	75,200	57,152	71,440	64,860	57,340	57,340
San Luis Water District	125,080	100,344	95,381	95,381	86,725	76,819	76,819
Westlands Water District (Ag)	1,188,490	950,792	722,602	903,252	820,058	724,979	724,979
Westlands Water District Distribution District No. 2 (Woods-Devine) (Ag)	4,198	3,358	2,552	3,190	2,897	2,561	2,561

None of the information provided in the OCAP simulation studies/model runs indicates that south-of-Delta deliveries could achieve a consistent level of full contract deliveries under expected hydrologic, regulatory, and operational constraints. Nevertheless, the analysis presented—particularly the characterization of ongoing drainage and water quality trends under current conditions—acknowledges that fully contract deliveries may be

provided in one or more favorable hydrologic years over the terms of the long-term water contracts being analyzed.

Based on these modeling studies, the No Action Alternative is likely to result in average annual agricultural and M&I deliveries that are at most equal to those received prior to CVPIA implementation.

Related Projects Affecting Operational Decisions and South-of-Delta Water Supply

The No Action Alternative serves as the "baseline" of future conditions against which the other alternatives/contracts will be compared when analyzing potential environmental consequences. The development of an appropriately framed benchmark for such comparisons requires that the No Action Alternative include any actions which are certain as well as changes that would occur regardless of any proposed alternative. Clearly describing the future without project condition provides the frame of reference necessary to evaluate changes caused by the alternatives. The No Action Alternative conditions include the effects of other water projects and programs that are expected to be operating, under construction or authorized and likely to be constructed and/or operated during the next 25 to 40 years —with emphasis on those other reasonably foreseeable projects that could affect, or be affected by the long-term contract renewal alternatives.

There are several related activities currently being implemented or planned by Reclamation and other agencies related to the efforts to manage and operate the CVP. Those actions affecting the quantity of water delivered by the CVP to south-of-Delta water service contractors are summarized in Table 3.9-3 as part of the No Action Alternative.

Table 3.9-3
Related Projects Affecting Surface Water Resources and Operational Decisions

Project or Study and Lead Agency	Summary/Objectives
CalFED - Ecosystem Restoration	Restore and recover native species; rehabilitate natural processes supporting habitats and species; maintain/enhance populations of certain species for commercial and recreation harvest; protect and/or restore certain habitats; prevent establishment of non-native species; and improve water and sediment quality.
CalFED - Water Supply Reliability	Maximize use of available water supplies through conservation, recycling and quality improvements; increase flexibility of federal, state and local water systems through improved conveyance, storage and operational improvements; develop additional groundwater and surface water storage projects.

Project or Study and Lead Agency	Summary/Objectives
CalFED – Storage	Provide financial and technical assistance to develop between 0.5 and 1.0 million acre-feet of locally managed groundwater storage; pursue opportunities for new off-stream storage and expansion of existing on-stream storage.
CalFED – Conveyance	Modify existing water conveyance system to promote benefits related to water supply, water quality, flood protection and the related ecosystem; improve SWP pumping operations to increase reliability and improve fish protection.
CalFED - Environmental Water Account	Reduce conflicts between the environment and project operations by providing necessary water and flexibility; provide protection for fish and habitats by increasing the flexibility of water deliveries; improve water supply reliability by achieving water supply needs in parallel with those of the environment.
CalFED - Water Use Efficiency	Reduce water demand through conservation; improve water quality through improved return flow management; improve ecosystem health by increasing in-stream flows, as necessary.
CalFED - Water Quality	Provide safe, reliable and affordable drinking water to Californians relying on Delta water through improvements in source water quality, treatment technology and water management.
CalFED - Water Transfers	Develop a more effective water transfer market; protect water rights, the environment and local economic interests; streamline state and federal agency approvals for water transfers.
CVPIA - Anadromous Fish Restoration Program	Obligates Secretary to participate in activities beneficial to fishery resources, including assisting anadromous fish at the Red Bluff Dam through water deliveries to the Sacramento Valley National Wildlife Refuge.
CVPIA - Refuges and Waterfowl	Provides long-term water supplies to specified State wildlife areas, private wetlands and National wildlife refuges identified in the CVPIA.
CVPIA - Habitat Restoration Program	Provides protection for and restoration of native habitats impacted by the CVP; stabilizes and improves populations of native species affected by the CVP, particularly federally listed species.
CVPIA - San Joaquin River Comprehensive Plan	Funds restoration efforts specific to the San Joaquin River; brings together diverse interest groups to promote consensus-based riparian restoration.
CVPIA - Restoration Fund	Fund created by surcharges on water deliveries to CVP irrigation and M&I contractors – funds are appropriated by Congress and are used to mitigate impacts of the CVP on the environment.
CVPIA - Water Acquisition	Joint effort of Reclamation and the U.S. Fish and Wildlife Service through which water supplies are acquired to meet habitat restoration and enhancement goals of the CVPIA; improvement of Secretary's ability to meet regulatory water quality requirements.

Project or Study and Lead Agency	Summary/Objectives
CVPIA - Long-Term Contract Renewal of Other Existing CVP Water Service Contracts	Negotiate and renew as many as 113 CVP water service contracts for California's Central Valley.
CVPIA - 800,000 AF Dedication	Provides annual allocation of CVP water for the primary purpose of restoring fish, wildlife, and related habitat.
Operations Criteria and Plan (OCAP)	Serves as the baseline description of facilities and operating environment, including decision making processes, of the CVP and SWP.
Coordinated Operating Agreement (COA)	Governs operation of the CVP and SWP to protect beneficial uses of water within each project as well as within the Sacramento Valley and Sacramento-San Joaquin Delta Estuary.

In addition to these projects, several other related water projects must be considered as part of the No Action Alternative, because operational decisions associated with these projects occur prior to, and often in higher priority than decisions governing deliveries to the San Luis Unit. These projects include:

- The San Luis Reservoir Low-Point Improvement Project
- Joint CVP/SWP Point of Diversion
- San Joaquin River Agreement/Vernalis Adaptive Management Plan
- Tracy Fish Facility Improvement Program
- Delta-Mendota Canal/California Aqueduct Intertie
- Consolidated Place of Use and Conformed Purposes of CVP Water, Use Petition, and EIR
- South Delta Improvements Program

Each of these projects are summarized below because of their importance in affecting future No Action conditions.

San Luis Reservoir Low-Point Improvement Project

With the existing facility configuration, the operation of the San Luis Reservoir could impact the water quality and reliability of water deliveries to the San Felipe Division, if the reservoir is drawn down too low. This operation could have potential impacts on resources in Santa Clara and San Benito Counties.

The goal of the San Luis Reservoir Low-Point Improvement Project is to increase the operational flexibility of storage in San Luis Reservoir and ensure a high quality, reliable water supply for the San Felipe Division contractors (Santa Clara Valley Water District 2004). To achieve this goal, the project incorporates the following specific objectives:

- Increase the operational flexibility of San Luis Reservoir by providing up to 200,000 acre-feet of additional storage capacity to the SWP and the CVP. Solving the low-point problem will increase the amount of water available for agricultural, domestic, industrial, and environmental uses.

- Ensure that the San Felipe Division contractors are able to use their annual CVP contract allocation to meet their water supply and water quality commitments. Because San Luis Reservoir provides about one-third of the San Felipe Division water agencies' annual supply, the low-point problem is a significant concern.

- Provide opportunities for project-related environmental improvements.

- Identify opportunities to enhance or restore natural resource benefits of streams and watersheds, consistent with the policy of the Santa Clara Valley Water District.

In addition to serving San Luis Unit contractors, San Luis Reservoir provides water to the Santa Clara Valley Water District and the San Benito County Water District. Water is delivered to these users through the CVP's San Felipe Division. In the near future, the Pajaro Valley Water Management Agency is also expected to draw from the reservoir via the San Felipe Division. When San Luis Reservoir approaches its late-summer/early-fall low point, operational limitations combine with the design of the facilities to impede the full use of reservoir storage. The low-point problem poses a threat to about half of the imported CVP supplies for the San Felipe Division agencies because of degraded water quality in San Luis Reservoir when the water level reaches a low point during the summer. The low water level, combined with hot weather, encourages the rapid growth of algae, which can foul the taste and odor of drinking water.

Implementation of a solution to the San Luis Reservoir low-point problem would allow full utilization of the reservoir's storage capacity without impacting the San Felipe Division water supply. Any changes to the operation of the CVP and SWP as part of solving the low-point problem would be consistent with the operating criteria of the specific facility. For example, any change in Delta pumping that would be the result of additional effective storage capacity in San Luis Reservoir would be consistent with the operating conditions for the Banks and Tracy Pumping Plants.

In addition to Reclamation activities directly governing operation of the San Luis Reservoir, there are several Reclamation and joint federal/state projects that have the potential to affect deliveries to San Luis Unit contractors because these projects influence the capacity to convey water from the Delta to San Luis Reservoir.

Joint Point of Diversion

D-1641 granted Reclamation and DWR the ability to use or exchange each other's diversion capacity capabilities to enhance the beneficial uses of both the CVP and SWP. The State Board conditioned the use of JPOD capabilities based on staged implementation and conditional requirements for each stage of implementation. The stages of the JPOD in D-1641 are:

- Stage 1 – water service to Cross Valley Canal contractors and Musco Olive, and to recover export reductions taken to benefit fish.
- Stage 2 – for any purpose authorized under the current project water right permits.
- Stage 3 – for any purpose authorized up to the physical capacity of the diversion facilities.

Each stage of the JPOD has regulatory terms and conditions that must be satisfied in order to implement the JPOD. All stages require a response plan to ensure that water levels in the southern Delta will not be lowered to the injury of water users in the southern Delta (Water Level Response Plan). All stages require a response plan to ensure that the water quality in the southern and central Delta will not be significantly degraded through operations of the JPOD to the injury of water users in the southern and central Delta.

Stage 2 has the additional requirement to complete an operations plan to protect fish and wildlife and other legal users of water. This is commonly known as the Fisheries Response Plan. Stage 3 has the additional requirement to protect water levels in the southern Delta under the operational conditions of the permanent South Delta Barrier program and an updated companion Fisheries Response Plan. Reclamation and DWR intend to apply all the response plan criteria consistently for JPOD uses as well as water transfer uses.

The priority access to project facilities has been addressed in the CALFED Environmental Water Account (EWA) protocols. The Stage 2 CVP JPOD has the same priority of use of excess Banks Pumping Plant capacity as the EWA program. Article 55 of SWP contracts gives the SWP contractors preferential use of excess Banks Pumping Plant capacity. Reclamation, in approving water transfers involving water from CVP water sources,

including those that use SWP Article 55, will consider the potential effects on use of the JPOD to move CVP reservoir storage releases.

In general, the JPOD capabilities will be used to accomplish four basic CVP–SWP objectives:

- When wintertime excess pumping capacity becomes available during Delta excess conditions and total CVP–SWP San Luis Reservoir storage is not projected to fill before the VAMP period, the project with the deficit in San Luis Reservoir storage may use the JPOD capabilities. Concurrently, under the CALFED Record of Decision, the JPOD may be used to create additional water supplies for the EWA or reduce debt for previous EWA actions.

- When summertime pumping capacity is available at Banks Pumping Plant and CVP reservoir conditions can support additional releases, the CVP may use the JPOD capabilities to enhance its annual south-of-Delta water supplies.

- When summertime pumping capacity is available at Banks or Tracy Pumping Plant to facilitate water transfers, the JPOD may be used to further facilitate the water transfer.

- During certain coordinated CVP–SWP operation scenarios for fishery entrainment management, the JPOD may be used to maximize CVP–SWP exports at the facility with the least fishery entrainment impact, while minimizing export at the facility with the most fishery entrainment impact.

San Joaquin River Agreement/Vernalis Adaptive Management Plan

Adopted by the State Board in D-1641, the San Joaquin River Agreement includes a 12-year experimental program providing for flows and exports in the lower San Joaquin River during a 31-day pulse flow period during April and May. It also provides for the collection of experimental data during that time to further the understanding of the effects of flows, exports, and the barrier at the Head of Old River (HORB) on salmon survival. This experimental program is commonly referred to as the Vernalis Adaptive Management Plan, or VAMP.

To assist the outmigration of juvenile salmon from the San Joaquin River's eastside tributaries from mid-April through mid-May, the operators of the water projects located on the eastside tributaries manage reservoir releases to provide target flows in the San Joaquin River at Vernalis. At the same time, the HORB is closed so that the San Joaquin River flow at Vernalis primarily passes through the Sacramento River Deep Water Ship Channel

rather than into the South Delta. The HORB culverts allow sufficient San Joaquin River water to pass into the South Delta to protect South Delta channel water levels.

The parties to the San Joaquin River Agreement include several agencies that contribute flow to the San Joaquin River, divert from or store water on the tributaries to the San Joaquin River, or have an element of control over the flows on the lower San Joaquin River. These include Reclamation, the San Joaquin River Exchange Contractors, and the Oakdale, South San Joaquin, Modesto, Turlock, and Merced Irrigation Districts. The VAMP is based on coordination among these participating agencies in carrying out their operations to meet a steady target flow objective at Vernalis.

The target flow at Vernalis for the spring pulse flow period is determined each year according to the specifications contained in the San Joaquin River Agreement. The target flow is determined prior to the spring pulse flows as an increase above the existing flows and so "adapts" to the previous hydrologic conditions. Possible target flows specified in the agreement are 2,000 cfs, 3,200 cfs, 4,450 cfs, 5,700 cfs, and 7,000 cfs.

The Hydrology Group develops forecasts of flow at Vernalis, determines the appropriate target flow, devises an operations plan including flow schedules for each contributing agency, coordinates implementation of the VAMP flows, monitors conditions that may affect the objective of meeting the target flow, updates and adjusts the planned flow contributions as needed, and accounts for the flow contributions. The Hydrology Group includes designees with technical expertise from each agency that contributes water to the VAMP.

The VAMP program has two distinct components, a flow objective and an export restriction. The flow objectives were designed to provide similar protection to those defined in the 1995 Bay-Delta Plan. Fishery releases on the Stanislaus River above those called for in the 1987 CDFG Agreement are typically considered Section 3406(b)(2) releases. The export reduction involves a combined state and federal pumping limitation on the Delta pumps. The combined export targets for the 31 days of VAMP are specified in the San Joaquin River Agreement: 1,500 cfs (when target flows are 2,000 cfs, 3,200 cfs, 4,450 cfs, or 7,000 cfs), and 2,250 cfs (when target flow is 5,700 cfs or 3,000 cfs [alternate export target when flow target is 7,000 cfs]).

During the 2003 VAMP, the state and federal projects averaged 1,446 cfs, substantially below the normal combined export pumping by the state and federal projects of 10,000 to 14,000 cfs. The greatly reduced export pumping during VAMP operations is designed to reduce the influence of the state and federal export projects on the resources of the South Delta.

