MUNICIPAL AND INDUSTRIAL WATER SHORTAGE POLICY
CENTRAL VALLEY PROJECT, CALIFORNIA

Draft Environmental Assessment

March 2005

Table of Contents

Items **Page**

CHAPTER 1 PURPOSE AND NEED

Introduction 1-1
Background of Central Valley Project Allocations 1-1
Purpose and Need for a Municipal and Industrial Water Shortage Policy 1-2
Relevant Actions and Decisions to be Made 1-2
Study Area 1-3
Study Period 1-3
Public Involvement Process 1-5
Other Related Documents or Activities 1-5

CHAPTER 2 BACKGROUND OF THE MUNICIPAL AND INDUSTRIAL WATER SHORTAGE POLICY

Introduction 2-1
Current Water Shortage Policy for Central Valley Project Water Service Contractors 2-1
Current Water Conservation Provisions and Programs 2-2
Previous Proposals Concerning the M&I Water Shortage Policy for Central Valley Project Water Service Contractors 2-3
1993 Proposal 2-3
1996 and 1997 Administrative Proposals 2-4
March 2000 Proposal 2-4
March 2001 Proposal 2-5
September 2001 Proposal 2-5

CHAPTER 3 DESCRIPTION OF ALTERNATIVES

Introduction 3-1
Frequency of Shortage Conditions for the Central Valley Project M&I Water Service Contractors in the No Action Alternative 3-1
Source of Water to Increase Water Allocations to M&I Water Service Contractors for Action Alternatives 3-1
Municipal and Industrial Central Valley Project Water Service Contractors 3-3
Development of Public Health and Safety Water Quantities to be Used in the Action Alternatives 3-6
Public Health and Safety Criteria for M&I Central Valley Project Water Service Contractors 3-6
Development of No Action Alternative and Action Alternatives 3-8
No Action Alternative 3-8
Alternative 1 3-9
Alternative 2 3-11
Alternatives Considered but Eliminated from Further Consideration 3-18
Summary of Impact Assessments 3-25

Items **Page**

CHAPTER 4 CENTRAL VALLEY PROJECT MUNICIPAL AND INDUSTRIAL WATER SERVICE CONTRACTORS WATER DEMANDS AND PUBLIC HEALTH AND SAFETY WATER QUANTITIES

Introduction 4-1
Public Health and Safety Water Quantities for Central Valley Project M&I Water Service Contracts 4-1
Shasta and Trinity Divisions 4-2
Shasta Community Services District 4-2
Shasta County Service Area #25 - Keswick County Service Area 4-3
Bella Vista Water District - not including areas served by Shasta County Water Agency 4-4
Clear Creek Community Services District 4-5
Centerville Community Services District 4-6
Shasta County Water Agency 4-7
Bella Vista Water District - Palo Cedro Estates County Services Area No. 8 4-7
Mountain Gate Community Services District 4-7
Jones Valley County Service Area No. 6 4-8
Crag View County Service Area No. 23 4-8
Castella County Service Area No. 3 4-8
Silverthorn, French Gulch School, and Shasta Holiday Mutual Water Company 4-9
Mountain Gate Community Services District 4-10
City of Shasta Lake 4-11
City of Redding 4-12
U.S. Forest Service - Centimundi Boat Ramp 4-13
Sacramento River Division 4-14
Colusa County Water District 4-14
County of Colusa 4-15
Whitney Construction 4-16
Elk Creek Community Services District 4-17
U.S. Forest Service 4-18
American River Division 4-19
El Dorado Irrigation District 4-19
City of Roseville 4-21
San Juan Water District 4-22
Sacramento County Water Agency 4-23
Placer County Water Agency 4-24
Sacramento Municipal Utility District 4-25
East Bay Municipal Utility District 4-26
Eastside Division 4-27
Tuolumne Utilities District 4-27
Delta Division 4-28
Broadview Water District 4-28
Del Puerto Water District 4-29
Plainview Water District 4-30
City of Tracy 4-31
Patterson Irrigation District 4-32

Items **Page**

Contra Costa Water District....4-33
Department of Veteran Affairs - San Joaquin National Cemetery....4-34

West San Joaquin Division....4-35
Westlands Water District....4-35
San Luis Water District....4-36
Pacheco Water District....4-37
Panoche Water District....4-38
City of Avenal....4-39
City of Coalinga....4-40
City of Huron....4-41
California Department of Fish and Game....4-42
San Felipe Division....4-43
San Benito County Flood Control and Water Conservation District....4-43
Santa Clara Valley Water District....4-44
Application of the M&I Water Shortage Policy for the American River Division....4-45
Sacramento Area Water Forum....4-45
Comparison of Water Forum Proposal Allocations to Central Valley Project Water Service Contracts Allocations....4-46
East Bay Municipal Utility District....4-47
Summary of Public Health and Safety Water Quantities for M&I Water Service Contractors....4-51

CHAPTER 5 AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

Introduction....5-1
Surface Water Resources and Central Valley Project Operations....5-1
Affected Environment....5-2
Environmental Consequences....5-2
No Action Alternative....5-2
Alternative 1A....5-2
Alternative 1B....5-9
Alternative 2A....5-15
Alternative 2B....5-15
Summary....5-26
Cumulative Effects....5-26
Groundwater....5-26
Affected Environment....5-26
Sacramento Valley (Shasta, Trinity, and Sacramento, and American River Divisions)....5-28
San Joaquin Valley (Eastside, Delta, and West San Joaquin Divisions)....5-28
San Felipe Division....5-30
Contra Costa and Alameda Counties (American River and Delta Divisions)....5-30
Environmental Consequences....5-31
No Action Alternative....5-31
Alternative 1A....5-31
Alternative 1B....5-31

Items **Page**

Alternative 2A 5-31
Alternative 2B 5-31
Cumulative Effects 5-32
Municipal and Industrial Land Use and Central Valley Project Water Costs 5-32
Affected Environment 5-32
Municipal and Industrial Land Use 5-32
Municipal and Industrial Water Supply Costs for CVP Water 5-33
Environmental Consequences 5-33
No Action Alternative 5-33
Alternative 1A 5-33
Alternative 1B 5-36
Alternative 2A 5-37
Alternative 2B 5-38
Cumulative Effects 5-39
Agricultural Land Use and Economics 5-39
Affected Environment 5-39
Environmental Consequences 5-40
No Action Alternative 5-44
Alternative 1A 5-44
Alternative 1B 5-45
Alternative 2A 5-45
Alternative 2B 5-46
Cumulative Effects 5-46
Fisheries and Wildlife Resources 5-46
Affected Environment 5-47
Aquatic Habitats and Species Assemblages in the Study Area 5-47
Terrestrial Habitats and Wildlife Communities in the Study Area 5-52
Environmental Consequences 5-63
No Action Alternative 5-63
Alternative 1A 5-73
Alternative 1B 5-73
Alternative 2A 5-73
Alternative 2B 5-73
Cumulative Effects 5-73
Recreation 5-74
Affected Environment 5-74
Sacramento Valley (Shasta, Trinity, and Sacramento River Divisions) 5-74
Lower American River (American River Division) 5-74
Delta Division 5-75
Eastside Division 5-76
Northern and Central San Joaquin Valley (Delta and West San Joaquin Divisions) 5-76
San Felipe Division 5-76
Contra Costa and Alameda Counties (American River and Delta Divisions) 5-77