Tracy Fish Facility Improvement Program

The Tracy Fish Collection Facility (TFCF) was developed and built by Reclamation with interagency cooperation in the 1950s as part of the CVP. Its purpose is to protect fish entering the Delta-Mendota Canal by way of the Tracy Pumping Plant. The Tracy Fish Facility Improvement Program began in 1989 with the overall goal of improving fish protection and fish salvage at the TFCF and is a cooperative effort between Reclamation's Mid-Pacific Region and the Denver Technical Service Center, enhanced through cooperation, review and assistance from other agencies including the CDFG, DWR, the USFWS, and NOAA Fisheries. Universities, private consultants, and the San Luis and Delta-Mendota Water Authority also assist.

The TFCF uses behavioral barriers consisting of primary and secondary louvers to guide targeted fish into holding tanks before transport by truck to release sites within the Delta. The CVP uses two release sites, one on the Sacramento River near Horseshoe Band and the other on the San Joaquin River immediately upstream of the Antioch bridge.

Delta-Mendota Canal/California Aqueduct Intertie

As described in the CALFED Record of Decision (CALFED 2000), the goal of the Delta-Mendota Canal/California Aqueduct Intertie (Intertie) is to provide operational flexibility and improve water supply reliability of the CVP and the SWP. The project involves construction and operation of a pumping plant and pipeline between the Delta-Mendota Canal and the California Aqueduct at milepost 7.2 on the Delta-Mendota Canal, where the two projects are 500 feet apart. The project is designed to enable the CVP to use the full capacity of the Tracy Pumping Plant (presently operated to a maximum of 4,600 cfs). The agencies involved will develop cooperative operational rules for the Intertie.

The Intertie would be used to achieve multiple benefits, including meeting current water supply demands, allowing the CVP Delta export and conveyance facilities to be maintained and repaired, and providing operational flexibility to respond to emergencies. The Intertie would allow flow in both directions, which would provide additional flexibility to both CVP and SWP operations. The Intertie includes a 400 cfs pumping plant at the Delta-Mendota Canal that would allow water to be pumped from the Delta-Mendota Canal to the California Aqueduct. A flow of up to 950 cfs could be conveyed by gravity from the California Aqueduct to the Delta-Mendota Canal.

The Intertie will be owned by Reclamation but operated by the San Luis and Delta-Mendota Water Authority. A three-way agreement among Reclamation, DWR, and the San Luis and Delta-Mendota Water Authority would identify the responsibilities and procedures for operating the Intertie. Reclamation would obtain a permanent easement where the Intertie alignment crossed state property.

The Intertie provides operational flexibility between the Delta-Mendota Canal and California Aqueduct. It would not result in any changes to authorized pumping capacity at the Tracy or Banks Pumping Plant. The Intertie would be used under three different scenarios:

- Up to 400 cfs would be pumped from the Delta-Mendota Canal to the California Aqueduct to help meet water supply demands of CVP contractors. This would allow Tracy Pumping Plant to pump to its authorized capacity of 4,600 cfs, subject to all applicable export pumping restrictions for water quality and fishery protections.

- Up to 400 cfs would be pumped from the Delta-Mendota Canal to the California Aqueduct to minimize impacts to water deliveries because of emergency shutdowns or to reductions in water levels required by system maintenance on the lower Delta-Mendota Canal (south of the Intertie) or the upper California Aqueduct (north of the Intertie) for system maintenance or due to an emergency shutdown.

- Up to 950 cfs would be conveyed by gravity from the California Aqueduct to the Delta-Mendota Canal to minimize impacts to water deliveries because of emergency shutdowns or to reductions in water levels required by system maintenance on the lower California Aqueduct (south of the Intertie) or the upper Delta-Mendota Canal (north of the Intertie).

Water conveyed at the Intertie under these three scenarios could include pumping of CVP water at Banks Pumping Plant or SWP water at Tracy Pumping Plant through use of a JPOD.

To help meet water supply demands of the CVP contractors, operation of the Intertie would allow the Tracy Pumping Plant to pump to its full capacity of 4,600 cfs, subject to all applicable export pumping restrictions for water quality and fishery protections. When in use, water within the Delta-Mendota Canal would be transferred to the California Aqueduct via the Intertie. Water diverted through the Intertie would be conveyed through the California Aqueduct to O'Neill Forebay.

Consolidated Place of Use and Conformed Purposes of CVP Water, Use Petition and EIR

Reclamation filed a petition in 1985 to make four changes to its water rights permits issued by the State Board for the operation of nine CVP facilities. The State Board gave notice of this petition on July 29, 1986. The petitioned changes were to:

- Consolidate the CVP authorized place of use.

- Expand the place of use.
- Conform to the purposes of use.
- Extend the time to complete full beneficial use of water under the permits.

In 1995, Reclamation amended its petition to exclude the Black Butte and New Melones projects that were addressed in three of the permits and to reduce the requested place of use expansion area from about 4,000,000 acres to 851,513 acres. These 851,513 acres consisted of lands that were located outside the authorized CVP place of use but were eligible to receive CVP water under existing contracts with Reclamation. In December 1997, the State Board distributed the *Draft Program Environmental Impact Report for the Consolidated and Conformed Place of Use* (CPOU EIR). The final CPOU EIR was distributed in November 1999.

Continued evaluation of the authorized CVP place of use boundary and the development and application of Reclamation's geographic information system allowed greater accuracy in characterizing and analyzing the authorized CVP place of use. This increased accuracy resulted in a reduction in the lands addressed in Reclamation's petition from 851,513 acres to 834,667 acres. This revised CVP place of use acreage was evaluated in the 1997 draft CPOU EIR. The place of use boundaries, as depicted in the draft CPOU EIR, did not accurately describe the place of use boundaries on the place of use maps on file with the State Board. However, the final CPOU EIR accurately indicates the place of use boundaries consistent with the permit maps on file. Additional evaluation and the correction of the maps in the final CPOU EIR also resulted in recalculations and reductions of the acreage of land outside the authorized place of use to 785,658 acres and the number of affected CVP water contractor service areas from 26 to 19.

The CPOU EIR disclosed significant impacts that were the basis for the D-1641. D-1641 addressed the following issues with respect to the authorized consolidated places of use and conformed purposes of use for CVP water:

- Conformed to the purposes of use in the individual permits so that the 16 existing permits authorize use of water for the same purposes described in the CPOU EIR.
- Consolidated the authorized places of use for water diverted from authorized CVP sources. As a result, new place of use maps identify all areas where water from a particular facility may be delivered, consistent with the current integrated operation of the CVP.

- Increased the authorized places of use in the appropriate permits by including encroachment lands (lands that had already received CVP water within the respective CVP water contractor service areas but had been outside the authorized places of use).

- Allowed Reclamation to use or deliver CVP water for subsequent use, consistent with the nine beneficial uses for which water may be appropriated pursuant to California law. At present, the purposes of use assigned by the various CVP water rights permits are not consistent with the integrated operation of CVP facilities.

- Allowed Reclamation to deliver CVP water to all areas where water from a particular facility may be used, consistent with the integrated operation of the CVP.

- Allowed Reclamation to continue to deliver CVP water to the encroachment lands contracted in accordance with federal Reclamation law and in a manner consistent with California law.

- Did not allow the expansion lands to be added to the authorized place of use. Expansion lands could be added on a case-by-case basis in the future, subject to appropriate California Environmental Quality Act (CEQA) documentation and the State Board's approval.

The State Board required that Reclamation develop a Habitat Management Plan[2] to address some of these impacts and Reclamation has complied with that requirement. Development of the Habitat Management Plan is an ongoing process, because new projects are continually added and new reports are provided to the State Board and other interested parties. The Habitat Management Plan describes Reclamation's current and future measures for addressing the impacts identified in the CPOU EIR. Impacts facilitated by the application of CVP water were caused by the conversion of naturally vegetated lands outside the authorized places of use. These lands, which were converted to either agricultural or M&I use, are referred to as the *encroachment lands*. As discussed in the CPOU EIR, mitigation for conversion of land to M&I uses was covered under local land use plans and CEQA documents. The Habitat Management Plan does not cover naturally vegetated lands outside the authorized place of use that have not yet been converted to other uses. These lands are referred to in the CPOU EIR and D-1641 as the *expansion lands*. Reclamation will apply to the State Board to include any of these lands within the authorized place of use if any beneficial use of CVP water on these lands is planned. It is

[2] Copies of the most recent Habitat Management Plan can be obtained at either Reclamation's Mid-Pacific Regional Headquarters in Sacramento, California, or at Reclamation's South-Central California Area Office in Fresno, California.

assumed that a separate CEQA environmental analysis would be conducted at the appropriate local land-use planning level and jurisdictions for development having the potential to result in significant impacts.

South Delta Improvements Program

DWR and Reclamation are responsible for implementing CALFED's South Delta Improvements Project (DWR 2004a). Actions contemplated as part of the program include providing for more reliable long-term export capability by the state and federal water projects, protecting local diversions, and reducing impacts on San Joaquin River salmon. Specifically, the CALFED actions in the South Delta Improvements Program include consideration of the following elements:

- Increase SWP pumping from March 15 to December 15 from the current limit to 8,500 cfs and modify the pumping criteria from December 15 to March 15 to allow greater use of SWP export capacity.

- Increase SWP pumping to the maximum capability of 10,300 cfs.

- Design and construct new fish screens at the Clifton Court Forebay and Tracy Pumping Plant facilities to allow the export facilities to pump at full capacity more regularly.

- Dredge and install operable barriers to ensure water of adequate quantity and quality to agricultural diverters within the South Delta (the fish barrier proposed for the Head of Old River is contained in this element).

DWR has postponed the construction of new fish screen facilities because of uncertainties associated with the design of and funding for the fish screens and the lack of results from fish screen testing facilities at the Tracy Pumping Plant. Without the new fish screen facilities, no new intake into Clifton Court Forebay was proposed. DWR has, therefore, delayed the implementation of increasing SWP diversions to 10,300 cfs.

Reclamation and DWR expect that developing environmental documentation, obtaining permits, and constructing the permanent operable barriers will take until late 2007. In the interim, there may be strategic opportunities during high flow months to increase allowable pumping capability at the SWP Banks Pumping Plant beyond the current operating rules.

In accordance with the CALFED Record of Decision (CALFED 2000), implementation of increased permitted pumping is conditioned upon avoiding adverse impacts to fishery protection and in-Delta water supply reliability. In addition to the CALFED Record of

Decision commitments, Reclamation and DWR agree that implementation of increased permitted pumping at the Banks pumping plant is also conditioned on:

- Reclamation and DWR constructing and operating permanent operable barriers in the South Delta to improve water quality and water level conditions and to provide fishery protection.

- Reclamation and DWR, in cooperation with other CALFED agencies and local interests, developing and implementing a comprehensive San Joaquin River Salinity Management Plan to enable reliable compliance with all current Delta water quality salinity objectives (electrical conductivity and chloride) for which the state and federal water projects have responsibility, in accordance with D-1641.

- Construction of the Beale and Byron Tracts aspects of the Old River and Rock Slough water quality improvement projects to protect and improve water quality conditions near the Contra Costa Canal.

- The USFWS, NOAA Fisheries, and CDFG developing and implementing environmental protection measures (including project-specific and updated programmatic federal biological opinions and state Natural Community Conservation Planning authorization to comply with federal Endangered Species Act and state Natural Community Conservation Planning requirements) that continue to protect and recover covered species to an equivalent level of protection as provided for in the CALFED Record of Decision. The assets needed to provide this level of protection will be adjusted periodically based on new science and other information.

- Reclamation, DWR, the USFWS, NOAA Fisheries, and CDFG developing and implementing a long-term EWA with appropriate water user and public funding to protect, recover, and restore at-risk native fish species that rely on the Delta, while providing water supply reliability commitments to the SWP and CVP exporters.

In summary, the No Action Alternative is characterized by several reasonably foreseeable future projects, many of which will need to be considered by CVP and SWP operators before mutually satisfactory decisions can be made regarding south-of-Delta deliveries. Those reasonably foreseeable future projects potentially having the greatest effect on decisions regarding south-of-Delta deliveries were included in the CALSIM modeling done for the 2004 OCAP, which resulted in projections of reduced average annual agricultural and M&I deliveries than those provided prior to CVPIA implementation.

ALTERNATIVE 1

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 would actually depend on several interacting factors, including, among other considerations, water year type, water transfers and 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 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 implementation of Alternative 1.

ALTERNATIVE 2

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 resulting from the implementation of Alternative 2.

CUMULATIVE IMPACTS

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 San Luis 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 San Luis Unit, long-term contract renewals in the San Luis Unit have limited opportunities to increase reliance on other south-of Delta surface water resources. Continued application of irrigation waters associated with the No Action and action alternatives will continue to support some agricultural operations that affect 18 miles of Panoche Creek (from Silver Creek to Belmont Avenue) that are listed on the 2002 Clean Water Act Section 303 (d) List of Water Quality Limited Segment[s] ("CWA 303(d) List"). Agricultural sources of sedimentation, siltation and selenium affecting receiving waters will continue to be supported by some CVP surface water deliveries.

IRREVERSIBLE AND/OR IRRETRIEVABLE COMMITMENTS OF RESOURCES

The No Action Alternative, Preferred Alternative, and Alternatives 1 and 2 would not irreversibly or irretrievably commit additional surface water resources to only beneficial agricultural and M&I uses in the San Luis Unit when compared to existing conditions. Reclamation has retained a level of regulatory flexibility in the contracts—which require reasonable and beneficial use—that have consequences that could allow Reclamation to reduce deliveries to one or more contractors. This flexibility is found most notably in Article 3 of the contract titled: Water to be Made Available and Delivered to the Contractor. Articles 11 (Temporary Reductions—Return Flows) and 12 (Constraints on the Availability of Water) also provide for reductions in contract amounts consistent with operational constraints discussed as part of existing conditions and the No Action Alternative.

SECTION 3.10: BIOLOGICAL RESOURCES

This section analyzes the potential impacts to non-listed species and habitats with the potential to occur in the study area and other portions of the San Luis Unit. To avoid redundancy and the potential for conflicts across separate NEPA and ESA processes, potential impacts to federal or state listed or federal candidate fish, plant, and wildlife species are addressed in separate documents, as discussed below.

The study area is located in the San Joaquin Valley and includes portions of Fresno, Kings, and Merced counties and the service areas of the San Luis Unit contractors. It is reasonable to initially assume that a variety of vegetation types and wildlife resources in the project area could potentially be affected by the renewal of long-term water service contracts.

Baseline information on biological resources in the San Luis Unit Study Area was compiled primarily from literature and information gathered from water district general managers and staff. Data sources included appendices to the Draft CVPIA PEIS (Reclamation 1997b, 1997e), 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 2000d), A Guide to Wildlife Habitats of California (Mayer and Laudenslayer 1988), vegetation categories derived from CALVEG data (Matyas and Parker 1980), the Grassland Bypass Project EIS/EIR (Reclamation 2001b), the CDFG California Natural Diversity Database, and the California Native Plant Society's Inventory of Rare and Endangered Vascular Plants of California (California Native Plant Society 2000).

DOCUMENTS ADDRESSING POTENTIAL IMPACTS TO LISTED SPECIES ASSOCIATED WITH DELIVERIES TO THE SAN LUIS UNIT

Reclamation and the 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 US Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries) regarding potential operational impacts to species listed pursuant to the federal Endangered Species Act (ESA). DWR is consulting with CDFG regarding potential operational impacts to species listed pursuant to the California ESA. The OCAP is a detailed analysis and explanation of the criteria and procedures for conducting combined CVP and SWP operations.

As part of the ESA consultation for the OCAP, Reclamation has prepared biological assessments (BA) analyzing the effects of proposed OCAP actions. The OCAP BA for fisheries (Reclamation 2004h) and the OCAP BAs for terrestrial (plant and wildlife) species (Reclamation 2004i, 2004k) 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 BAs 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 BA for fisheries (Reclamation 2004h) 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 that these documents account 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 San Luis Unit. The OCAP BA for terrestrial species (Reclamation 2004i) addresses the continued CVP and SWP operations on wildlife and plant species that are listed or proposed for listed under the federal ESA, 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 BA for terrestrial species (Reclamation 2004k) also covers wildlife and plant species that are listed or proposed for listing under the California ESA, including the bank swallow, Swainson's hawk, and western yellow-billed cuckoo.

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 and 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 consultations result 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 USFWS 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 (NOAA Fisheries 2004) covers proposed 2020 operations of the CVP including the Trinity River Mainstem Record of

Decision (Reclamation 2000b), 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 Tracy Fish Collection Facility, operation of the SWP-CVP intertie, and renewal of long-term water service contracts, including for the San Luis Unit. The formal consultation in the biological opinion also covered the effects of operations of the SWP including operations of the North Bay Aqueduct, Suisun Marsh Salinity Control Gates, and the John E. Skinner Fish Facility Protective Facility.

Early consultation effects include operations of components of the South Delta Improvement Program, including pumping of 8,500 cubic feet per second (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 USFWS 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. Recent concern regarding the health of the Sacramento-San Joaquin Delta fisheries may delay one or more of these consultations.

In addition, Reclamation has consulted under the ESA on the Operations and Maintenance Program Occurring on Bureau of Reclamation Lands within the South-Central California Area Office, resulting in a Biological Opinion issued February 17, 2005 (1-1-04-0368). The opinion considers the effects of operation and maintenance of Reclamation's facilities used to deliver water to the study area, as well as certain other facilities within the jurisdiction of the south-Central California Area Office, on California tiger salamander, vernal pool fairy shrimp, valley elderberry longhorn beetle, blunt-nosed leopard lizard, vernal pool tadpole shrimp, San Joaquin wooly-threads, California red-legged frog, giant garter snake, San Joaquin kit fox, and on proposed critical habitat for the California red-legged frog and California tiger salamander.

Since listed fishery and terrestrial species and habitats affected by CVP (and SWP) operations that serve to deliver water to the San Luis Unit have been and continue to be evaluated extensively in the OCAP BAs (Reclamation 2004h, 2004i, 2004k) and corresponding draft OCAP biological opinion (NOAA Fisheries 2004), as well as in the biological opinion for Reclamation's Operation and Maintenance Program (Reclamation 2000d) this EIS will not redundantly address potential impacts of long-term water service contract renewals to fishery or terrestrial resources outside the San Luis Unit. In addition, listed fishery and terrestrial species and habitat have been extensively analyzed in the West San Joaquin Division, San Luis Unit Biological Assessment Long-Term Contract Renewal (Reclamation 2004j), which is also incorporated by reference in this EIS and is available

under separate cover. The San Luis Unit BA was submitted to the USFWS in September 2004, and a biological opinion is pending.

In summary, impacts evaluations of those listed species requiring consultation under the federal ESA are addressed either in the fishery and terrestrial OCAP BAs (Reclamation 2004h, 2004i, 2004k), the September 5, 2003 and September 5, 2004 Memoranda from the South Central Area Office, or the San Luis Unit BA (Reclamation 2004j), all of which are available under separate cover.

AFFECTED ENVIRONMENT

The following discussion describes the distribution of natural and semi-natural communities and other land uses that have the potential to occur within the San Luis Unit project area. The following discussion also summarizes the distribution of land uses and natural communities that are within two miles of the San Luis Unit action area.

LAND USE AND NATURAL COMMUNITIES WITHIN TWO MILES OF THE SAN LUIS UNIT

Immediately west of the San Luis Unit lies the Diablo Range of the California Coast Range. The area west of the northern portion of the San Luis Unit includes a portion of the San Luis Reservoir, O'Neil Forebay, and Los Banos Reservoir near Santa Nella in Merced County. From here, the western portion follows foothills through portions of the Panoche Hills and Monocline Ridge in western Fresno County. Other than the open water of the reservoirs, this area along most of the western boundary is primarily composed of open areas of annual grasses with linear riparian communities along intermittent streams. Further south, the land adjacent to the San Luis Unit includes grasslands and portions of coastal scrub, chaparral, and oak woodland communities at the higher elevations of hills west of Coalinga. The southern portion of the San Luis Unit includes a mix of oil development, agricultural lands, and annual grasses on the Kettleman Hills near Avenal in southwestern Fresno County and western Kings County.

Immediately southeast of the San Luis Unit lies the north shore of what was historically the open water and tule marshes of Tulare Lake and the Kings River. The area includes some riparian and wetland areas but is largely dominated by irrigated agriculture, primarily row crops. Going north, the area east of the San Luis Unit includes the historical marshlands of the Fresno Slough, which were created by the channelization of the Fresno Slough and flood control operations of the Kings River from its departure through the area of Tranquillity and the Mendota Wildlife Area. Most of these lands are used for irrigated agriculture, but there are also areas of restored and conserved wetlands such as the

Mendota Wildlife Area. From there, the eastern portion of the San Luis Unit extends northwest through Mendota and the Mendota Pool area along the San Joaquin River. It continues along the area of the Delta-Mendota Canal through irrigated farmland mixed with restored wetlands up to the northern portion of the San Luis Unit near Santa Nella.

LAND USE AND NATURAL COMMUNITIES WITHIN THE SAN LUIS UNIT

The San Luis Unit encompasses approximately 1,322 square miles of land situated on arid plains and low hills on the west side of the San Joaquin Valley. It lies between the lowlands of the valley trough and the eastern foothills of the Diablo Range. The unit lies just north and west of the Tulare Lake bed and west of historical marshlands along Fresno Slough and the San Joaquin River, as described above.

Historically, the region surrounding the San Luis 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). The dominant community types associated with the San Luis Unit study area include grasslands, saltbush scrub, and alkali sinks (USFWS 1998; Piemeisel and Lawson 1937). Huge herds of pronghorn antelope, tule elk, and mule deer grazed the prairies, and large flocks of waterfowl used the extensive wetlands. Major plant communities included grasslands, vernal pools, marshes and riparian forests. The historical descriptions of the area generally describe the eastern portion of the San Luis Unit as a swath of alkaline desert scrub lands outside the flood zone of the lower marshlands of the San Joaquin Valley trough (Mead 1901; Piemeisel and Lawson 1937). Going east toward the Coast Range, desert scrub lands intergraded into grasslands that extended past the western boundary of the San Luis Unit (Piemeisel and Lawson 1937). Grasslands of the San Luis Unit were originally dominated by perennial bunch grasses. By the 1930s, desert scrub and native grass communities had been heavily impacted by overgrazing and brush removal and had been almost entirely replaced by annual grasses (Piemeisel and Lawson 1937).

At present, approximately 14 percent of the San Luis Unit's land area remains undeveloped. Most remaining undeveloped lands are along the foothills of the Diablo Range at the western edge of the San Luis Unit. Approximately 71 percent of undeveloped lands are in the hills surrounding the Pleasant Valley near Coalinga and the Kettleman Hills near Avenal. The remaining 29 percent is in the northern portion of the San Luis Unit near Santa Nella and various small parcels throughout the San Luis Unit (DWR 2004).

Approximately 75 to 81 percent of the San Luis Unit is currently used as irrigated farmland, 2.5 percent is used for oil production, and 1.5 percent is used for urban areas, farmsteads, transportation, and conveyance facilities (DWR 2004b). Approximately one-half of the San Luis Unit's irrigated farmland is used for the production of cotton (35 percent) and tomatoes (16 percent). Approximately 11 percent is used for orchards and vineyards, half of which is used for the production of almonds. The remaining farmland is used for a variety of crops, such as alfalfa, asparagus, wheat, melons, corn, grain, and various pasture crops (DWR 2004b).

Another land use of note is retired agricultural lands. Currently, approximately 6 percent of the land area in the San Luis Unit is either idle or has been purchased to be retired from irrigation (DWR 2004b; Westlands Water District 2003b). In 1998, Interior initiated a land retirement demonstration project to "address concerns about the scope and degree of impacts of land retirement on drain volume reduction, wildlife, socio-economics, and overall cumulative effects of removal of land from irrigated agriculture" (Uptain et al. 2004). As of 2002, approximately 2,086 acres of farmland were retired and in use for the demonstration project (Uptain et al. 2004).

Westlands Water District has also initiated a land acquisition program to address the problems of "(1) inadequate drainage on lands overlying shallow groundwater, and (2) insufficient and unreliable water supply" (Westlands Water District 2003c). As of 2002, the district had acquired approximately 13,978 acres of land, which had been temporarily fallowed and will also acquire an additional 86,197 acres of land (Westlands Water District 2003c). These 100,175 acres would represent approximately 12 percent of the land area of the San Luis Unit. It is anticipated that this land would come back into production as drainage service is provided and the Westlands Water District's water supply increases. The lands that would be acquired and temporarily fallowed are primarily in the southern and eastern areas of the district's service area.

Undeveloped lands on the valley floor are now restricted to small habitat patches that are fragmented and isolated from each other. As a result of the conversion of natural 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 habitat 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 adjacent to the study area along portions of the eastern boundary 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 study area were different from fishery resources present today (Reclamation 1997e). 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 San Luis 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 San Luis Unit project area. The intermittent streams located within the project 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; 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 uses and land cover types within the San Luis Unit. The categories discussed below generally correspond to the land use and land cover types displayed on the figures included in Appendix D. It also includes a discussion of vegetation types, plants, and animals located in and adjacent to the study Area. Lists of common and scientific names of the plant and animal species cited in this document are provided in Appendix E. In addition to the natural, semi-natural and agricultural communities discussed below, other uses in the San Luis Unit include land developed for industrial and transportation uses, mixed urban uses, residential and commercial development, and land that is barren.

Natural or Semi-Natural Communities

Wetlands

Available wetland habitats in the two-mile buffer area around the study 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 non-tidal wetlands not classified as lacustrine, estuarine or riverine and having 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 grasslands 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.

Very little area in the San Luis Unit (0.02 percent) is mapped as seasonal emergent wetlands. Wetlands occur primarily as small parcels along the eastern edge of the Westlands Water District nearest to historical marshlands along Fresno Slough. A small area of wetlands is also mapped in an area of riparian woodland habitat maintained at the O'Neill Forebay Wildlife Area. A large mosaic of seasonal wetlands and grasslands occurs northeast of the San Luis Unit and near the San Luis National Wildlife Refuge Complex.

Riparian Communities

Riparian communities develop in the floodplains of low-gradient rivers and streams. They occur adjacent to freshwater reaches of permanent and seasonal watercourses. Typically, riparian land cover occurs as narrow bands of vegetation immediately adjacent to watercourses. In and near the San Luis Unit, tree species include non-native salt cedar and cottonwood. Shrub cover includes riparian scrub vegetation, which includes several community types dominated by different shrub species, including buttonbush scrub, elderberry savanna, great valley mesquite scrub, and great valley willow scrub (USFWS 1998).

Approximately 0.2 percent of the San Luis Unit is mapped as riparian communities. Of these, approximately 42 percent is in an area of riparian woodland habitat maintained at the O'Neill Forebay Wildlife Area. The remainder is primarily riparian scrub with intermittent cottonwoods and non-native salt cedar along seasonal streams that flow into the San Luis Unit from the Diablo Range, such as Los Banos Creek, Little Panoche Creek, Panoche Creek, Cantua Creek, Las Gatos Creek, Warthen Creek, and Zapato Chino Creek.

It should be noted that the map sources used may not be of sufficient detail to identify some small areas of riparian habitat that occur along stream drainages.

Water

Open water in the San Luis Unit is primarily in reservoirs and water conveyance facilities. Streams in the San Luis Unit originate on the Coast Range and typically will carry water for a few hours or days after a rainfall event. Historically, the water from these streams would spread out over the plain of the western San Joaquin Valley and would seldom reach the San Joaquin River (Mead 1901). With the exception of heavy rainfall events, open water covers less than 1 percent of the study area and is nearly all found in the San Luis Canal, parts of O'Neill Forebay, and various other canals.

Ruderal or Unclassified Rangeland

Ruderal or unclassified rangeland areas are classified as undeveloped on recent maps of irrigated and urban lands, but lack a secondary source to classify the dominant vegetation community. These lands make up approximately 3.5 percent of the study area (University of California-Santa Barbara 1996; California State University-Stanislaus, Endangered Species Recovery Program 2004). They include open areas reserved for flood control and parcels of farmland that have been abandoned and have reverted to some semi-natural state. They also include linear areas such as canal rights-of-way, open areas around communication towers, and marginal areas at the interface between undeveloped and developed lands. In this region, most of these lands are made up of non-native grasses and would be similar to those labeled Annual Grasslands, but with a greater amount of disturbance. The habitat value of these lands will vary considerably with the level of degradation and land management practices.

Idle/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.

Shrub and Brush, Herbaceous, and Mixed Rangeland

Rangelands are classified into three basic types. The shrub and brush rangeland is dominated by woody vegetation and is typically found in arid and semiarid regions. Mixed rangelands are ecosystems where more than one-third of the land supports a mixture of herbaceous species and shrub or brush rangeland species. Herbaceous rangelands are dominated by naturally occurring grasses and forbs, which are typically grazed by livestock, as well as some areas that have been modified to include grasses and forbs as their principal cover. Rangelands are, by definition, areas where a variety of commercial livestock are actively maintained. Within the rangeland community, a number of herbivorous animals such as grasshoppers, jackrabbits, and kangaroo rats compete with livestock for forage.

Agricultural Habitat

Although natural communities provide the highest value for wildlife, many of these historical 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 crops 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, but grasses or forbs are allowed to grow between rows to reduce erosion in some areas. 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 growers using species management programs to force these species away from the orchards.

Deciduous and Evergreen Forest

Deciduous forests are composed of trees that lose their leaves in the winter. These include species such as the various California oaks and California buckeye. The interior live oak, which is not deciduous, is also found in deciduous forests. Valley oak woodlands are found in the Sacramento and San Joaquin Valleys and usually occur below elevations of 2,000 feet. The deciduous forest plant species often provide a substantial amount of food to associated animals. The forest itself also provides a large amount of habitat. Wildlife associated with deciduous forests includes a wide variety of birds, small rodents, deer, raccoons, various insects, foxes, bobcats, black bears, or even wolves.