Items **Page**

Environmental Consequences....5-77
No Action Alternative....5-77
Alternative 1A....5-77
Alternative 1B....5-77
Alternative 2A....5-77
Alternative 2B....5-78
Cumulative Effects....5-78
Cultural Resources....5-78
Affected Environment....5-78
Prehistory....5-78
Ethnography....5-80
History....5-81
Identified Cultural Resources....5-83
Environmental Consequences....5-86
No Action Alternative....5-86
Alternative 1A....5-87
Alternative 1B....5-87
Alternative 2A....5-87
Alternative 2B....5-87
Cumulative Effects....5-87
Indian Trust Assets....5-87
Affected Environment....5-87
Environmental Consequences....5-88
No Action Alternative....5-88
Alternative 1A....5-88
Alternative 1B....5-89
Alternative 2A....5-89
Alternative 2B....5-89
Cumulative Effects....5-89
Air Quality....5-89
Affected Environment....5-89
Upper Sacramento Valley (Shasta, Trinity, and Sacramento River Divisions)....5-91
Lower Sacramento Valley (American River Division)....5-92
Northern and Central San Joaquin Valley (Eastside, Delta, and West San Joaquin Divisions)....5-93
San Francisco Bay Area (American River, Delta, and San Felipe Divisions)....5-93
Environmental Consequences....5-93
No Action Alternative....5-93
Alternative 1A....5-93
Alternative 1B....5-94
Alternative 2A....5-94
Alternative 2B....5-94
Cumulative Effects....5-94
Soils....5-94
Affected Environment....5-94
Soil Characteristics....5-94
Soil Issues....5-96
Environmental Consequences....5-97

Items **Page**

No Action Alternative 5-97
Alternative 1A 5-97
Alternative 1B 5-97
Alternative 2A 5-98
Alternative 2B 5-98
Cumulative Effects 5-98
Visual Resources 5-98
Affected Environment 5-98
Upper Sacramento Valley (Shasta, Trinity, and Sacramento River Divisions) 5-98
Lower Sacramento Valley (American River Division) 5-99
Northern and Central San Joaquin Valley (Eastside, Delta, and West San Joaquin Divisions) 5-99
San Francisco Bay Area (American River, Delta, and San Felipe Divisions) 5-100
Environmental Consequences 5-100
No Action Alternative 5-100
Alternative 1A 5-100
Alternative 1B 5-100
Alternative 2A 5-101
Alternative 2B 5-101
Cumulative Effects 5-101
Power Resources 5-101
Affected Environment 5-101
Environmental Consequences 5-102
No Action Alternative 5-102
Alternative 1A 5-102
Alternative 1B 5-102
Alternative 2A 5-102
Alternative 2B 5-102
Cumulative Effects 5-102
Social Conditions 5-103
Affected Environment 5-103
Environmental Consequences 5-103
No Action Alternative 5-103
Alternative 1A 5-103
Alternative 1B 5-108
Alternative 2A 5-108
Alternative 2B 5-108
Cumulative Effects 5-108
Environmental Justice 5-108
Affected Environment 5-109
Environmental Consequences 5-109
No Action Alternative 5-109
Alternative 1A 5-109
Alternative 1B 5-109
Alternative 2A 5-109
Alternative 2B 5-112
Cumulative Effects 5-112

Items **Page**

Secondary Growth Impacts 5-112
Irreversible and Irretrievable Commitments of Resources 5-113

CHAPTER 6 CONSULTATION AND COORDINATION

Introduction 6-1
Public Involvement 6-1
Consultation with Other Agencies 6-1
National Environmental Policy Act 6-2
California Environmental Quality Act 6-2
Endangered Species Act 6-2
Fish and Wildlife Coordination Act 6-2
National Historic Preservation Act 6-2
Indian Trust Assets 6-3
Indian Sacred Sites on Federal Land 6-3
Environmental Justice 6-3
State, Area-wide, and Local Plan and Program Consistency 6-3
Floodplain Management 6-3
Wetlands Protection 6-3
Wild and Scenic Rivers Act 6-4
Farmland Protection Policy Act and Farmland Preservation 6-4
Clean Air Act 6-4
Safe Drinking Water Act 6-4
Clean Water Act 6-5

LIST OF ATTACHMENTS

ATTACHMENT A **LIST OF PREPARERS**

ATTACHMENT B **BIBLIOGRAPHY**

ATTACHMENT C **ACRONYMS, ABBREVIATIONS, AND METRIC CONVERSIONS**

ATTACHMENT D **SUMMARY OF PROJECT EFFECTS ON LISTED SPECIES IN THE STUDY AREA**

LIST OF TABLES

1-1 Related Activities 1-6

2-1 Central Valley Project Water Service Contract Existing Water Shortage Allocations 2-2

3-1 Water Years with M&I Central Valley Project Water Allocations Less than 75 percent Based on CALSIM II Model Results for 2020 Level of Development 3-2

3-2 Municipal and Industrial Central Valley Project Water Service Contractors Considered in Evaluation of the Shortage Policy 3-3

3-3 Summary of Public Health and Safety Criteria Developed by Water Agencies to be Used in Action Alternatives 3-7

3-4 No Action Alternative Water Shortage Allocations 3-9

3-5 Alternative 1 Water Shortage Allocations 3-10

3-6 Alternative 2A Water Shortage Allocations 3-19

3-7 Alternative 2B Water Shortage Allocations 3-22

3-8 Impact Assessment Results 3-26

4-1 Comparison of Water Deliveries of Central Valley Project Service Contract Water and Senior Water Rights Water to American River Division Contractors with Standard Central Valley Project Water Allocations, Public Health and Safety Water Quantities or Water Forum Proposal 4-48

4-2 Comparison of Water Deliveries of Central Valley Project Water Service Contract Water to East Bay Municipal Utility District with the Amendatory Contract or Implementation of Public Health and Safety Water Quantities 4-50

4-3 Municipal and Industrial Central Valley Project Water Service Contractors Public Health and Safety Water Quantities 4-51

5-1 Central Valley Project Water Service Contract Deliveries Under Alternative 1A that would Provide Public Health and Safety Water Quantities for M&I Contractors up to 75 percent of Contract Total 5-4

5-2 Summary of Changes in Central Valley Project Allocations for M&I and Irrigation Water Service Contractors under Alternative 1A 5-7

LIST OF TABLES - continued

5-3 Central Valley Project Water Service Contract Deliveries Under Alternative 1B that would Provide Public Health and Safety Water Quantities for M&I Contractors up to 75 percent of Contract Total.....5-10

5-4 Summary of Changes in Central Valley Project Allocations for M&I and Irrigation Water Service Contractors under Alternative 1B.....5-13

5-5 Central Valley Project Water Service Contract Deliveries Under Alternative 2A that would Provide Public Health and Safety Water Quantities for M&I Contractors up to 75 percent of Contract Total.....5-16

5-6 Summary of Changes in Central Valley Project Allocations for M&I and Irrigation Water Service Contractors under Alternative 2A.....5-19

5-7 Central Valley Project Water Service Contract Deliveries Under Alternative 2B that would Provide Public Health and Safety Water Quantities for M&I Contractors up to 75 percent of Contract Total.....5-21

5-8 Summary of Changes in Central Valley Project Allocations for M&I and Irrigation Water Service Contractors under Alternative 2B.....5-24

5-9 Percent Allocations to Central Valley Project Water Services Contract Deliveries for M&I and Irrigation Water Service Contractors..5-27

5-10 2004 Rates for Cost of Service for M&I Central Valley Project Water Service Contract Water.....5-34