Some of the component species of the mixed evergreen forest include tanbark oak, madrone, douglas fir, California bay, bigleaf maple, canyon live oak, black oak, coast live oak, and California hazelnut. This forest is also filled with leafy trees and few conifers.

AREAS NOT AFFECTED BY USE OF CVP WATER

Four natural areas in the vicinity of the study 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 the O'Neill Forebay. The Little Panoche Wildlife Management Area is located on Little Panoche Creek.

AREAS AFFECTED BY USE OF CVP WATER

All nine of the contractors in the study area and several Significant Natural Areas[1] in the area of the study area use CVP water. The following sections of the report describe several of the larger Significant Natural Areas affected by CVP water delivered from the San Luis Unit or other CVP sources.

Significant Natural Areas

There are 77 Significant Natural Areas scattered throughout the San Joaquin Valley region, with some concentration 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 woolly-threads, 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,

[1] The Significant Natural Areas Program is part of the California Department of Fish and Game'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 analyses data from the California Natural Diversity Database. Significant Natural Areas are identified using the following biological criteria: 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.

with wetland acreage reduced to 120,300 acres. In combination with the adjacent uplands, the wetland complex is referred to as "the Grasslands" and consists of 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 San Luis Unit or are located nearby. Significant Natural Areas in the Unit include the Lower and Upper Cottonwood Creek Wildlife Management Areas, Mendota Wildlife Management Area and O'Neill Forebay. Significant Natural Areas near the San Luis Unit include Los Banos Wildlife Management Area, Little Panoche Wildlife Management Area, Merced Wildlife Management Area, North Grasslands Wildlife Management Area, San Joaquin River Wildlife Management Area, San Luis National Wildlife Refuge Complex, and Volta Wildlife Management Areas.

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 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 these 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 1997b). 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). Service from the San Luis Unit is limited to domestic supply.

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 (USFWS 2004e). Expanded from its original 3,000 acres, there are now 6,217 acres of wetland habitat including lakes, sloughs, and managed marsh. 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 (USFWS 2004e). 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 it for foraging. Other listed 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 1997d). Previously 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 (USFWS 2004h). 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 an increased public hunting area, which is opened during the hunting season.

North Grasslands Wildlife Management Area

The North Grasslands Wildlife Management Area was purchased by the State of California in April 1990 and managed by the CDFG (Reclamation 1997d). It includes three separate units–the China Island, Galdwall, and Salt Slough 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. The 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 a mixture of managed seasonal and permanent wetlands, riparian habitat associated with three watercourses,

native grasslands, alkali sinks and vernal pools (USFWS 2004e). The complex is primarily managed to provide habitats for migratory and wintering birds. 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 are also found here (USFWS 2004c). Major public use occurs in the refuge complex, including interpretive wildlife observation programs, hiking, fishing and waterfowl and pheasant hunting.

San Joaquin River National Wildlife Refuge

The San Joaquin River National Wildlife Refuge is located approximately 10 miles west of Modesto on Highway 132 and within the floodplain of the confluences 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 and has grown substantially. Through recent land acquisitions, the refuge has increased to 6,642 acres with an approved refuge boundary of 12,877 acres (USFWS 2004d). The 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. Due to the proximity of large population centers, great 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 maintains more than 1,800 acres of wetlands, including 1,400 acres of moist soil plants, and 720 acres of alkali sink habitat are preserved on the refuge as a rare ecological community (Reclamation 1997d). This facility 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

In addition to the measures required under the ESA to protect listed and proposed species, other measures to mitigate or offset impacts to sensitive and listed species have been developed and implemented by the counties in the study area as part of their general plans.

The most current measures for the affected counties in the study area are described below. Reclamation has no control over the development or implementation of these goals and policies or their capabilities to protect species or habitat.

Fresno County

The Land Use and Open Space and Conservation Elements in the Fresno County draft general plan policy document set goals, policies, and implementation measures for biological resources (County of Fresno 2000a, 2000b). These items are included in Section LU-C, River Influence Areas; Section OS-A, Water Resources; Section OS-D, Wetland Communities and Riparian Areas; Section OS-E, Fish and Wildlife Habitat; and Section OS-F, Vegetation. These goals and objectives include the following:

- 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 (Goal OS-D). The county's policies seek to protect natural areas and to preserve the diversity of habitat in the county. Related policies are included in the 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 supports fish and wildlife species so that populations are maintained at viable levels (Goal OS-E). Policies seek to protect native vegetation resources, primarily on private land, within the county.

- To preserve and protect the valuable vegetation resources of Fresno County (Goal OS-F).

Merced County

Merced County has the following goals and objectives stated in the Open Space/ Conservation chapter of its general plan regarding the conservation of natural resources (Merced County 1990).

- Goal 1. Habitats that support rare, endangered, or threatened species are not substantially degraded.

- Objective 1.A. Rare and endangered species are protected from urban development and are recognized in rural areas.

- Objective 1.B. Local, state, and federal managed lands are recognized.

Kings County

Kings County has the following goals stated in the resource conservation element of its general plan (Kings County Planning Department 1993).

- Goal 16. Preserve land that contains important natural plant and animal habitats.
- Goal 17. Maintain the quality of natural wetland areas identified by the CDFG and the USFWS.
- Goal 18. Protect and manage riparian environments as valuable resources.
- Goal 19. Balance the protection of the county's diverse plant and animal communities with its economic needs.
- Goal 20. Manage natural stream environments to provide protection for fish habitat.

ENVIRONMENTAL CONSEQUENCES

This section describes the potential environmental consequences or impacts the long-term water service contract renewals could have on biological resources in the San Luis Unit.

The following criteria were used to assess the general potential for the various alternatives to result in impacts to biological resources. Impacts to biological resources are considered adverse if long-term contract renewals could result in any of the following:

Fisheries and Aquatic Ecosystems

- Cause aquatic habitat reduction of greater than five percent.
- Substantially degrade aquatic ecosystem processes such as sediment transport or nutrient recycling.
- Substantially degrade structural characteristics of the aquatic ecosystem, such as woody debris recruitment or channel morphology.
- Substantially reduce populations of fish species having economic or social value.
- Cause a fish population to drop below self-sustaining levels.

- Substantially interfere with movements of migratory fish species.

Vegetation and Wetlands

- Result in adverse changes or loss of riparian vegetation, wetlands, or upland vegetation including removal, burning, or fragmentation.

Wildlife

- Interfere substantially with the movement of any resident or migratory species.
- Substantially reduce habitat diversity or numbers of any species of animal or interfere with the long-term survival, growth, or reproduction of any wildlife populations.
- Result in the introduction of a new species of animal into an area.
- Substantially diminish wildlife habitat.

IMPACT ASSESSMENT

This section presents the assessment of potential impacts that alternatives considered in this document could have on the non-listed biological habitat and species in the San Luis Unit, as compared to the No Action Alternative.

No Action Alternative

Requirements of the CVPIA biological opinion (Reclamation and USFWS 2000a) would be met under the No Action Alternative, including continuation of ongoing species conservation programs. The renewal of long-term contracts would not involve the construction of new facilities or the installation of structures that would alter current land uses. The renewal of CVP contracts for the San Luis Unit study 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.

The No Action Alternative requires Reclamation to renew long-term water service contracts for 25 to 40-year periods for agricultural and M&I contractors. Ongoing trends in drainage and water quality, agriculture, land use, soils, groundwater, and surface water resources will be continued under the No Action Alternative. Reclamation acknowledges that several of those trends, especially with respect to drainage and ground- and surface water quality will continue. The rate of degradation of San Luis Unit and receiving

ground- and surface waters will likely proceed at reduced rates than those experienced historically because of the regulatory conditions affecting water quality, as well as aggressive drainage and groundwater management and water quality programs being implemented in and around the San Luis Unit. Nonetheless, the No Action Alternative will continue the application of irrigation waters to drainage-impaired lands, and will therefore continue to contribute, along with several other natural processes and man-caused activities, pollutants to affected waters. The No Action alternative also assumes that Reclamation will implement drainage service during the contract term as required by law, following separate environmental review, because specific features of drainage service have not presently been identified.

The State Water Resources Control Board has developed Total Maximum Daily Load (TMDL) requirements for selenium, salts, and boron, the requirements of which were previously reviewed in section 3.2. Under the No Action Alternative, and each of the three action alternatives (Alternative 1, 2, and the Preferred Alternative), the San Luis Unit Contractors will be required to comply with these TMDL requirements, and all other applicable water quality regulations applicable to drainage waters.

The No Action Alternative will be characterized by the effects of existing CVPIA and related Central Valley programs intended to beneficially restore and conserve biological habitat and resources within and near the San Luis Unit. These programs include but are not limited to the following:

- CVPIA Habitat Restoration Program
- CVPIA San Joaquin River Comprehensive Plan
- CVPIA Restoration Fund
- CVPIA Water Acquisition Program
- CVPIA Land Retirement Program,.
- Central Valley Habitat Joint Venture
- CVP Conservation Program
- The San Joaquin Valley Upland Species Recovery Plan

In addition to these programs, Reclamation continues to work with the USFWS and other federal, state, and local on over 20 ongoing projects directed towards species restoration, recovery, and conservation of habitats and species in the Central Valley. In addition to ongoing drainage management programs discussed in section 3.2, these programs also will be part of the No Action Alternative, including ongoing training for pesticide applicators

in collaboration with the California Department of Parks and Recreation, Reclamation Lands Biological Surveys, Land Ownership (in areas of biological interest), Kit Fox escape den installations, habitat acquisition, and other CVPIA Terrestrial Restoration Activities benefiting refuges, fish and wildlife, and efforts to acquire and retire lands as appropriate.

The CVPIA Land Retirement Program will likely continue to result in progressive reductions to irrigated acreage within the San Luis Unit. Land retirement will likely result in some additional lands being dedicated to habitat restoration and conservation, especially in those instances where such lands provide valuable additions to existing habitat units through increased cover and diversity, greater contiguous land areas capable of supporting more successful migration and other life history elements now being stressed from habitat disturbance and fragmentation.

If future land retirement programs result in substantial reductions in the irrigable land base within the San Luis Unit, those programs will result primarily from voluntary programs wherein individual landowners consider the economic costs and benefits of retiring land from agricultural production. The range of factors that will likely be considered will include crop prices that can be taken in future agricultural markets, the fixed and variable costs of agricultural production (equipment, labor, field preparation, machinery, seed, fertilizer, maintenance, etc.), the cost of water, and other considerations at the specific landowner level. If these landowners opt to convert the use of retired lands to any of several uses (e.g., undeveloped, habitat, residential, commercial, or industrial development), such decisions will occur at the landowner and local (city and county) land use planning levels where such jurisdiction resides. Reclamation does not have land use planning jurisdiction, because the same quantity of CVP water is projected to be available under the No Action and each Action Alternative and because the chain of such land use decisions associated with future locations and levels of retired lands will rest with landowners and local jurisdictions, it is reasonable to assume that such decisions will occur regardless of whether the No Action or one of the action alternatives is implemented. Although the cost of water is partially controlled by Reclamation, this will be but one of many factors that will be considered, and therefore land retirement is substantially indifferent with respect to the alternatives considered in this EIS.

Preferred Alternative

The Preferred Alternative would not result in adverse impacts on biological resources in the San Luis Unit study area when compared to existing conditions or the No Action Alternative. The renewal of CVP contracts would only continue water deliveries that accommodate current land uses, and that continue to support refuge water and habitat

needs and the aims of the habitat restoration and conservation programs that will persist as part of the future/No Action Alternative. Implementation of the Preferred Alternative 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 long-term water service contracts under the Preferred Alternative would not result in adverse effects on fish, vegetation, or wildlife species located in the San Luis Unit.

Alternative 1

Alternative 1 would not result in adverse impacts on biological resources, including fish, vegetation, and wildlife, in the study area when compared to existing conditions or the No Action Alternative. The renewal of CVP contracts 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 these contracts under Alternative 1 would not result in adverse effects on fish, vegetation, or wildlife species located in the San Luis Unit.

Alternative 2

Alternative 2 would not result in adverse impacts on biological resources, including fish, vegetation, and wildlife, in the San Luis Unit project area when compared to existing conditions or the No Action Alternative. The renewal of CVP contracts for the project 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 these contracts under Alternative 2 would not result in adverse effects on fish, vegetation, or wildlife species located in the San Luis Unit.

CUMULATIVE IMPACTS

Long-term contract renewal alternatives, when considered in combination with other past, present, and reasonably foreseeable future actions and projects, are unlikely to result in further adverse cumulative impacts to biological resources when compared to the No Action Alternative and existing conditions. Much of the cumulative effects to biological resources arising from the combination of long-term contract renewals and other past and

present activities have already occurred and are expressed in this EIS as existing conditions and ongoing trends within the Affected Environment and/or No Action Alternative descriptions. The cumulative effects of long-term contract renewals and the continued application of irrigation and M&I water will contribute to the continuation of these conditions and trends as a result of decisions to be made regarding the levels of deliveries that the CVP can provide as the CVPIA continues to be implemented. This is particularly true when considering cumulative impacts resulting from all other CVP and SWP projects analyzed in the OCAP in combination with long-term contract renewals—levels of deliveries will dictate potential levels of irrigation applications, which will in turn increase the amount of potential drainage water originating from the San Luis Unit that could affect biological resources – especially wetlands and waterfowl habitat in the San Luis Unit.

Long-term, indirect adverse cumulative impacts to downstream fishery resources resulting from long-term contract renewals will continue under the No Action and action alternatives to the extent to which these impacts are directly attributable to irrigation applications in the San Luis Unit. The severity of these cumulative impacts is expected to be reduced in the future consistent with the goals and objectives of several ongoing programs. The most obvious of these are regulatory requirements for water quality objectives, which are expected to result in the termination of drainage discharges and consequent decrease in selenium and salts reaching the San Joaquin River. Future drainage management, habitat restoration, land acquisition, land retirement, water conservation, and related CVP programs are expected individually and in combination with long-term contract renewals to reduce cumulative drainage and water quality-related impacts to aquatic and terrestrial biological resources if implemented as intended and consistent with the CALFED Ecosystem Restoration Program and other habitat restoration programs in the San Joaquin Valley.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The No Action Alternative is expected to continue existing drainage and water quality trends, and their indirect effects on biological resources. These trends will irreversibly commit soil and groundwater resources to "drainage-impaired" and ultimately unusable conditions for agricultural production if drainage service is not provided within the term of the long term renewal contracts. For example, current estimates presented in the San Luis Drainage Feature Re-evaluation (Reclamation 2005) estimate from 44,106 to 308,000 acres that will need to be retired from agricultural production because of these lands' inability to economically support crop growth. The irreversible and irretrievable nature of these resource commitments applies only to such resources' ability to support agricultural

production, and not to all potential uses, and is predicated on permanent lack of drainage service. However, because the No Action Alternative assumes that Reclamation will implement the court-ordered provision of drainage service during the term of this contracts, irreversible and irretrievable commitments of resources will not occur, because each of them will similarly continue the delivery of irrigation waters to some drainage-impaired lands that ultimately may need to be retired.

The No Action and action alternatives would irreversibly and irretrievably commit some surface water resources to be used as agricultural irrigation waters. Commitments of these resources would effectively forego opportunities for allocating these surface water resources to other environmental purposes or beneficial uses that could benefit aquatic and/or terrestrial habitats.

SECTION 3.11: CULTURAL RESOURCES

This section discusses the potential effects that the alternatives considered in Chapter 2 could have on the cultural resources in the San Luis Unit.

AFFECTED ENVIRONMENT

Renewal of the long-term water service contracts between Reclamation and the San Luis Unit contractors constitutes an "undertaking" under federal definitions. The potential for impacts to cultural resources must be considered in the environmental review document being prepared for these renewals, in compliance with a number of federal rules and regulations (below).

For cultural resources, the area of potential effect of the undertaking consists of the contract service areas for the San Luis Unit contractors. Their service areas, which are 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 and the northernmost portion of the Temblor Range of the Central Coast Ranges.

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 service areas of the San Luis Unit contractors. Included at the end of this section are recommendations for general actions that, if adopted and implemented by Reclamation, would ensure that any effects of the undertaking would be reduced to less-than-significant levels.

INFORMATION SOURCES AND BACKGROUND DATA FOR AFFECTED ENVIRONMENT

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

In order to secure information concerning the types and general distribution of known archaeological and historic sites and to estimate whether additional such sites may remain undiscovered within an individual contractor's lands, the following sources were consulted:

- Archaeological surveys and site and other records and documents maintained by the California Historical Resources Information System, Central California Information Center and Southern San Joaquin Valley Information Center.
- Selected published and unpublished archaeological, ethnographic and historic reports and documents available for the overall study area.
- The NRHP.
- The California Register of Historical Resources (State of California 1998).
- The California Inventory of Historic Resources (State of California 1976).
- The California Historical Landmarks Registry (State of California 1990).
- The California Points of Historical Interest listing (State of California 1992 and updates).
- The Historic Property Data File (Office of Historic Preservation 2001).
- The CALTRANS Local Bridge Survey (California Department of Transportation 1989).
- The Survey of Surveys (1989).

The results of background research and records searches are summarized below in the discussions of the environmental, prehistoric, ethnographic, and historic contexts. Specific results are summarized in the Current Inventory of Cultural Resources section.

NATURAL ENVIRONMENTAL CONTEXT

The service areas of the San Luis 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 and including lands at the interface of the valley and the lower reaches of the Diablo and Temblor Ranges of the Central Coast Ranges.

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 and valley lands. Drainages and associated natural levees and benches were moderately to intensively used, 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 intensive 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 for example), expansion of mechanized agriculture, and construction of associated agricultural equipment and storage buildings.

PREHISTORIC CONTEXT

The CVPIA project area, inclusive of the present 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 (before present) to 11,200 BP.

The next cultural period, the Western Pluvial Lakes Tradition, is thought by most to be subsequent to the Clovis period. It is another widespread complex 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 has been dated to between 8,000 BP and 10,000 BP 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 in southern California, where it has been termed the Milling Stone Horizon (Wallace 1954, 1978c), but recent studies suggest that the horizon may be more widespread than originally described and was likely present throughout the CVPIA area. Radiocarbon dates associated with this period vary between 8,000 BP and 2,000 BP, although most cluster in the 6,000 BP to 4,000 BP range (Moratto 1984).

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 dated to this time period contain mortars and pestles and/or are associated with bedrock mortars, implying increasingly intense exploitation of acorns. The range of subsistence resources utilized, along with Native American 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, which are often found as mortuary items.

ETHNOGRAPHIC CONTEXT

As noted above, the San Luis Unit study area is nearly coterminous with lands claimed by the Penutian-speaking Northern Valley Yokuts (Wallace 1978a) and the Southern Valley Yokuts (Wallace 1978b; Kroeber 1925) at the time of initial contact with European-American populations circa AD 1850. These peoples occupied an area extending from the crest of the Coast Diablo and Temblor Ranges easterly into the foothills of the Sierra Nevada, north to the American River in the case of the Northern Valley Yokuts, and south to Buena Vista and Kern Lakes at the southernmost end of the Great Central Valley in the case of the Southern Valley Yokuts.

The basic social unit for the Yokuts was the family, although the village may also be considered both a social and a political and economic unit. Often located on flats adjoining streams, villages were inhabited mainly in the winter because it was necessary to go 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, each containing a single family of three to seven people. Larger villages that were maintainable seasonally 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 in 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, in part because of their perishability and 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 San Luis Unit. The most frequently occurring types include 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, frequently but not always located 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 California's natural and cultural landscape 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 Central Valley. The mining communities' demand for hard commodities led quickly to the expansion of ranching and agriculture throughout the Central 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, particularly along major transportation

corridors. Of particular importance was the transformation brought about by the construction of railroad lines.

The Southern Pacific and Central Pacific Railroads and a host of smaller interurban lines to the north around the cities of Stockton and Sacramento began intensive projects in the late 1860s. By the turn of the century, nearly 3,000 miles of rail lines connected the cities of Modesto and Stockton with points south and north. Many cities in the Central Valley were laid out as isolated railroad towns in the 1870s and 1880s by the Southern Pacific Railroad, which not only built and settled, but continued to nurture the infant cities until settlement was successful. The Southern Pacific Railroad main line traverses the Central Valley a short distance east of the San Luis Unit study area.

Dry-farming practices predominated during the early years until the 1880s when large-scale diversions of water from the San Joaquin River and its tributaries began. By the turn of the century, more than 350,000 acres were being irrigated across the San Joaquin Valley. New pump technology in the 1920s allowed more groundwater to be used. Valuable crops, such as vegetables, fruits, and nuts, were grown. New farming techniques allowed for leveling for irrigation on a scale never before possible. These practices had devastating results to the region's prehistoric sites and very few remained undisturbed. It is these conditions that characterize portions of the study area today.

The construction of the CVP in the mid-1900s drastically changed the hydrology of the San Joaquin River by diverting most of the river's flows at Friant Dam. The construction of the west-side canals to offset the Friant diversions led to the further development of irrigated agriculture and subsequent drainage issues.

Intensive agricultural development soon followed, since railroads provided the means for product to be transported to a much larger market. By the end of the twentieth century, a substantial portion of the valley had been converted from native habitat and 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

Historical overviews for the region generally document the presence of a wide range of historic site and feature types and complexes. The types known or most likely to be present within the study area include the following:

- Historical railroad alignments.
- Two-track historic trails/wagon roads and now-paved historical 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 with associated buildings and irrigation systems.
- 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 67 archaeological and historic sites are currently documented within the contract service areas of the San Luis Unit contractors. These include sites that contain exclusively prehistoric material, sites with only historic material, sites with mixed prehistoric and historic components, and structures.

Prehistoric sites are represented by habitation areas (village sites) in which both habitation and special-use activity areas are represented; mortuary sites; specialized food-procurement and food-processing sites; 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 and early through mid-twentieth centuries; historic transportation features; water distribution systems; occupation sites and homesteads with associated features such as refuse disposal areas, 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 (SHPO). Others remain unevaluated.

In addition to formally recorded sites, it is probable that both prehistoric and historic sites remain undiscovered within the San Luis Unit study area simply because for many areas, especially on undeveloped ranch and farm lands, formal archaeological inventory surveys have not been undertaken.

Table 3.11-1 summarizes the current cultural resources inventory by contractor. The table also provides a conclusion as to whether the service area is known 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 historical societies as summarized in existing archaeological reports and other 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 contractor service areas.

Table 3.11-1
Summary of Previous Studies and Cultural Properties

San Luis Unit Contractor	Recorded Sites or Landmarks	Percentage Surveyed to Date	Are Undocumented Sites Likely To Be Present in Service Area?
City of Avenal	25	9%	Yes
City of Coalinga	0	1%	Yes
City of Huron	0	0%	Yes
Pacheco Water District	12	5%	Yes
Panoche Water District	0	12%	Yes
San Luis Water District	28	5%	Yes
Westlands Water District	2	2%	Yes
Total	**67**		

ISSUES IDENTIFIED

The primary issues involving cultural resources include (a) what types of archaeological and historic sites are present within the water service areas 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 water service 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 existing records and documents, including archaeological survey reports and archaeological site documents on file at the California Historical Resources Information Centers and elsewhere, (b) an archaeological and historic overview of the study area, and (c) the results of previous consultation with Native American groups and historical societies as documented in existing reports and files at the California Historical Resources Information Centers.

The significance or importance of archaeological sites located within the study area has been addressed by using established procedures outlined in the NRHP Criteria for Evaluation (36 CFR 60.4) and discussed below.

The final two cultural resource issues revolve 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-significant levels. These issues are discussed below under Impact Significance Criteria and Methodology.

ENVIRONMENTAL CONSEQUENCES

The objectives of this section are (a) to describe the basis for determining which cultural resources located within the San Luis Unit 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 contractors' service areas, (b) to identify and assess the potential effect of long-term contract renewals on eligible or potentially eligible 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 any of the alternatives.

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 October 1998). Reclamation is responsible for ensuring compliance with federal laws, rules and regulations.

According to federal regulations and guidelines, significant or important cultural resources are those prehistoric and historic sites, districts, buildings, structures, and objects and those 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, represent the work of a master, 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 were evaluated under the *Guidelines for Consideration of Traditional Cultural Values in Historic Preservation Review* (U.S. National Park Service 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 a number of archaeological and historic sites have been documented within the contractors' service areas, not all of them have been evaluated for NRHP eligibility. As well, intensive-level pedestrian surveys have been undertaken within only a small portion of the overall water service contract areas (see Table 3.11-1).

IMPACT ASSESSMENT

This section presents the assessment of potential impacts that the alternatives considered in this EIS could have on cultural resources in the region, as compared to the No Action Alternative.

No Action Alternative

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 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 San Luis Unit include documented and undocumented prehistoric and historic sites and features, some of which may contain subsurface (buried) accumulations of cultural material.

All of the actions associated with long-term renewal of the San Luis Unit water service contracts are within the range of "existing conditions" with respect to land use. While archaeological and historic sites have already been documented within the service areas of four of the nine San Luis Unit contractors (and are likely present in all of the service areas, but simply have not yet been documented), the continuation of existing land uses is not considered adverse, and no specific mitigation measures would be necessary. Specifically, the implementation of the long-term contract renewals would not modify or substantially alter current land uses within the contractors' boundaries. Contract renewal would not alter the area of use, types of use, range of river or stream flows, or reservoir fluctuations (excepting an instance in which the San Luis Reservoir is operated to increase end-of-month storage in September; this occurrence would reduce the present "bathtub ring" effect when compared to the Affected Environment). No additional infrastructure would be constructed, there would be no increase in deliveries, and there would be no conversion of existing natural habitat into farmland or other uses.

Future needs could possibly result in proposals by one or more of the contractors to: (1) bring new lands into irrigation and/or incorporate new land into their boundaries; or (2) substantially alter existing land uses within their boundaries.

Reclamation would need to consider the effects of either one of the above to historic properties for any actions it approves. 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.

Preferred Alternative

The Preferred Alternative would not result in adverse impacts to cultural resources when compared to existing conditions or the No Action Alternative. As with the No Action Alternative, actions associated with the Preferred Alternative would result in the continuation of existing land uses, which should not be considered detrimental with respect to cultural resources. Similar to the No Action Alternative, no specific mitigation measures would be necessary.

As previously discussed in the No Action Alternative, any future needs of the water contractors could possibly result in proposals that would be required to 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 adverse impacts to cultural resources when compared to existing conditions or the No Action Alternative. Land use would be similar to historical patterns. The continuation of existing land uses is not considered adverse, and no specific mitigation measures would be necessary.

As previously discussed in the No Action Alternative, any future needs of the water contractors could possibly result in proposals that would be required to 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 2

Similar to the discussion above for the No Action Alternative, Alternative 2 would not result in adverse impacts to cultural resources when compared to existing conditions or the No Action Alternative. Land use would be similar to historical patterns. The continuation of existing land uses is not considered adverse, and no specific mitigation measures would be necessary.

As previously discussed in the No Action Alternative, any future needs of the water contractors could possibly result in proposals that would be required to 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.

CUMULATIVE IMPACTS

As noted in discussions above, actions associated with the long-term renewal of the San Luis Unit water service contracts under all of the alternatives are within the range of "existing conditions" with respect to land uses that could affect cultural resources. Currently, most of the land areas within individual contractor boundaries are being farmed, an activity that has been ongoing for decades. Since the No Action Alternative consists of contract renewal only, the undertaking would not add to the potential impacts to cultural

resources located within San Luis Unit contractor boundaries. This is also true with respect to each of the three other alternatives, as related actions would not add to the potential impacts to cultural resources located within San Luis Unit contractor boundaries. As previously discussed, any future needs of the water contractors could possibly result in proposals that would be required to 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.

IRREVERSIBLE AND/OR IRRETRIEVABLE COMMITMENT OF RESOURCES

Compliance with Section 106 of the National Historic Preservation Act and other federal rules and regulations could be required for new undertakings (for example, if substantial new lands are to be incorporated within a contractor's boundaries or land use changes are proposed that involve the use of federally contracted water). Section 106 and the other relevant federal rules and regulations are designed to ensure that all eligible and potentially eligible sites are adequately inventoried. "Inventory" includes the identification, evaluation in relation to NRHP eligibility criteria, and assessment of effects in relation to proposed project impacts. Consequently, implementation of treatments recommended in the Section 106 consultation and related process results in reducing levels the impacts that a project might have on eligible or potentially eligible archaeological or historic sites. By definition, reducing impacts consistent with these treatments implies that there would be no irreversible or irretrievable commitment of cultural resources.

SECTION 3.12: RECREATIONAL RESOURCES

This section discusses the potential effects that the alternatives considered in Chapter 2 would have on the recreational resources within the San Luis Unit.

AFFECTED ENVIRONMENT

Recreation sites that could be assumed to be affected by the renewal of long-term water service contracts include San Luis Reservoir, Los Banos Reservoir, Little Panoche Reservoir, the O'Neill Forebay, San Luis Canal, the San Joaquin River, and the wildlife refuges located near the San Luis Unit.

RESERVOIRS

San Luis Reservoir, the adjacent O'Neill Forebay, and Los Banos and Little Panoche Reservoirs provide reservoir-related recreational resources in or near the study area. San Luis Reservoir and the O'Neill Forebay are located west of Interstate 5 near State Route 152. Los Banos Reservoir is located southwest of the Town of Los Banos and Little Panoche Reservoir is located south of Los Banos. 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 (CDPR) 2004]. This included 469,478 day-users and 44,618 campers. Visitor origins include San Luis Reservoir, coastal and bay counties to the west, and valley and foothill counties to the east.

San Luis Reservoir

When 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.

San Luis Reservoir
Source: U.S. Bureau of Reclamation

Water-enhanced activities account for the largest portion of reservoir use. Relaxing and camping are the most popular of the water-related activities. About three-fourths of the annual use occurs between April and September. The majority of visitors are from the Bay-Delta (38 percent) or San Joaquin Valley areas (27 percent) (DWR 1987).