5-11 Agricultural Production, Rankings, and Leading Crops by Counties 5-41

5-12 Agricultural Land Use and Irrigated Acreage by County.....5-42

5-13 Annual Average Farm Values and Expenses by County.....5-43

5-14 Frequency of Irrigation Central Valley Project Contract Deliveries as percent of Total Irrigation Water Service Contract Deliveries.....5-44

5-15 Federally Listed, Proposed, and Candidate Fish Species Potentially Occurring in the Study Area.....5-53

5-16 Potential Occurrence of Listed, Proposed, and Candidate Fish Species in the Study Area 5-54

5-17 Occurrence of Terrestrial Habitats in the Study Area 5-64

5-18 Federally Listed Wildlife and Plant Species Potentially Occurring in the Study Area 5-65

5-19 Occurrence of Listed and Proposed Plant and Wildlife Species in the Study Area 5-67

LIST OF TABLES - continued

5-20 Occurrence of Critical Habitat for Listed Plant and Wildlife Species in the Study Area 5-70

5-21 Habitat Associations of Listed Plant and Wildlife Species in the Study Area 5-71

5-22 Ambient Air Quality Standards 5-90

5-23 Population Estimates and Projections by County 5-104

5-24 Housing Types in Year 2000 by County 5-105

5-25 Employment in Year 2003 by County 5-106

5-26 Income in Year 1999 by County 5-107

5-27 Ethnicity by County 5-110

LIST OF FIGURES

1-1 Central Valley Project Service Area 1-4

3-1 Calculations of Water Allocations under Alternative 1A for M&I CVP Water Allocations of Less than 75 percent 3-14

3-2 Calculations of Water Allocations under Alternative 1B for M&I CVP Water Allocations of Less than 75 percent 3-15

3-3 Calculations of Water Allocations under Alternative 2A for M&I CVP Water Allocations of Less than 75 percent 3-20

3-4 Calculations of Water Allocations under Alternative 2B for M&I CVP Water Allocations of Less than 75 percent 3-23

LIST OF EXHIBITS

3-1 Example Calculation of Adjusted Historical Use 3-12

3-2 Example Application of Alternative 1A 3-16

3-3 Example Application of Alternative 1B 3-17

3-4 Example Application of Alternative 2A 3-21

3-5 Example Application of Alternative 2B 3-24

EXECUTIVE SUMMARY

Executive Summary

INTRODUCTION

This Environmental Assessment (EA) was prepared to evaluate alternatives considered by the U.S. Bureau of Reclamation (Reclamation) to implement a Municipal and Industrial (M&I) Water Shortage Policy for the Central Valley Project (CVP). The purposes of the policy are to: (1) define water shortage terms and conditions applicable to all CVP M&I contractors, as appropriate; (2) establish CVP water supply levels that, together with the M&I contractors' drought water conservation measures and other water supplies, (a) would sustain urban areas during droughts, and (b) during severe or continuing droughts would assist the M&I contractors in their efforts to protect public health and safety; and (3) provide information to M&I contractors for development of drought contingency plans.

STUDY AREA

The Study Area for this EA includes areas with CVP facilities, CVP water users, or water rights holders affected by CVP operations. These areas are located throughout the Central Valley, and in Trinity, Contra Costa, Alameda, Santa Clara, and San Benito counties in the Shasta and Trinity River, Sacramento River, American River, Eastside, Delta, West San Joaquin, and San Felipe divisions.

The CVP water service contractors included in this analysis are the contractors with a water service contract that is expected to reference the proposed policy upon renewal. As described in the June 30, 2004 Long-Term Central Valley Project and State Water Project Operations Criteria and Plan Biological Assessment (OCAP 2004 biological assessment), "Reclamation expects the proposed policy [M&I Water Shortage Policy] will not be referenced in contracts for the (1) Friant Division, (2) New Melones interim supply, (3) Hidden and Buchanan Units, (4) Cross Valley contractors, (5) Sugar Pine Units (subject of title transfer legislation) [this unit was transferred to Foresthills Public Utilities District]; (6) San Joaquin settlement contractors, and (7) Sacramento River settlement contractors."

STUDY PERIOD

The analysis period for this EA is the term of the long-term contracts being considered under separate environmental documentation for M&I water users. For the long-term contract renewals, the contract term for agricultural-irrigation contracts is 25 years, or to the Year 2029. The contract term for mixed agricultural-irrigation and M&I contracts is 25 years, or to the Year 2029. The analysis period for the M&I-only contracts is a 40-year term, or to the Year 2044.

FREQUENCY OF SHORTAGE CONDITIONS FOR CENTRAL VALLEY PROJECT M&I WATER SERVICE CONTRACTORS IN THE NO ACTION ALTERNATIVE AND ACTION ALTERNATIVES

Reclamation uses the CALSIM II model to simulate operations of the CVP, as described in OCAP 2004. This model uses generalized rules to operate the CVP and SWP systems. The CALSIM II model uses historical hydrologic records for the system from 1922 through 1994 which represents 72 consecutive years to reflect the impacts of critical dry to wet periods and associated carryover storage conditions. The

CALSIM II model for Year 2020 Level of Development under OCAP 2004 indicated that M&I CVP water service contract allocations would be less than 75 percent in 13 of the 72 years. There are no allocations to Irrigation CVP water service contractors in 4 of the 13 years. In addition, the allocations are very small in two additional years when allocations to Irrigation CVP water service contractors are 2 to 3 percent.

PREVIOUS PROPOSALS CONCERNING THE M&I WATER SHORTAGE POLICY FOR CENTRAL VALLEY PROJECT WATER SERVICE CONTRACTORS

In response to related actions and concerns of M&I CVP water service contractors concerning allocations of CVP water, Reclamation initiated development of an M&I Water Shortage Policy in 1992. There were several proposals prepared by Reclamation in 1993, 1996, 1997, 2000, and 2001. Portions of these proposals and responses to the proposals were used by Reclamation in the development of the alternatives considered in this EA.

The most recent proposal was developed in September 2001 and stated that the shortage allocation should be based upon historical M&I water use adjusted for growth, extraordinary water conservation measures, and use of non-CVP water sources. The draft proposal also indicated that the M&I allocation would be based upon the M&I demand projected as of September 30, 1994 (as shown in Schedule A-12 of the 1996 Municipal and Industrial Water Rates book for the year 2030). Water converted or transferred after September 30, 1994 would be subject to the agricultural water allocation. The transferred water may become eligible for M&I water allocation following a separate analysis of impacts to agricultural water supplies and mitigation of all adverse impacts to agricultural water supplies; converted water may become eligible for M&I water allocation following a separate analysis of impacts to agricultural water supplies and to other water supplies and mitigation of all of those impacts.

The draft proposal indicates that when the Governor declares a water shortage emergency applicable to a specific contractor or contractors, or when Reclamation in consultation with the contractor determines a water shortage emergency exists, Reclamation would deliver CVP water to M&I contractors at not less than a public health and safety water supply level if CVP water is available. At that time the public health and safety level would be determined by the contractor and reviewed by Reclamation. The draft proposal does indicate that Reclamation would provide a water supply to all M&I contractors (including those with water converted or transferred to M&I purposes after September 30, 1994) with a water supply at public health and safety levels, if CVP water is available.

This draft proposal required each M&I water service contractor to develop and implement a water conservation plan and a water measuring plan consistent with the requirements of CVPIA. Each M&I contractor also must provide a drought contingency plan to protect public health and safety.