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, prepared draft environmental documentation for the San Luis Reservoir and Los Banos Creek State Recreation Area Joint General Plan and Resource Management Plan (68 FR 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, prepared a joint draft programmatic environmental impact statement/report in April 2005. The purpose of the general plan is to guide future development activities and management objectives at the recreation area. CDPR prepared the general plan portion and Reclamation developed the resource management plan of the combined document. Reclamation and CDPR cooperated to prepare the joint plans in a consolidated planning process that will solicit agency and stakeholder participation for both efforts simultaneously. The project areas for each plan varried, based on differences in management and ownership; however, there are 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 CDFG-managed lands are not a 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, are 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 are the primary management guidelines for defining a framework for resource stewardship, interpretation, facilities, visitor use, and services. The joint plans define an ultimate purpose, vision, and intent for management through goal statements, guidelines, and broad objectives. They are 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.

Pacheco State Park

Pacheco State Park is adjacent to the San Luis Reservoir to the west. It 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

Los Banos Dam and Reservoir

Los Banos Dam and Reservoir are on Los Banos Creek above the San Luis Canal, approximately seven miles southwest of the City of Los Banos in Merced County. The

reservoir has a capacity of 34,600 acre-feet. The main purpose of the detention dam is to protect the canal from damaging floods caused by runoff from the Los Banos Creek watershed. The reservoir has 620 water surface acres and 12 miles of shoreline. The recreation area offers trails following the Path of the Padres, a boat and hiking trail. The path leads to the baths used by the padres of early California. During the spring, guided interpretive tours are provided on the trail. The reservoir offers day-use facilities for picnicking and family activities. Fishing opportunities are available, and the reservoir is stocked during the fall and winter months with trout. A horse camp is available and there are equestrian trails for the horse enthusiast.

Little Panoche Reservoir

The Little Panoche Reservoir has a capacity of 5,580 acre-feet and detains floodwater collected over 81.3 square miles of mountainous drainage area. Its limited recreational facilities are considered undeveloped, but allow camping and hunting.

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. It covers about 2,250 surface acres when full. It was developed in part to accommodate recreational use that may be lost when San Luis Reservoir is drawn down. 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.

Recreational facilities consist of two boat ramps, two picnic areas, a campground, and a swimming area. 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.

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 are exposed.

SAN LUIS CANAL

Fishing access is provided along 343 miles of the 444-mile-long San Luis Canal. Most of the 279-mile portion of the San Luis Canal that passes through the San Joaquin River Region is accessible for fishing. In this area, 12 fishing access sites provide parking areas and toilet facilities. The majority of the fishing occurs along the access roads running alongside the canal, away from designated fishing sites. No water-dependent uses other than fishing are allowed.

San Luis Canal
Source: California Department of Water Resources

SAN JOAQUIN RIVER

The San Joaquin River is approximately 100 miles long and extends from Millerton Lake to the Delta. While there are no major recreation features associated with the San Joaquin River in the vicinity of the San Luis Unit, public access exists at several road and state highway crossings.

Recreational use estimates for the 100 miles of the lower San Joaquin River are not available. 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.

SALT SLOUGH

Within the San Luis National Wildlife Refuge, fishing in Salt Slough is permitted during daylight hours. Fishing is by rod and reel only and the taking of frog, crayfish, turtles, snakes, and all other wildlife is prohibited. Fishing outside the refuge occurs near the Lander Avenue Bridge. Fish species include bass and catfish.

MUD SLOUGH

Fishing is not officially permitted at Mud Slough. "No Fishing" signs have been posted at Mud Slough to protect people from ingesting high levels of selenium. Despite posted fishing restrictions, catfish is the primary fish caught at Mud Slough.

WILDLIFE REFUGES

Wildlife refuges in the vicinity of the San Luis Unit include the San Luis and Merced National Wildlife Refuges, which are owned and operated by the USFWS, and the Volta and Los Banos Wildlife Management Areas, which are owned and operated by the California Department of Fish and Game.

Recreation facilities in the national wildlife refuges and wildlife management areas are primarily designed to enhance wildlife observation. Recreational facilities are limited at the San Luis and Merced National Wildlife Refuges. Camping is permitted at staging areas on the national wildlife refuges during hunting season only. Camping at the Volta or Los Banos Wildlife Management Areas is not allowed.

Most recreational activities on the refuges are wildlife-dependent. They include non-consumptive uses (e.g., wildlife observation) or consumptive uses (e.g., hunting). About 15 percent of the visitors originate from the local area. Recreational activities at the refuges are associated with the presence of wildlife, primarily waterfowl, and accordingly, visitation peaks in winter when waterfowl are present. Waterfowl hunting is permitted at the wildlife management areas and the national wildlife refuges. Fishing is permitted at the San Luis National Wildlife Refuge. Management regulations designed to minimize wildlife disturbance at the refuges include limiting public access to certain time periods and not providing facilities that would extend recreation beyond existing boundaries and limits for observation.

PRIVATE HUNTING CLUBS

The 176 private waterfowl hunting clubs in the San Joaquin River Region cover about 96,800 acres. Of this total acreage, about 33,900 acres are flooded annually.

CLEAR CREEK MANAGEMENT AREA

The Clear Creek Management Area is located near the southwestern portion of the San Luis Unit, west of Coalinga. It is open year-round for day and overnight use. It has been an important weekend recreational destination for central California residents for the past 35 years. Clear Creek is one of the most popular off-highway-vehicle areas in California. The Clear Creek Management Area continues to be popular with motorcyclists, who use the area for hill climbing, trail riding, and camping. Other common activities include four-wheel-drive off-highway vehicle touring, hobby gem/mineral collecting, hunting, hiking, backpacking, and sightseeing.

Camping is permitted throughout the area, with the exception of the San Benito Mountain Natural Area, which is closed to camping. Campfire permits are required and are free. There are also some stream terraces in the Clear Creek canyon that are closed to vehicle use and car camping in order to protect rare plant habitat and occurrences. Six staging areas and the Oak Flat Campground are all open to camping and have dumpsters and pit toilets. There is no running or potable water in the area. Hunting is also permitted in most areas. The Joaquin Ridge area includes 22,000 acres for exploring, most with little evidence of human disturbance. There are a few roads, some abandoned and some still in

use by the livestock operators, but in large part, the area is untouched. Non-motorized recreation is welcome. The Draft Resource Management Plan Amendment and Draft EIS for the Clear Creek Management Area (Bureau of Land Management 2004) includes extensive additional information on the resources of that area.

ENVIRONMENTAL CONSEQUENCES

Potential effects on recreational resources are identified by how the alternatives could change or alter recreational resources in the San Luis Unit. The following criteria for were used to assess whether the potential exists for the long-term renewal contracts to have an adverse impact. Potential recreational impacts could be considered adverse if the long-term contract renewal could:

- Increase the use of existing parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated.
- Require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment.

IMPACT ASSESSMENT

This section presents the assessment of potential impacts that the alternatives considered in this EIS could have on recreational resources in the region, as compared to the No Action Alternative and existing conditions.

No Action Alternative

Under the No Action Alternative, San Luis Reservoir levels could be affected by water level fluctuations during one or more dry water years if deliveries to San Luis Reservoir are constrained beyond current levels. Boating may be constrained and shoreline activities may decline for two or more peak-season months as compared to existing conditions, especially if operational decisions, independent of contract renewals, further constrain deliveries to San Luis Reservoir. During consecutive wet water years, boat ramps could be unusable for one more peak-season month, boating could be constrained, and shoreline activities could decline for two more peak-season months and one more off-season month. It is estimated that additional use could decrease about 1 percent during dry years and about 4 percent during wet water years. These effects could result from CVPIA operations and deliveries to the San Luis Unit, regardless of long-term contract renewals.

Because pool elevations in O'Neill Forebay are maintained at constant levels, water level fluctuations would be unaffected by the long-term contract renewals. Increased stream

flows on the San Joaquin River could increase recreational opportunities. Recreational opportunities provided by the San Luis Canal are expected to be similar to existing conditions because the water level in the canal would be held at a constant level by telemetry. Wildlife refuges would receive increased water supplies as a result of Level 2[1] refuge water supplies, thereby maintaining existing refuge recreational opportunities at current or enhanced levels, especially for wildlife observation.

Preferred Alternative

The Preferred Alternative would not result in adverse impacts on recreational resources when compared to existing conditions or the No Action Alternative. The facilities would continue to operate as in the past and present, with deliveries and water levels generally approximating estimates now projected for San Luis Reservoir. Recreational opportunities and annual use levels at the San Luis, Los Banos, and Panoche Reservoirs, state recreation areas, the O'Neill Forebay, San Luis Canal, San Joaquin River, and parks and wildlife refuges are not expected to change from current or No Action Alternative conditions as a result of the long-term contract renewals.

Alternative 1

Alternative 1 would not result in adverse impacts on recreational resources when compared to existing conditions or the No Action Alternative. The facilities would continue to operate as in the past and present, with deliveries and water levels generally approximating estimates now projected for San Luis Reservoir. Recreational opportunities and annual use levels at the San Luis, Los Banos, and Panoche Reservoirs, state recreation areas, the O'Neill Forebay, San Luis Canal, San Joaquin River, and parks and wildlife refuges are not expected to change from current or No Action Alternative conditions as a result of the long-term contract renewals.

Alternative 2

Alternative 2 would not result in adverse impacts on recreational resources when compared to existing conditions or the No Action Alternative. The facilities would continue to operate as in the past and present, with deliveries and water levels generally approximating estimates now projected for San Luis Reservoir. Recreational opportunities and annual use levels at the San Luis, Los Banos, and Panoche Reservoirs, state recreation areas, the O'Neill Forebay, San Luis Canal, San Joaquin River, and parks and wildlife refuges are

[1] Level 2 supplies are defined in the 1989 Reclamation report *Refuge Water Supply Investigations* as the historic annual average water deliveries to each refuge prior to enactment of the CVPIA and two-thirds of the water supplies identified for the lands affected by the 1989 San Joaquin Basin Action Plan/Kesterson Mitigation Plan (Reclamation and USFWS 1998).

not expected to change from current or No Action Alternative conditions as a result of the long-term contract renewals.

CUMULATIVE IMPACTS

The effects of long-term contract renewals, when added to the aggregate effects of other past, present, and reasonably foreseeable future actions, will not cause or contribute to impacts to recreational opportunities or resources. Long-term contract renewals call for the same estimated quantities of available future water to be delivered to the same reservoirs and recreational areas, regardless of whether it is the No Action Alternative or one of the other renewal alternatives, 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 will be attributable to other operational decisions that will each need to consider several timing, quantity, and related constraints, independent of the renewal of long-term water service and repayment contracts.

IRREVERSIBLE AND/OR IRRETRIEVABLE COMMITMENTS OF RESOURCES

The renewal of long-term contracts would not irreversibly or irretrievably commit recreational resources. The contractual obligation to deliver the same estimated quantities of available future water through the use of the same facilities and their future operational schedules would not noticeably change their expected effect on recreational opportunities when compared to the No Action Alternative.

SECTION 3.13: VISUAL RESOURCES

This section discusses the potential effects that the alternatives considered in Chapter 2 could have on the visual resources in the San Luis Unit.

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 natural water feature. A number of wetlands used as wildlife refuges are also located in the region. The valley area is developed predominantly for agricultural use. 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.

Some CVP facilities within and in the vicinity of the San Luis Unit are visual resources. These facilities include the San Luis, Los Banos, and Little Panoche Reservoirs, the O'Neill Forebay, and the Delta-Mendota, San Luis, and Coalinga Canals. Also, the CVP, through its wildlife refuges, creates visual benefits. The landscape in this area is considered to be of common scenic or minimal scenic quality. O'Neill Forebay and the San Luis, Los Banos, and Little Panoche Reservoirs are considered to be of common scenic quality. The service area of the CVP, including the area of the Delta-Mendota Canal and the San Luis Canal, is considered to have minimal scenic quality with some areas of common scenic quality (USFS 1976).

Panoramic views are found within some areas of Interstate 5, some segments of which are designated scenic highways. Views from Interstate 5 of the Delta-Mendota Canal and California Aqueduct are the basis for this designation. Similarly, views of the San Luis Reservoir are an important part of the designation of SR 152 as a scenic highway.

Wildlife refuges in the region near the San Luis Unit are considered to have landscape variety that ranges from common scenic to distinctive scenic quality (USFS 1976). These areas provide visual contrast to the 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 numbers of visitors, 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 substantially interfered with existing scenic views, blocked visibility, or produced light and glare inconsistent with existing areas. Impacts in the San Luis Unit project area depend on: (1) changes in cropping patterns, which may result in increased fallowed land and the associated modified agricultural viewshed; (2) potential land retirements associated with the CVPIA Land Retirement Program, which would reduce irrigated lands in the San Luis Unit project area; and (3) 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.

IMPACT ASSESSMENT

This section presents the assessment of potential impacts that the alternatives considered in this EIS could have on visual resources in the study area, when compared to the No Action Alternative and existing conditions.

No Action Alternative

Under the No Action Alternative, irrigated acreage may be reduced by only a small amount. The visual character of lands irrigated in the past for agricultural purposes would not be substantially altered from this reduction. 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.

Included in the potential reduction of irrigated acreage would be lands retired as part of the CVPIA Land Retirement Program. This voluntary program may lead to contractors removing a portion of their irrigated lands from production in exchange for compensation. Land retirement amounts would help reduce drainage problems in areas where salts and other solids systemically pass into drain water and would also contribute to beneficial habitat impacts. The acreage and extent of lands retired under No Action Alternative conditions are not expected to substantially deviate from acreages now left unfarmed or otherwise undeveloped for other uses due to economic factors. Because the extent and appearance of such lands is not expected to differ substantially from existing conditions, neither scenic views nor visibility would be adversely impacted. Therefore, the No Action Alternative would not adversely impact visual resources when compared to existing conditions.

If the San Luis Reservoir is operated to increase end-of-month storage in September, the occurrence of the present "bathtub ring" effect would be reduced when compared to the

Affected Environment, particularly during the summer, when the reservoir experiences substantial use.

Preferred Alternative

The Preferred Alternative would not result in adverse impacts to visual resources when compared to the No Action Alternative or existing conditions. As with the No Action Alternative, the visual character of lands irrigated in the past for agricultural purposes would not substantially change. 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 be significantly altered. Neither scenic views nor visibility would be adversely impacted. Therefore, the Preferred Alternative would not adversely impact visual resources when compared to the No Action Alternative or existing conditions.

Alternative 1

Similar to the discussion above for the No Action Alternative, Alternative 1 would not result in adverse impacts on visual resources when compared to the No Action Alternative. 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 when compared to the No Action Alternative or existing conditions. 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 significantly affect visual resources in the San Luis Unit. Long-term contract renewals will obligate delivery of the same quantities of water to the same lands, without requiring 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 existing rural/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 does not cumulatively add to these impacts arising independently.