SOURCE OF WATER TO INCREASE WATER ALLOCATIONS TO M&I WATER SERVICE CONTRACTORS FOR ACTION ALTERNATIVES

In years when allocations to Irrigation and M&I CVP water service contractors are less than Contract Totals, there are no surplus flows. It is also not possible to reduce deliveries to water rights holders, environmental commitments, or Level 2 refuge water supplies. These demands must be met prior to deliveries under water service contracts, as described in OCAP 2004.

As part of this analysis, several methods were considered to provide the additional water to the M&I CVP water service contractors. During the 13 drier years of the 72 years when M&I CVP water service contract allocations are less than 75 percent, 10 of the 13 years are considered "Critical (Dry)" and 3 years are considered "Dry."

To increase M&I CVP water service contract deliveries, concepts would include: 1) storage of additional water during wet years, 2) reduction of deliveries to Irrigation CVP water service contractors in all years with storage of the non-delivered water in CVP reservoirs, or 3) reduction of deliveries to Irrigation CVP water service contractors in the years when deliveries to M&I CVP water service contractors are less than 75 percent. However, increasing storage quantities was not possible with existing facilities and commitments with higher priorities than CVP water service contractors. Therefore, this analysis assumed that the additional water for deliveries to the M&I water service contractors in the 13 years would be made available by reducing deliveries to Irrigation CVP water service contractors within the shortage year considered.

In the American River Division, it is not possible to convey water from the Sacramento River to users that divert from the American River. The American River Division is not projected to include any Irrigation CVP water service contracts under the No Action Alternative. Therefore, it is not possible to increase M&I CVP water service contract allocations to the American River Division unless new conveyance facilities are constructed. Reclamation has initiated an evaluation of these types of facilities in a separate study. If those facilities are approved, increasing CVP water allocations to American River Division M&I CVP water service contractors could be implemented. However, for the purposes of this EA, increased allocations to American River Division water service contractors are identified but not evaluated.

DEVELOPMENT OF NO ACTION ALTERNATIVE AND ACTION ALTERNATIVES

Alternatives to the M&I Water Shortage Policy were developed based upon information compiled during the review of previous proposals and information collected during the scoping process. Two main alternatives, each with two sub-alternatives, were considered in addition to the No Action Alternative.

Alternative 1A is identical to the September 2001 draft water shortage policy. Implementation of Alternative 1B is similar in nature, but would require modification of the September 2001 draft water shortage policy. The September 2001 draft water shortage policy did not include provisions that are presented in Alternatives 2A and 2B. Therefore, implementation of Alternatives 2A or 2B would require modification of the September 2001 draft water shortage policy.

No Action Alternative

The No Action Alternative is defined by the operational criteria presented in the OCAP 2004. Allocations of CVP water service contract water would be in accordance with the current allocation process, as presented in Table ES-1.

Under the No Action Alternative, allocations would be based upon historical use adjusted for growth, extraordinary water conservation measures, and use of non-CVP water sources.

The water demands assumed in the No Action Alternative are the values developed by the water service contractors and Reclamation for the Water Needs Assessment prepared as part of the Long-Term Contract Renewal process. It is anticipated that these demands would occur prior to 2029 and would be applied to 40-year M&I water service contracts and to 25-year Irrigation/M&I water service contracts.

TABLE ES-1

NO ACTION ALTERNATIVE WATER SHORTAGE ALLOCATIONS

Allocation Step	Allocation to Irrigation Users	Allocation to M&I Users
1	100 percent	100 percent
2	100 to 75 percent	100 percent
3	75 to 70 percent	100 to 95 percent
4	70 to 65 percent	95 to 90 percent
5	65 to 60 percent	90 to 85 percent
6	60 to 55 percent	85 to 80 percent
7	55 to 50 percent	80 to 75 percent
8	50 to 25 percent	75 percent
9	25 to 20 percent	75 to 70 percent
10	20 to 15 percent	70 to 65 percent
11	15 to 10 percent	65 to 60 percent
12	10 to 5 percent	60 to 55 percent
13	5 to 0 percent	55 to 50 percent
14	0 percent	50 percent

Alternative 1

Under Alternative 1, the allocation methodology for M&I CVP water service contractors would be the same as under the No Action Alternatives when the M&I CVP allocations are greater or equal to 75 percent. In years when the M&I CVP allocations are less than 75 percent, water would be re-allocated from the Irrigation CVP water service contractors to provide at least the public health and safety water quantity up to 75 percent of the CVP water service contract total and up to the total amount allocated to the Irrigation CVP water service contractors, if and when the water is available. There are some years in which allocations to Irrigation CVP water service contractors are at or near zero. In those years, the increased allocations to M&I CVP contractors would not be fully realized.

There are two sub-alternatives for Alternative 1. Alternative 1A would apply M&I Allocation of the M&I Water Shortage Policy to the quantity of CVP water identified for M&I uses as of September 30, 1994, as shown on Schedule A-12 of the 1996 Municipal and Industrial Water Ratebook, and for those contract quantities specified in section 206 of Public Law 101-514. Alternative 1A is identical to the September 2001 draft proposal. Alternative 1B would apply the M&I allocation of the M&I Water Shortage Policy to quantity of CVP water identified for M&I uses under the Water Needs Assessment.

Alternative 2

Alternative 2 provides a two-tier level of water supply allocations to M&I CVP water service contractors when M&I CVP allocations are less than 75 percent.

- First Tier: A portion of the M&I contract amount would be provided in a similar manner as defined in Alternative 1B.

- Second Tier: A portion of the M&I contract amount that when added to the First Tier provides up to 100 percent of industrial demand under Alternative 2A or 100 percent of total M&I demand under Alternative 2B, up to 75 percent of Contract Total. The second tier would be priced every year at a higher level than cost of service M&I water service contract rates. For the purpose of this EA, it is assumed that the second tier would be priced at 10 times the M&I cost of service rate shown in the 2003 CVP M&I Water Service Contract Ratebook as a "worst-case" scenario.

The M&I Water Shortage Policy would apply to that amount of M&I water identified under the Water Needs Assessment.

Under Alternative 2A, the second tier would only be offered to M&I water service contractors that provide water to a portion of the manufacturing sector for which nearly no reduction in water use can be tolerated as part of the manufacturing process, such as electronic industries. For the purposes of this EA, it was assumed that 100 percent allocations would be provided for industrial water demand when M&I CVP contract allocations are less than 75 percent. However, the maximum allocations would be limited to 75 percent of the CVP Contract Total. Allocations for the remaining M&I demands would be provided as described under Alternative 1B.

Under Alternative 2B, the second tier would be offered to all M&I water service contractors. For the purposes of this EA, it was assumed that Alternative 2B would attempt to provide up to 100 percent allocation of M&I water demands when M&I CVP contract allocations are less than 75 percent. However, the maximum allocations would be limited to 75 percent of CVP Contract Total. Allocations for the remaining M&I demands would be provided as described under Alternative 1B.

DEVELOPMENT OF PUBLIC HEALTH AND SAFETY WATER QUANTITIES TO BE USED IN THE ACTION ALTERNATIVES

The M&I Water Shortage Policy refers to the allocation of CVP water based upon "public health and safety" criteria. However, these quantities are not currently available for use in this analysis but are expected to be developed by Reclamation and the contractors. As part of this evaluation, information developed by Reclamation, water service contractors, and by other non-CVP water users was reviewed. Most studies acknowledged that the communities had implemented long-term conservation measures to reduce water demands. Therefore, the incremental savings for emergency conservation measures were limited. A limited number of reports included specific reduction targets for overall water system demand. Using this information, a definition of "public health and safety value" was developed as follows:

- Residential = 50 gallons/capita/day
- Commercial = 80 percent of average commercial water demand
- Industrial = 90 percent of average industrial water demand
- System Losses = 80 percent of identified system losses

The public health and safety water criteria have been developed for use in this EA to estimate adequate water for consumption, operation of necessary water and wastewater facilities, and to avoid economic disruption.

ENVIRONMENTAL CONSEQUENCES AND SELECTION OF PROPOSED ACTION

The alternatives were evaluated with respect to the following resources: surface water resources and Central Valley Project operations, groundwater, municipal and industrial land use and Central Valley Project water supply costs, agricultural land use and economics, fishery and wildlife resources, recreation, cultural resources, Indian Trust Assets, air quality, soils, visual resources, power resources, social conditions, environmental justice, and secondary growth issues. The results of the evaluation of impacts on CVP water service contract allocations are summarized in Tables ES-2 and ES-3.

Based upon this analysis, Alternative 1B was identified as the proposed action. Alternative 1B is consistent with proposed provisions of the long-term contract renewal contracts and would improve CVP water service contract allocations with less impacts to Irrigation CVP water service contractors than Alternatives 2A and 2B. Under Alternative 1B, reductions to Irrigation CVP water service contractors would range from 0 to 3 percent and years with no deliveries would increase from 4 to 6 of 72 years.

TABLE ES-2

PERCENT ALLOCATIONS TO CENTRAL VALLEY PROJECT WATER SERVICE CONTRACT DELIVERIES FOR M&I AND IRRIGATION WATER SERVICE CONTRACTORS

Frequency	Allocations for No Action Alternative		Allocations to CVP Water Service Contractors in Action Alternatives							
			Alternative 1A		Alternative 1B		Alternative 2A		Alternative 2B	
	M&I	Irrig.	M&I	Irrig.	M&I	Irrig.	M&I	Irrig.	M&I	Irrig.
4 of 72 years	50%	0%	50%	0 [a]	50%	0 [a]	50%	0 [a]	50%	0 [a]
1 of 72 years	52%	2%	63%	0 [b]	63%	0 [b]	63%	0 [b]	63%	0 [b]
1 of 72 years	53%	3%	65%	1%	66%	<1%	69%	0 [b]	69%	0 [b]
2 of 72 years	54%	4%	65%	2%	67%	1%	73%	0 [b]	73%	0 [b]
1 of 72 years	57%	7%	67%	5%	69%	5%	75%	4%	82%	2%
1 of 72 years	63%	13%	70%	12%	72%	11%	77%	10%	82%	10%
1 of 72 years	66%	16%	72%	16%	74%	15%	78%	14%	82%	14%
1 of 72 years	70%	20%	74%	20%	78%	19%	79%	19%	82%	18%
1 of 72 years	74%	23%	76%	23%	79%	22%	79%	22%	82%	22%
59 of 72 years	Same as in Table ES-1									

"Irrig." = Irrigation

[a] Under the No-Action Alternative for 50 percent M&I Allocation years, deliveries to Irrigation CVP water service contractors are equal to zero. Therefore, there are no changes in deliveries to M&I or Irrigation water users.

[b] Re-allocation of water to increase M&I CVP water service contract water in these alternatives will result in zero deliveries to Irrigation CVP water service contractors

TABLE ES-3

IMPACT ASSESSMENT RESULTS

	No Action Alternative	Alternative 1A	Alternative 1B	Alternative 2A	Alternative 2B
Surface Water Resources	CVP water supply allocations in the future will be slightly less than under existing conditions. M&I CVP water service contractors deliveries are less than 75 percent in 13 of the 72 years analyzed in the CALSIM II model used for this EA. Zero deliveries would occur to Irrigation CVP water service contractors in four of the 72 years.	Reductions to Irrigation CVP water service contractors would be from 0 to 2 percent. One additional year with zero deliveries to Irrigation CVP water service contractors for a total of five of the 72 years.	Reductions to Irrigation CVP water service contractors would be from 0 to 3 percent. Two additional years with zero deliveries to Irrigation CVP water service contractors for a total of six of the 72 years.	Reductions to Irrigation CVP water service contractors would be from 0 to 4 percent. Four additional year with zero deliveries to Irrigation CVP water service contractors for a total of eight of the 72 years.	Reductions to Irrigation CVP water service contractors would be from 0 to 5 percent. Four additional year with zero deliveries to Irrigation CVP water service contractors for a total of eight of the 72 years.
Groundwater	It is anticipated that groundwater withdrawals will be increased as municipal growth occurs to directly use groundwater or reduce availability of irrigation water supplies.	Groundwater withdrawals by M&I CVP water service contractors may be reduced in 9 of 72 years under this alternative. Groundwater withdrawals by Irrigation CVP water service contractors may increase unless other water supplies are available or fields are fallowed more frequently.	Similar to Alternative 1A	Similar to Alternative 1A	Similar to Alternative 1A
Municipal and Industrial Land Use and CVP Water Cost	Growth would continue in M&I communities, as described in the county general plans and associated environmental documentation.	No increase in Contract Totals, therefore, no change in land use. Slightly higher allocations of CVP water in drier years. Water supply costs similar to those under the No Action Alternative.	Similar to Alternative 1A	Similar to Alternative 1A with slightly higher allocations of CVP water in drier years.	Similar to Alternative 1A with slightly higher allocations of CVP water in drier years.

TABLE ES-3

IMPACT ASSESSMENT RESULTS

	No Action Alternative	Alternative 1A	Alternative 1B	Alternative 2A	Alternative 2B
Agricultural Land Use and Economics	Increased groundwater withdrawals may increase costs. Cropping patterns of may be modified if adequate water supplies are not available.	Land use would be similar to No Action Alternative. Water supply costs may be higher if additional groundwater or other water supplies are used in drier years. Reduction in farm income during drier years due to more frequent fallowing if additional groundwater is not available	Similar to Alternative 1A.	Similar to Alternative 1A, with higher water supply costs and more frequent occurrence of reduced Irrigation CVP water allocations.	Similar to Alternative 2A.
Fisheries and Wildlife Resources	Growth would continue in M&I communities, as described in the county general plans and associated environmental documentation. The general plans include protection measures for biological resources.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.
Recreation	CVP operations would be similar to those under existing conditions. Therefore, recreational opportunities related to CVP operations would be similar to those under existing conditions.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.
Cultural Resources	CVP operations would be similar to those under existing conditions.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.
Indian Trust Assets	Indian Trust Assets would be the same as under the existing conditions.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.

TABLE ES-3

IMPACT ASSESSMENT RESULTS

	No Action Alternative	Alternative 1A	Alternative 1B	Alternative 2A	Alternative 2B
Air Quality	Growth would continue in M&I communities, as described in the county general plans and associated environmental documentation. The general plans include air quality improvement and protection measures.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.
Soils	Soil conditions would be similar to existing conditions.	No impact as compared to the No Action Alternative for M&I CVP water service contractors. Potential increase in soil salinity in irrigated areas due to increased frequency of fallowing	Similar to Alternative 1A.	Similar to Alternative 1A.	Similar to Alternative 1A.
Visual Resources	Conditions would be similar to existing conditions.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.
Power Resources	Reservoir and power generation operations will continue as described in OCAP 2004.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.