IRREVERSIBLE AND/OR IRRETRIEVABLE COMMITMENT OF RESOURCES

Based on this analysis, no irreversible and/or irretrievable commitments of visual resources in the San Luis Unit study area would result from long-term contract renewals.

SECTION 3.14: PUBLIC HEALTH

This section discusses the potential effects that the alternatives considered in Chapter 2 could have on public health within the San Luis Unit.

AFFECTED ENVIRONMENT

The San Luis Unit is located within the San Joaquin Valley and includes the western portions of Fresno, Kings, and Merced counties.

All of the contractors in the San Luis Unit have distribution systems to transport their CVP water supply. These distribution systems generally consist of lift stations, underground pipelines, open canals, and varying lengths of lined and unlined canals. Many of these canals are gravity-fed, open canals. The contractors reuse drainage or tailwater to eliminate off-site drainage. This tailwater is most often transported through unlined ditches either directly back onto a field for irrigation or into the contractor's distribution system for reuse.

MOSQUITOES

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, sloughs, ditches, reservoirs, and other areas where water may pond. The main features near the San Luis Unit that carry water include the San Luis Canal and the Mendota Pool. These features could potentially provide breeding grounds for mosquitoes. 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.

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 USFWS 1999).

Local mosquito control agencies have been formed to manage 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 USFWS 1999).

West Nile virus is a mosquito-borne virus that affects birds, humans, and other mammals. Mosquitoes acquire the virus by feeding on a bird with the virus in its blood. The virus lives in the mosquito and is transmitted to a new host when the insect bites a person or animal. There is also evidence that West Nile virus can be acquired via a blood transfusion or organ transplant from an infected donor. Most humans with West Nile virus infections have either no symptoms or a mild flu-like illness. Severely affected patients may develop an inflammation of the brain or the membranes of the brain or spinal cord or both, called encephalitis, meningitis, or meningoencephalitis, respectively. These severe cases may be fatal (DHS 2002).

West Nile virus was first detected in the United States in New York in 1999. Since then, it has spread to 46 states, including California in 2003, where it has been found in all except Del Norte and San Benito Counties. As of September 2004, there have been over 400 known human infections and over 700 known mosquito pools in California (DHS 2004).

SELENIUM

A naturally occurring element, selenium is found in the soil, water, and air. While selenium is considered a necessary dietary constituent for humans, high concentrations can be toxic and may cause skin lesions, tooth decay, and central nervous system disorders. Selenium has been found in some domestic wells in the San Joaquin Valley in concentrations that exceed current water quality objectives.

Selenium concentrations in groundwater generally decrease with depth below the surface. Concentrations across the San Joaquin Valley vary considerably, but a number of sites have shallow groundwater with selenium levels considerably greater than that which could be discharged to the surface.

Because some aquatic plants and invertebrates can store selenium to levels far higher than those found in the water in which they grow, contaminated fish and aquatic birds may be a potential health risk to humans who consume them.

Preliminary information from the CARB indicates that levels of particulate selenium in the respirable size range are not detectable in the San Joaquin Valley.

ENVIRONMENTAL CONSEQUENCES

This section discusses potential environmental consequences or impacts the alternatives could have on public health in the region, as compared to the No Action Alternative and existing conditions.

Potential effects on public health and safety are identified by how the alternatives could change or alter existing public health and safety in the San Luis Unit. Because specific impacts cannot be precisely determined, the following criteria were developed to help assess whether the potential exists for the renewal of long-term contracts to have adverse impacts to public health.

Potential adverse impacts to public health resulting from the renewal of long-term contracts could occur if contract renewals:

- Substantially increase the potential for human exposure to disease-bearing animals or insects.
- Substantially increase public exposure to toxic or hazardous materials or significant levels of pollutants.

NO ACTION ALTERNATIVE

Mosquitoes

The implementation of the No Action Alternative is not expected to increase flows or the incidence of standing water in CVP or related storage, transmission, or distribution facilities. It would, therefore, not result in an increase in mosquito populations. Because no direct increase in mosquito populations is anticipated, it is assumed that CVP contractors will continue to implement existing 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 contractors remove aquatic weeds by applying a chemical herbicide. 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 existing facilities would be constructed as a result of long-term contract renewals. It can be assumed that water would be transferred through the existing distribution facilities and would not expand the existing mosquito population.

Preferred Alternative

Similar to the discussion above for the No Action Alternative, the Preferred Alternative would not directly result in an increase in mosquito populations or have an adverse impact on public health. Implementation of the Preferred Alternative is not expected to increase flows or the incidence of standing water and, therefore, would not result in an increase in mosquito populations when compared to existing conditions or the No Action Alternative.

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 and, therefore, would not result in an increase in mosquito populations when compared to existing conditions or the No Action Alternative.

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 and, therefore, would not result in an increase in mosquito populations when compared to existing conditions or the No Action Alternative.

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. It would not cumulatively increase the public health hazard associated with selenium concentrations. 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.

IRREVERSIBLE AND/OR IRRETRIEVABLE COMMITMENT OF RESOURCES

Based on this analysis, there would be no irreversible and/or irretrievable commitment of resources related to public health concerns associated with long-term contract renewals.

SAN LUIS UNIT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
LONG-TERM CONTRACT RENEWAL

Chapter 4:
Other Considerations

September 2005

CHAPTER 4

OTHER CONSIDERATIONS

This section discusses other analyses required by or included in National Environmental Policy Act (NEPA) documents. It includes a review of potential environmental justice impacts, Indian trust assets, and growth-inducing impacts.

ENVIRONMENTAL JUSTICE

As mandated by Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, this environmental impact statement (EIS) addresses potential environmental justice concerns. The executive order requires federal agencies to identify and address disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations.[1] In August 1994, the Secretary of the Interior issued an environmental justice policy statement directing departmental action that resulted in the Department of the Interior's Strategic Plan for Environmental Justice.

Renewal of the long-term water service contracts between the U.S. Bureau of Reclamation (Reclamation) and the water contractors within the San Luis Unit would not involve the construction of new facilities, result in any known health hazards, cause the generation of any hazardous wastes, or result in any property takings. Moreover, renewal of these contracts will not directly or indirectly cause disproportionately high and direct or indirect adverse human health or environmental effects. In examining impacts to the study area as a whole, it could be determined that renewal of the long-term water service contracts would not disproportionately affect the human health or physical environment of minority or low-income populations. To the extent that the long-term renewal of San Luis Unit contracts for CVP water have the potential to disproportionately affect the economic conditions of certain communities within or affected by CVP water deliveries, such agricultural and socioeconomic effects are discussed in Chapter 3 of this EIS.

[1] Executive Order 12898 specifically states that "[t]o the greatest extent practicable and permitted by law, and consistent with the principles set forth in the report on National Performance Review, each federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States and its territories and possessions, the District of Columbia, the Commonwealth of Puerto Rico, and the Commonwealth of the Mariana Islands."

In examining impacts to the study area as a whole, the renewal of the long-term water service contracts would not disproportionately affect minority or low-income populations.

INDIAN TRUST ASSETS

Indian trust assets are legal interests in assets held in trust by the federal government for Indian tribes or individuals. The trust relationship usually stems from a treaty, executive order, or act of Congress. Assets are anything with monetary value and can be real property, physical assets, or intangible property rights. Trust assets may include lands, minerals, natural resources, and hunting, fishing, and water rights. Indian reservations, rancherias, and public domain allotments are examples of lands that are often considered trust assets. Federal agencies have a responsibility to protect and maintain assets held in trust for a tribe by the United States.

Reclamation examined geographic information system coverage that depicts the distribution of Indian reservations, rancherias, and public domain allotments throughout its Mid-Pacific Region. No Indian lands of any type were found within the San Luis Unit study area. Consequently, renewing the long-term water service contracts would not conflict with Indian trust assets.

GROWTH-INDUCING IMPACTS

Reclamation provides water for beneficial uses and purposes to lands within the San Luis Unit. The existing contracts authorize use of CVP water for M&I only for contractors that are cities, or for both irrigation and M&I purposes for contractors in the Unit that are water districts. Those authorized purposes for CVP water deliveries and the existing water quantities would be continued under the No Action Alternative. The proposed action is to renew the contracts incorporating certain requirements of the CVPIA, as well as certain administrative and financial terms. The proposed action would continue to deliver CVP water either for M&I-only or for M&I and irrigation purposes in the same quantities as delivered for existing contracts, subject to similar shortage provisions. Given existing growth trends within the area, it is likely that some additional irrigation water will be converted to M&I use over the term of the proposed renewal contracts. However, the proposed action alternatives (Alternatives 1, 2, and the Preferred Alternative), as compared to the No Action Alternative, will not have growth-inducing impacts.

The action alternatives will not have growth-inducing impacts because Reclamation lacks jurisdiction over local land use policy or decision making relative to land development proposals, as do the CVP contractors that are California water districts. Such jurisdiction lies solely with county and city governments. Growth issues in the region have been

addressed, and in the future will continue to be addressed, within these and other local forums, including the Fresno, Kings, and Merced county general plans, community specific plans adopted by those counties, the general plans for Avenal, Coalinga, Huron, and the associated service areas, and other regional plans of the California Department of Transportation and other entities. These local planning efforts combine historical analyses, the formulation of public goals and policies, and various types of forecasting to generate growth management plans that address the nature, pace, scale, and geographical distribution of future changes in population, economy, and land use generally within the potentially affected service areas. Each plan was developed with substantial community and public agency input, and each was subject to environmental review under the California Environmental Quality Act (CEQA) prior to its approval and adoption. Thus, the baseline and framework for regional land development under California law take into account the availability of CVP water under the existing water service contracts. The proposed federal action of renewing those contracts without changes in quantity or purpose of use does not induce changes in the planned levels of development as compared to the No Action Alternative for San Luis Unit.

The implications of growth projections considered in local land use plans are that careful resource management and water supply planning is required. For instance, the City of Avenal's population projections (Collins and Associates 1992) envision a growth rate ranging from 2.0 to 3.5 percent for the period 1992–2010, with a total city population ranging from 8,106 to 10,854 by 2010. All current and pending water system improvement projects by water service contractors that have land use planning authority were designed to meet the demand figures determined by such regional plans and, like them, were reviewed pursuant to CEQA prior to their approval. The proposed long-term contract renewals will not modify the growth projections that these existing regional plans encompass, alter the approved water system improvement projects, or increase the amount of water previously planned for delivery to contractor service areas. They would simply continue the contracted amounts of water that Reclamation is obligated to provide under legally stipulated delivery rules and schedules. Thus, the proposed action alternatives do not induce growth.

Those San Luis Unit contractors that have no general land use planning authority have limited opportunity to affect growth within their service areas. With respect to their water supply contracts, they may have the opportunity to approve requests for intra-district transfers or for conversions from irrigation to M&I uses. For example, the San Luis Water District has adopted a policy requiring parties seeking conversion of irrigation supplies to M&I use to assure a sufficient water supply for their purposes. The policy requires that a proposed M&I user have sufficient CVP water entitlement to satisfy its demands in a year

in which the water allocation from the CVP is only 25%. Thus, more water used for irrigation purposes must be transferred to serve a particular parcel with M&I water, than if that water already were classified as M&I water. Such policies are designed to treat all district users fairly, in particular, to protect users of irrigation water and M&I water at times when critical health and public safety shortage criteria apply to water that has been transferred for M&I use. Such policies therefore tend to limit, rather than to induce, M&I growth.

Based on the above analysis, there are no direct growth-inducing effects from the proposed action alternatives as compared to the No Action Alternative.

As for indirect effects, future regional growth in the San Luis Unit service area is dependent on the approval of individual development projects over a course of decades. Despite severe delivery curtailments and significantly decreased reliability over the past 15 years, development has continued. There is no indication that growth is impacted by CVP deliveries in the San Luis Unit. Application of the indirect effects test to specific projects is a fact-intensive exercise. The facts here indicate that neither of the two prongs of the indirect effect test are met: (1) it cannot be demonstrated that "but for" the proposed action, growth or development will not take place and (2) it cannot be shown with any specificity where such growth or development is "reasonably certain to occur." Again, all such future specific projects will be subject to independent environmental review. Furthermore, assigning growth-inducing impacts to programs that conserve water, reduce impacts to water sources, and result in no net increases in water supplies would discourage investment in these programs. For legal, factual, and policy reasons, the activities under review here are not considered to have indirect growth-inducement effects.

SAN LUIS UNIT
DRAFT ENVIRONMENTAL IMPACT STATEMENT
LONG-TERM CONTRACT RENEWAL

CHAPTER 5:
CONSULTATION AND COORDINATION/
PUBLIC INVOLVEMENT

September 2005

CHAPTER 5

CONSULTATION AND COORDINATION/ PUBLIC INVOLVEMENT

Both prior to and during the preparation of this environmental impact statement (EIS), input from a broad range of cooperating and consulting agencies and the public was solicited and incorporated. This chapter summarizes the public involvement program and key issues raised by the public and interest groups. This chapter also describes how federal statutes, implementing regulations, and executive orders potentially applicable to implementation of the Central Valley Project Improvement Act (CVPIA) have been addressed. The conclusions of compliance are based on the environmental consequences presented in Chapter 3. The compliance summaries apply only to the alternatives discussed in this EIS and not to the development of concurrent CVPIA implementation programs.

PUBLIC INVOLVEMENT

Section 226 of the Reclamation Reform Act of 1982 (PL 97-293) amends Section 9 of the Reclamation Project Act of 1939 (43 USC 485h) by adding the following new subsection:

> *(f) No less than sixty days before entering into or amending any repayment contract or any contract for the delivery of irrigation water (except any contract for the delivery of surplus or interim irrigation water whose durations is for one year or less) the Secretary shall—*
>
> *(1) Publish notice of the proposed contract or amendment in newspapers of general circulation in the affected area and shall make reasonable efforts to otherwise notify interested parties which may be affected by such contract amendment, together with information indicating to whom comments or inquiries concerning the proposed actions can be addressed; and*
>
> *(2) Provide an opportunity for submission of written data, views and arguments so received.*

The U.S. Bureau of Reclamation (Reclamation) started the preparation of this EIS with public scoping meetings. Scoping served as a fact-finding process to identify public concerns and recommendations about the long-term contract renewal issues that would be addressed in this EIS and the scope and level of detail for analyses. Scoping activities began in October 1998 after a Notice of Intent to prepare environmental documentation for the long-term contract

renewals was filed in the Federal Register (Reclamation 1998a). The scoping period formally ended in January 1999. The Scoping Report was released in the summer of 1999.

Public input continued during long-term contract negotiations to define the contract language. Discussions also were held with the San Luis Unit water service contractors during the preparation of this document.

At the public scoping meetings, Reclamation provided information about the long-term water service contract renewal process and solicited public comments, questions, and concerns. At these meetings, participants had numerous comments and questions about how important issues would be considered both in the CVPIA Programmatic Environmental Impact Statement (PEIS) (Reclamation and USFWS 1999) and in the long-term contract renewal process. The majority of the comments received during the scoping process addressed the needs assessment methodology to be used as part of the long-term contract renewal process. Contract renewal negotiation issues were also addressed. The least number of comments addressed to environmental review issues.