TABLE ES-3

IMPACT ASSESSMENT RESULTS

	No Action Alternative	Alternative 1A	Alternative 1B	Alternative 2A	Alternative 2B
Social Conditions	In the future, M&I communities will continue to grow and agricultural activities may be reduced as lands are converted to accommodate the growth as compared to existing conditions.	Increased deliveries of M&I CVP water supplies may encourage industries to continue to operate in the urban areas. If other water supplies are used by irrigation users, there may be no change in employment. If the frequency of fallowing is increased, employment may be reduced in 9 of 72 years.	Similar to Alternative 1A.	Similar to Alternative 1A	Similar to Alternative 1A.
Environmental Justice	Projections by U.S. Census Bureau and the State of California were used to develop the basis of comparison for Environmental Justice.	Increased deliveries of M&I CVP water supplies may encourage industries to continue to operate in the urban areas. If other water supplies are used by irrigation users, there may be no change in employment. If the frequency of fallowing is increased, employment may be reduced in 9 of 72 years.	Similar to Alternative 1A.	Similar to Alternative 1A	Similar to Alternative 1A.
Secondary Growth Impacts	Growth would continue in M&I communities, as described in the county general plans and associated environmental documentation.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.

CHAPTER 1
PURPOSE AND NEED

CHAPTER 1
Purpose and Need

INTRODUCTION

This Environmental Assessment (EA) was prepared to evaluate alternatives considered by the U.S. Bureau of Reclamation (Reclamation) to implement a Municipal and Industrial (M&I) Water Shortage Policy for the Central Valley Project (CVP). The purposes of the policy are to: (1) define water shortage terms and conditions applicable to all CVP M&I contractors, as appropriate; (2) establish CVP water supply levels that, together with the M&I contractors' drought water conservation measures and other water supplies, (a) would sustain urban areas during droughts, and (b) during severe or continuing droughts would assist the M&I contractors in their efforts to protect public health and safety; and (3) provide information to M&I contractors for development of drought contingency plans.

This EA has been prepared pursuant to and in accordance with the National Environmental Policy Act (NEPA) of 1969 (42 USC § 4321-4370d) and the Council on Environmental Quality (CEQ) regulations on implementing NEPA (40 CFR Parts 1500-1508).

BACKGROUND OF CENTRAL VALLEY PROJECT ALLOCATIONS

The CVP is operated as an integrated system with reservoirs on the Trinity, Sacramento, American, Stanislaus, and San Joaquin rivers. The June 2004 "Long-Term Central Valley Project Operations Criteria and Plan, CVP-OCAP" (OCAP 2004) described the authorizations for the CVP under the Rivers and Harbors Act of August 26, 1937, which act, provided that the CVP dams and reservoirs be "used, first, for river regulation, improvement of navigation and flood control; second, for irrigation and domestic uses; and third, for power." The OCAP 2004 described recent changes, in accordance with the Central Valley Project Improvement Act (CVPIA) that "modified the 1937 act and specified that the dams and reservoirs of the CVP should now be used first, for river regulation, improvement of navigation, and flood control; second for irrigation and domestic uses and fish and wildlife mitigation, protection and restoration purposes; and third for power and fish and wildlife enhancement."

The OCAP 2004 also described constraints to the operations of the CVP. The OCAP 2004 stated that:

> "State Water Resources Control Board (SWRCB) decisions and orders and the biological opinions for endangered species largely determine Delta regulatory requirements for water quality, flow, and operations. SWRCB Water Quality Control Plan (WQCP) and applicable water rights decisions, as well as other agreements, [were] considered in determining the operations of the Central Valley Project (CVP) and the State Water Project (SWP)."

The applicable water rights decisions and orders include satisfaction of senior water rights and riparian water rights, requirements of water right settlement and exchange contracts with the CVP, water rights agreements with the CVP, as well as water quality requirements established by the State Water Resources Control Board. The CVPIA also requires the CVP to provide water for refuge water supplies and for implementation of fish and wildlife requirements under Section 3406(b)(2) of the CVPIA.

The OCAP 2004 also described the allocation of CVP water supply for the 253 water service contracts and Sacramento River Settlement Contracts, as described in the following manner. "Those water service contracts had many varying water shortage provisions. In some contracts, M&I and agricultural use

shared shortages equally. In most of the larger M&I contracts, agricultural water was shorted 25 percent of its contract entitlement before M&I water was shorted, and then both shared shortages equally."

As the CVP system was being developed, there were no shortage allocations because the actual water demands were less than the water supply each year. The first drought occurred in 1977-1978 when severe hydrologic conditions resulted in extremely restricted water supplies. The second drought occurred in 1987-1992. Following adoption of the CVPIA and subsequent changes of the SWRCB orders and decisions related to operations of the CVP, water supplies also were reduced due to regulatory conditions as well as hydrologic reductions. For example, limitations on the CVP ability to convey water across the Delta in accordance with SWRCB orders and decisions can result in lower allocations for CVP water users located south of the Delta as compared to CVP water users located north of the Delta.

PURPOSE AND NEED FOR A MUNICIPAL AND INDUSTRIAL WATER SHORTAGE POLICY

In January 1993, many M&I CVP water service contractors were concerned about the future allocations of water supplies provided by the CVP. Reclamation subsequently initiated an effort to develop an M&I water shortage policy that would be incorporated into long-term water service contracts during the contract renewal process implemented under the CVPIA.

As part of the process to develop the M&I Water Shortage Policy, the M&I water service contractors identified the following reasons for the need for increased water supply allocations: (1) M&I long-term planning processes and facilities construction for M&I users require long-term knowledge of water supply allocations; (2) CVP M&I water service rates are higher than agricultural water service contract rates and therefore should coincide with increased allocations; (3) agricultural users have more flexibility for water shortages; and (4) urban areas must have a good understanding of the allocations of each supply to manage other supplies.

During this process, the agricultural water service contractors commented that changes to the CVP allocation process could reduce agricultural water supplies and that increased M&I allocations should be implemented through willing seller/willing buyer water transfers. Agricultural water service contractors also indicated that if higher water rates were used as justification of increased allocations, then agricultural users should be allowed to also pay higher water rates for greater allocations.

In response to these concerns and the need to more fully define water shortage criteria allocations following adoption of CVPIA, Reclamation initiated development of the M&I Water Shortage Policy. Involved stakeholders submitted language for the M&I Water Shortage Policy as part of several proposed policies, as summarized in Chapter 2. Portions of the proposed language were used by Reclamation in the development of the alternatives considered in the EA.

Thus, given the above discussion and background the purpose and need of the proposed action is to develop an M&I shortage policy recognizing the needs of various segments of the water user community and how those needs could be addressed in times of water shortages.

RELEVANT ACTIONS AND DECISIONS TO BE MADE

The long-term renewals of M&I water service contracts are currently being evaluated in separate environmental documents. The renewal contracts with M&I water service contractors are expected to include provisions referring to the then existing M&I water shortage policy. This EA is being prepared to support the final decision on a M&I water shortage policy.

This EA has been developed based upon information presented in other environmental documents prepared by Reclamation and other public agencies. Those documents include the Programmatic Environmental Impact Statement (PEIS) for the CVPIA and the associated Biological Opinion; NEPA documents completed by Reclamation for CVP amendatory contracts, contract assignments, and interim contract renewals and the related biological opinions; and the Long-Term CVP Operations Criteria and Plan and biological assessment.

STUDY AREA

The Study Area for this EA includes areas with CVP facilities, CVP water users, or water rights holders affected by CVP operations. These areas are located throughout the Central Valley, and in Trinity, Contra Costa, Alameda, Santa Clara, and San Benito counties, as shown in Figure 1-1.