Reclamation received numerous comments about issues to be considered in the CVPIA PEIS and the methodologies for analyzing impacts. Comments regarding the development of alternatives were considered in the formation of the alternatives. However, it was determined that the description of alternatives would focus on the contract proposals and that issues related to water supply improvements would be addressed by CALFED and through the Central Valley Project (CVP) Least Cost Yield study. Consideration of comments on methods to address impacts occurred in the development of Chapter 3, Affected Environment and Environmental Consequences. Based upon the comments received and the determination to focus the alternatives on the language in the proposed contracts, the level of detail in this EIS was determined.

All contract negotiation sessions with the San Luis Unit contractors have been open to the public, with the time and location posted on Reclamation's website. Draft versions of the contracts have been available on Reclamation's Mid-Pacific Region website since 2000. The final versions of the negotiated contracts are currently available on the same website and were subjected to a 60-day public review and comment period.

REVIEW AND CONSIDERATION OF COMMENTS ON FIRST PUBLIC DRAFT EIS

The first draft of this San Luis Unit Long-Term Contract Renewal EIS was available for public review between November 16, 2004, and January 3, 2005. Sixteen letters and e-mails representing the comments of 25 different agencies, associations, districts, and other interested parties were received during that public comment period. Those comments have been assembled, documented, reviewed, and discussed for consideration in this EIS. The comments ranged from editorial changes not affecting the impacts analysis to more complex comments questioning CVP water

management, contract terms and conditions negotiated between the U.S. Bureau of Reclamation (Reclamation) and the San Luis Unit contractors, the National Environmental Policy Act (NEPA) approach used by Reclamation, and ongoing drainage, water quality, and related issues more appropriately addressed in wholly separate NEPA, ESA, and other federal processes. Each of these comments were considered, and have been addressed in the preparation of this second public draft EIS. Comment letters and documentation of how the EIS responds to them have been retained by Reclamation as part of the administrative record for this draft EIS.

Some commentors on the draft San Luis Unit EIS requested the following general editorial and/or text changes. These changes, which have been made in the text of this EIS and result in no change to the impacts analyses, include:

- Clarifications and corrections to contractor-specific descriptions
- Updates on district transfers and assignments
- Corrections and clarifications to CVP-related laws and regulations
- Other editorial and factual corrections.

Other commentors focused on the language, terms, and conditions of the contracts as negotiated between Reclamation and the San Luis Unit contractors. These comments alleged that the contract language is inadequate to comply with existing laws, that contract terms dealing with Reclamation rate setting and contractor repayment obligations are generally inappropriate, and that the contracts should include conditions for monitoring to ensure the contractors are in compliance with existing water quality standards and conservation measures.

The San Luis Unit EIS does not evaluate the appropriateness of the language, terms, or conditions of the San Luis Unit contracts. It is an environmental analysis of the chiefly administrative action of renewing the current water service contracts as written. Reclamation continues to be committed to a full and open process for public input. Consistent with that approach, contract negotiations have been held in public and each session has included an opportunity for public comment. To date, more than 190 such sessions or workshops have been open to the public. Reclamation has also maintained an extensive website (www.usbr.gov/mp/cvpia/3404c/index.html) to inform the public of the status and content of contract negotiations and has posted the relevant environmental documents. That process was available for commenting on the language, terms, and conditions of the contracts and on the rate setting and repayment processes. The 60-day public comment periods for the nine contracts analyzed in this EIS were October 26, 2004 through December 27, 2004 (CDFG, City of Coalinga, City of Huron, Pacheco Water District, Panoche Water District, San Luis Water District, Westlands Water District Distribution District No. 2) December 3, 2004

through February 1, 2005 (City of Avenal), and June 16, 2004 through August 5, 2005 (Westlands Water District).

The original designation or assignment of contractors assigned to the San Luis Unit was primarily an administrative one that can be attributed in part to their receipt of water from one or more facilities at the time the unit was formed and in regard to other administrative concerns within Reclamation.

CONSULTATION WITH SAN LUIS UNIT CONTRACTORS

This EIS was prepared with the assistance of information collected from the San Luis Unit contractors. On June 1, 2000, Reclamation met with representatives of the San Luis and Delta-Mendota Water Authority and several member water service contractors from the San Luis Unit. Reclamation, through its contractor, committed to scheduling field visits and interviews with the individual contractors to exchange information and to discuss special circumstances applicable to the individual districts. Meetings with Pacheco Water District, Panoche Water District, San Luis Water District, and Westlands Water District were held during the summer of 2000. During the summer of 2001, meetings were held with the cities of Avenal, Coalinga, and Huron. No meeting with the California Department of Fish and Game (CDFG) was held because it receives only a limited CVP supply. Contract negotiations and environmental review began in late summer 2001 and informational meetings between the contractors and Reclamation were held in October 2001. An additional meeting with the San Luis Unit contractors was conducted on February 27, 2004, to solicit additional input and updates of information received during the 2000 and 2001 field visits and interviews. From February 27, 2004 through June 2005, Reclamation has actively requested comments from the San Luis Unit contractors regarding localized impacts of the long-term contract renewals and has responded to those comments in this EIS. Contract negotiations have recently been concluded.

AGENCY CONSULTATION

This EIS has been prepared in consultation with other federal, state, regional, and local agencies in a manner consistent with their objectives for administering applicable acts, policies, plans, and controls in the project area. Applicable laws, orders, regulations, and other policies and plans that have been considered in this EIS include:

- NEPA
- California Environmental Quality Act (CEQA)
- ESA
- Fish and Wildlife Coordination Act
- Floodplain Management
- Wetlands Protection
- Wild and Scenic Rivers Act
- Farmland Protection Policy Act and Farmland Preservation

- National Historic Preservation Act
- Indian Sacred Sites on Federal Land
- State, Area-Wide, and Local Plan and Program Consistency
- Clean Air Act
- Safe Drinking Water Act
- Clean Water Act

In addition to these activities, this EIS was prepared with the assistance of valuable information collected from eight of the nine San Luis Unit contractors during site visits and interviews conducted in December 2000 and August 2001. These seven contractors are included as agencies contacted as part of the long-term contract renewal process. CDFG as a contractor was contacted only through telephone interviews.

NATIONAL ENVIRONMENTAL POLICY ACT

This EIS was prepared pursuant to regulations implementing the NEPA. NEPA provides a commitment that federal agencies will consider the environmental effects of their actions. This EIS provides information regarding the No Action Alternative, Alternatives 1 and 2, and the Preferred Alternative. It discusses the potential for environmental impacts resulting from each of the alternatives when compared to the No Action Alternatives, and potential mitigation measures as appropriate. No avoidable or unavoidable significant adverse environmental impacts were identified when comparing Alternatives 1, 2, and the Preferred Alternative to the No Action Alternative.

CALIFORNIA ENVIRONMENTAL QUALITY ACT

Implementation, funding, and permitting actions carried out by state and local agencies must comply with the CEQA. The CEQA requirements are similar to the NEPA requirements. This EIS could be used as a basis for preparation of a CEQA document.

ENDANGERED SPECIES ACT

Reclamation has prepared a Biological Assessment that examines whether the renewal of long-term water service contracts in the San Luis Unit could have the potential to affect listed, threatened, and endangered species. The biological assessment addresses listed species potentially affected by the operation of the CVP in the San Luis Unit. The Biological Assessment was submitted to the U.S. Fish and Wildlife Service (USFWS) in September 2004 as a result for formal consultation pursuant to the Endangered Species Act. Preparation of a Biological Opinion by the USFWS is pending.

FISH AND WILDLIFE COORDINATION ACT

The Fish and Wildlife Coordination Act requires that Reclamation consult with federal and state fish and wildlife agencies on all water development projects that could affect biological resources. The implementation of the CVPIA, of which this action is a part, has been jointly

analyzed and is being jointly implemented by Reclamation and the USFWS. This continuous consultation and consideration of the USFWS' views, its review of this document, and consideration of its comments satisfy any applicable requirements of the Fish and Wildlife Coordination Act.

NATIONAL HISTORIC PRESERVATION ACT

Section 106 of the National Historic Preservation Act requires that federal agencies evaluate the effects of federal undertakings on historical, archeological, and cultural resources and provide opportunities for the Advisory Council on Historic Preservation to comment on the proposed undertaking. The first step in the process is to identify cultural resources eligible for inclusion in the National Register of Historic Places that are located in or near the project area. The second step is to identify the possible effects of the proposed federal actions. The lead agency must examine whether there are feasible alternatives that would avoid such effects. If an effect cannot reasonably be avoided, measures must be taken to minimize or mitigate potential adverse effects.

During the preparation of this EIS, information on cultural resources was collected from the cultural resources records centers at California State University–Stanislaus and California State University–Bakersfield. The results of that information collection effort and details regarding needed cultural resources activities are presented in Section 3.11, Cultural Resources. It was determined by the State Historic Preservation Office that compliance with Section 106 should be coordinated on a project-specific basis.

INDIAN SACRED SITES ON FEDERAL LAND

Executive Order 13007 provides that in managing federal lands, each federal agency with statutory or administrative responsibility for managing these lands shall, to the extent practicable and as permitted by law, accommodate access to and ceremonial use of Indian sacred sites by Indian religious practitioners and avoid adversely affecting the physical integrity of these sacred sites. During the scoping or planning process, no sacred sites were identified, and therefore, this topic was not included in the impact assessment of this EIS.

STATE, AREA-WIDE, AND LOCAL PLAN AND PROGRAM CONSISTENCY

Agencies must consider the consistency of a proposed action with approved state and local plans and laws. This EIS was prepared with extensive information from local planning agencies. The renewal of long-term water service contracts is not inconsistent with their adopted plans or policies.

FLOODPLAIN MANAGEMENT

If a federal program will affect a floodplain, the agency must consider alternatives to avoid adverse effects in the floodplain or to minimize potential harm. Executive Order 11988

requires federal agencies to evaluate the potential effects of any actions they might take in a floodplain and to ensure that planning, programs, and budget requests reflect consideration of flood hazards and floodplain management. The long-term contract renewal alternatives would not affect floodplain management as compared to the No Action Alternative.

WETLANDS PROTECTION

Executive Order 11990 authorizes federal agencies to take actions to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands when undertaking federal activities and programs. Any agency considering a proposal that might affect wetlands must evaluate factors affecting wetland quality and survival. These factors should include the proposal's effects on public health, safety, and welfare resulting from modifications in water supply and water quality; maintenance of natural ecosystems; conservation of flora and fauna; and other recreational, scientific, and cultural uses. The alternatives would not affect wetlands as compared to the No Action Alternative.

WILD AND SCENIC RIVERS ACT

The Wild and Scenic Rivers Act designates qualifying free-flowing river segments as wild, scenic, or recreational. The act establishes requirements applicable to water resource projects affecting wild, scenic, or recreational rivers within the National Wild and Scenic Rivers System or rivers designated on the National Rivers Inventory. Under the act, a federal agency may not assist in the construction of a water resources project that would have a direct, adverse effect on the free-flowing, scenic, and natural values of a wild or scenic river. If the project would affect the free-flowing characteristics of a designated river or unreasonably diminish the scenic, recreational, and fish and wildlife values present in the area, such activities should be undertaken in a manner that would minimize adverse impacts and should be developed in consultation with the National Park Service. None of the EIS alternatives would affect flows in wild or scenic portions of rivers.

FARMLAND PROTECTION POLICY ACT AND FARMLAND PRESERVATION

Two policies require federal agencies to include assessments of the potential effects of a proposed project on prime and unique farmland: the Farmland Protection Policy Act of 1981 and the Memoranda on Farmland Preservation, dated August 30, 1976, and August 11, 1980, respectively, from the U.S. Council on Environmental Quality. Under the requirements set forth in these policies, federal agencies must determine these effects before taking any action that could result in converting designated prime or unique farmland to nonagricultural uses. If implementing a project would adversely affect farmland preservation, the agencies must consider alternatives to lessen those effects. Federal agencies also must ensure that their programs, to the extent practicable, are compatible with state, local, and private programs to protect farmland. The Natural Resources Conservation Service is responsible for ensuring that

these laws and polices are followed. The alternatives would not affect agricultural or urban lands as compared to the No Action Alternative.

CLEAN AIR ACT

The federal Clean Air Act was enacted to protect and enhance the nation's air quality in order to promote public health and welfare and the productive capacity of the nation's population. The act requires an evaluation of any federal action to determine its potential impact on air quality in the project region. Coordination is required with the appropriate local air quality management district and the U.S. Environmental Protection Agency (EPA). This coordination would determine whether the project conforms to the Federal Implementation Plan and the State Implementation Plan.

Section 176 of the Clean Air Act prohibits federal agencies from engaging in or supporting in any way an action or activity that does not conform to the applicable State Implementation Plan. Actions and activities must conform to a State Implementation Plan's purpose of eliminating or reducing the severity and number of violations of the national ambient air quality standards and in attaining those standards expeditiously. The EPA has promulgated conformity regulations (codified in 40 CFR Section 93.150, *et seq.*).

The alternatives and corresponding air quality impact analysis assume that current practices to control dust and soil erosion on lands that are seasonally fallowed would continue and the land use agencies would continue to work with the air quality districts. Therefore, it is assumed that no air quality impacts would occur as a result of the alternatives compared to the No Action Alternative.

SAFE DRINKING WATER ACT

The Safe Drinking Water Act (Public Law 99-339) became law in 1974 and was reauthorized in 1986 and again in August 1996. Through the act, Congress gave the EPA the authority to set standards for contaminants in drinking water supplies. Amendments to the act provide more flexibility, more state responsibility, and more problem-prevention approaches. The law changes the standard-setting procedure for drinking water and establishes a State Revolving Loan Fund to help public water systems improve their facilities, to ensure compliance with drinking water regulations, and to support state drinking water program activities.

Under the provisions of the act, the California Department of Health Services has the primary enforcement responsibility. The California Health and Safety Code establishes this authority and stipulates drinking water quality and monitoring standards. To maintain primacy, a state's drinking water regulations cannot be less stringent than the federal standards. The surface water quality analysis of the EIS alternatives as compared to the act's requirements indicated that there were would be no impacts to water quality from the renewal of the long-term water

service contracts, and therefore, there would be no changes in compliance as compared to the No Action Alternative.

CLEAN WATER ACT

The Clean Water Act gave the EPA the authority to develop a program to make all waters of the United States "fishable and swimmable." This program includes identifying existing and proposed beneficial uses and methods to protect or restore those beneficial uses. The act contains provisions that regulate the discharge of pollutants into water bodies. The discharges may be direct flows from point sources, such as an effluent from a wastewater treatment plant, or a nonpoint source, such as eroded soil particles from a construction site. The comparison of the EIS alternatives to the Clean Water Act's requirements indicated that there were no changes in compliance as compared to the No Action Alternative.

DISTRIBUTION LIST

The distribution list for this EIS is provided as Appendix F.