The CVP water service contractors included in this analysis are the contractors with a water service contract that is expected to reference the proposed policy upon renewal. As described in the June 30, 2004 Long-Term Central Valley Project and State Water Project Operations Criteria and Plan Biological Assessment (OCAP 2004 biological assessment), "Reclamation expects the proposed policy [M&I Water Shortage Policy] will not be referenced in contracts for the (1) Friant Division, (2) New Melones interim supply, (3) Hidden and Buchanan Units, (4) Cross Valley contractors, (5) Sugar Pine Units (subject of title transfer legislation) [this unit was transferred to Foresthills Public Utilities District]; (6) San Joaquin settlement contractors, and (7) Sacramento River settlement contractors."

STUDY PERIOD

The analysis period for this EA is the term of the long-term contracts being considered under separate environmental documentation for M&I water users. For the long-term contract renewals, the contract term for agricultural-irrigation contracts is 25 years, or to the Year 2029. The contract term for mixed agricultural-irrigation and M&I contracts is 25 years, or to the Year 2029. The analysis period for the M&I-only contracts is a 40-year term, or to the Year 2044

Water Needs Assessments were performed for each long-term CVP contractor. Each Water Needs Assessment was predicated on the amount of water that would be beneficially used by the year 2025, and was used to determine the long-term Contract Total. The Water Needs Assessments showed that contractor’s future water demand equaled or exceeded their full Contract Total at year 2025. No interim time period conditions were considered or evaluated with respect to build-out conditions or changes in the CVP contract. Thus, all environmental impacts associated with use of the full Contract Total would be manifested at the end of the 25-year Water Needs Assessment period (2025). Therefore, the initial analysis of impacts in this EA covers a 25-year period from 2004 through 2029 and is extended to 2044.

If there are changes in actual amount of CVP water delivered after full build-out in year 2029, those are anticipated to be a result of allocations reflecting future CVP-wide demands, hydrology, or reductions in the allocations of CVP water supply because existing water rights holders are more fully using their water rights. Resulting changes would be further reductions in allocations. Any decrease in the actual amount of water allocated would not result in additional development of M&I service areas following 2029. Changes due to currently unforeseen conversion of irrigation water demands to M&I water demands would be subject to evaluation in separate environmental documentation.

Figure 1-1

Central Valley Project Service Area

PUBLIC INVOLVEMENT PROCESS

As described in Chapter 2, a public process was initiated in 1993 by Reclamation to develop an M&I Water Shortage Policy. Reclamation initiated the public process and continued the process as part of the Administrative Proposal efforts to implement CVPIA. Reclamation issued draft policies in 1994, 1996, 1997, 2000, and 2001. Public comments received on these drafts and at other public meetings were used to develop the range of alternatives considered in this EA.

OTHER RELATED DOCUMENTS OR ACTIVITIES

There are several activities being implemented by Reclamation as part of the obligation to manage and operate the CVP. Related studies and projects that have been conducted recently or are reaching completion, are summarized in Table 1-1.

TABLE 1-1
RELATED ACTIVITIES

Project or Study and Lead Agency	Summary
Long-Term Contract Renewal of Existing CVP Water Service Contracts - Reclamation	Reclamation is in negotiation with CVP water contractors for renewal of long-term contracts.
Long-Term Renewal of Sacramento River Settlement Contracts - Reclamation	Reclamation has reached an agreement with all Sacramento River Settlement Contractors.
Implementation of CVPIA - Reclamation and U.S. Fish and Wildlife Service (Service)	Reclamation and Service are proceeding with implementation of other provisions of CVPIA, including stream restoration, refuge water supplies, and further analysis of yield replacement.
CALFED Bay-Delta Program - CALFED	Established in May 1995, the consortium of federal and state agencies is charged with the development of a long-term solution to the Delta water concerns. CALFED completed an Environmental Impact Report (EIR) and Environmental Impact Statement (EIS) as part of this process. Renewal of Long-Term CVP Contracts and existing CVP allocation policies are assumed in the CALFED EIR/EIS and Record of Decision.
Coordinated Operating Agreement (COA) - Reclamation and California Department of Water Resources	Provisions and requirements of the CVPIA, SWRCB Decision 1641, the CALFED Bay-Delta Program, and other agency regulations will lead to the need of evaluating operational roles and responsibilities of the SWP and CVP.
Operations Criteria and Plan (OCAP) Update - Reclamation	Operational criteria are periodically reviewed by the Service in accordance with the Endangered Species Act. CALSIM modeling used for OCAP Update was used as basis for the No Action Alternative in this EA.
Trinity River Mainstem Fishery Restoration Environmental Impact Statement/Report - Service and Trinity County	Final EIS/EIR and Record of Decision were completed in 2001. Ensuing litigation prevented full implementation. Resolution of essentially all litigation has been achieved and the Trinity River restoration flows will be implemented.

CHAPTER 2
BACKGROUND OF THE MUNICIPAL AND INDUSTRIAL WATER SHORTAGE POLICY

CHAPTER 2
Background of the Municipal and Industrial Water Shortage Policy

INTRODUCTION

This chapter describes previous analyses that were used in the development of the alternatives that are described in Chapter 3.

CURRENT WATER SHORTAGE POLICY FOR CENTRAL VALLEY PROJECT WATER SERVICE CONTRACTORS

Water deliveries to CVP water service contractors are based primarily on the following six variables.

- Forecasted reservoir inflows to CVP reservoirs and Central Valley hydrologic water supply conditions
- Current amounts of storage in upstream reservoirs and San Luis Reservoir
- Projected water demands in the Sacramento Valley
- Instream and Delta regulatory requirements
- Annual management of 3406(b)(2) resources.

In many years, the combination of carryover storage and runoff into the CVP reservoirs is not sufficient to provide water Contract Totals to CVP water service contractors. Each CVP storage reservoir must be operated to provide water and to provide reasonable assurance that minimum storage, instream flows, diversion pools, and hydroelectric power pools can be sustained.

Since 1992, increasing constraints placed on operations by legislative and Endangered Species Act requirements have removed some of the capability of operations flexibility required to deliver water to CVP water service contractors. Water allocations to contractors located south of the Delta have been most affected by changes in operations by the legislative and regulatory changes. Even in above normal runoff years, it may not be possible to meet all competing needs for CVP water, especially south of the Delta. During prolonged droughts, all beneficial uses of CVP water are adversely affected.

In wetter years, CVP water service contract allocations are based upon the availability of water for users located both north and south of the Delta. In addition, allocations for users located south of the Delta may be further restricted due to regulatory and capacity limitations of the Delta export pumping facilities and, sometimes, by capacity limitations in San Luis Reservoir. Therefore, in wet, above normal, and below normal water year types, allocations for irrigation and M&I CVP water service contractors may be greater for users located north of the Delta than users located south of the Delta.

In drier years, the maximum volume of water allowed by regulations to be diverted by Delta export pumping facilities is usually higher than the available volume of water for CVP water users. Therefore, deliveries to users located south of the Delta generally are not limited by Delta export restrictions in dry and critical dry years, and CVP water service contract allocations are similar for users located north of the Delta and south of the Delta users. In these years, allocations to all CVP water service contract users are limited by hydrologic conditions, rather than by regulatory and capacity limitations of the Delta export pumping facilities.

Allocation steps are determined for the contractors considered in this EA by availability of carry-over storage and inflow into CVP reservoirs on the Trinity, Sacramento, American, and Stanislaus rivers. The allocation steps, as described in OCAP 2004, are presented in Table 2-1.

TABLE 2-1

CENTRAL VALLEY PROJECT WATER SERVICE CONTRACT
EXISTING WATER SHORTAGE ALLOCATIONS

Allocation Step	Allocation to Irrigation Users	Allocation to M&I Users
1	100 percent	100 percent
2	100 to 75 percent	100 percent
3	75 to 70 percent	100 to 95 percent
4	70 to 65 percent	95 to 90 percent
5	65 to 60 percent	90 to 85 percent
6	60 to 55 percent	85 to 80 percent
7	55 to 50 percent	80 to 75 percent
8	50 to 25 percent	75 percent
9	25 to 20 percent	75 to 70 percent
10	20 to 15 percent	70 to 65 percent
11	15 to 10 percent	65 to 60 percent
12	10 to 5 percent	60 to 55 percent
13	5 to 0 percent	55 to 50 percent
14	0 percent	50 percent

CURRENT WATER CONSERVATION PROVISIONS AND PROGRAMS

The 1982 Reclamation Reform Act established the need for water service contractors to prepare water conservation plans.

The 1985 California Urban Water Management Planning Act required M&I users with more than 3,000 connections or use of more than 3,000 acre-feet/year to prepare an urban water management plan (UWMP). The UWMP must include existing and projected water supplies and demands, water supply allocations, comparison of supplies and demands, water demand management program (conservation), wastewater recycling, and water shortage contingency plans.

The 1988 SWRCB draft Water Quality Control Plan included specific water efficiency requirements. Although this plan was not adopted, these efforts led to the formation of the California Urban Water Conservation Council in 1992 through a Memorandum of Understanding. There are currently 178 voluntary signatories to this Memorandum of Understanding to implement water conservation plans. Agricultural users formed Agricultural Water Suppliers in California and also developed a memorandum

of understanding for water use efficiency. There are currently 68 signatories to this Memorandum of Understanding, including many CVP water service contractors.

The CVPIA, adopted in 1992, included criteria that were consistent with Section 210(b) of the 1982 Reclamation Reform Act. Such criteria addressed cost-effective Best Management Practices (BMPs) that are economical and appropriate. The Urban BMPs are similar to the requirements in the California Urban Water Conservation Council's Memorandum of Understanding that was signed by many urban M&I users. Reclamation provided criteria in 2002 for BMPs so that "[urban] contractors will implement each BMP ... unless the Contractor provides adequate documentation for an exemption. BMP Number four, Metering with Commodity Rates for all New Connections and Retrofit of Existing Connections, is the only BMP which is not exemptible."

In 1990 and 1991, Reclamation provided "hardship" water to some agricultural water service contractors to sustain permanent crops and to some M&I contractors to meet demands that could not be met from other sources during a year when contract allocations were reduced. In 1994, Reclamation provided "critical need" water for some agricultural and M&I contractors that had water conservation plans approved by Reclamation. This water was provided to the extent that water was available. Only 150,000 acre-feet were provided as compared to requests for more than 800,000 acre-feet.

In 2000, the California Governor's Drought Advisory Panel described a Critical Water Shortage Reduction Marketing Plan. The Plan suggested criteria for participation in a statewide water transfer program, including a plan to minimize the impacts of critical water shortages.

Reclamation prepared a Water Shortage Contingency/Drought Planning Handbook in 2003. The handbook includes worksheets to meet the requirements of Reclamation-wide water conservation policies and drought financial assistance from California Department of Water Resources and California Department of Health Services.

PREVIOUS PROPOSALS CONCERNING THE M&I WATER SHORTAGE POLICY FOR CENTRAL VALLEY PROJECT WATER SERVICE CONTRACTORS

In response to related actions and concerns of M&I CVP water service contractors concerning allocations of CVP water, Reclamation initiated development of an M&I Water Shortage Policy in 1992. There were several proposals prepared by Reclamation, as summarized below. Portions of these proposals and responses to the proposals were used by Reclamation in the development of the alternatives considered in the EA.

1993 Proposal

A 1993 draft M&I water shortage policy was released on February 17, 1994 as a draft interim policy until the CVPIA PEIS was completed. This draft interim policy identified three levels of water supply.

- Under shortages caused by regulations, such as SWRCB regulations or biological opinions: The minimum deliveries to M&I water service contractors would be either 75 percent of M&I contract amount or 85 percent M&I historic useage, whichever was greater.
- Under a hydrologic shortage: Minimum deliveries of 75 percent of M&I historic use
- In severe emergencies: Public health and safety water supply levels would be delivered. However, specific public health and safety levels were not identified in this proposal.

Comments received on this draft interim policy were used in the development of the 1996 and 1997 Administrative Proposals.

1996 and 1997 Administrative Proposals

In 1996, as part of the implementation process for CVPIA, Reclamation prepared draft administrative proposals on several issues that were of concern to stakeholders and required issue-specific analysis. One of those proposals was the Urban Water Supply Reliability Proposal. The initial draft was developed with input from an Urban Reliability Team. This team included representatives of water users, regulatory agencies, and environmental stakeholder organizations. The 1996 Administrative Proposal addressed (1) minimum level of allocations to urban water contractors; (2) consideration/protection of other water supplies in urban shortage allocations; and (3) allocations of converted or transferred CVP water from agricultural to M&I use. Reclamation responded in the administrative proposal that these issues would be considered in a future Urban Water Supply Reliability proposal.

Comments received on the draft administrative proposal were used in the development of the 1997 Administrative Proposal.

The 1997 Administrative Proposal suggested using the following two levels of shortage allocations.

- Under shortages caused by regulations and/or hydrology: Minimum deliveries of 75 percent of M&I historic useage adjusted for growth, supplemental water supply status, and conservation practices.
- In severe emergencies: Water would be provided for public health and safety levels. Public health and safety levels were not identified in this proposal.

The 1997 Administrative Proposal also stated that the M&I shortage policy would only apply to that portion of the CVP water used historically for M&I purposes and projected for M&I purposes as of September 30, 1994 (as shown in Schedule A-12 of the 1996 Municipal and Industrial Water Rates book for the year 2030). Two levels of allocations were considered: (1) minimum allocations regardless of the presence of other water supplies; and (2) higher allocations if an M&I contractor would pay a higher M&I CVP water service contract rate, but not to a level that would jeopardize deliveries of public health and safety levels in severe emergencies.

March 2000 Proposal

Reclamation incorporated comments on the administrative proposal and other information collected in public outreach efforts to prepare a Draft M&I Water Shortage Policy in March 2000. This draft policy required each M&I water service contractor to prepare a water management plan in coordination with the water conservation management plan required by the Reclamation Reform Act and CVPIA.

The draft policy stated that the shortage allocation should be based upon historical M&I water use adjusted for growth and extraordinary water conservation measures. The draft policy also indicated that the M&I allocation would be based upon the M&I demand projected as of September 30, 1994 (as shown in Schedule A-12 of the 1996 Municipal and Industrial Water Rates book for the year 2030) and did not include water converted or transferred after September 30, 1994.

This proposal recommended using Steps 1 through 8, as listed in Table 2-1. When agricultural allocations were below 25 percent, M&I water allocations would depend upon CVP water supply availability and possibly consider the availability of other water supplies available to CVP contractors. However, the

proposal stated that Reclamation would consider public health and safety to be a priority. The draft policy indicated that it may be necessary to reduce Level 2 refuge water supplies or Section 3406(b)(2) water minimum allocations to less than CVPIA-mandated levels to provide public health and safety allocations.

Following the publication of the March 2000 Proposal, Reclamation published a position paper, "Position #2: Criteria for the Public Health and Safety as the term will be used in the M&I Water Shortage Policy." This position paper stated "Reclamation does not have specific criteria for public health and safety levels during a period of such severe water shortage. In times of such severe water shortage, Reclamation will work with the Contractors, the California State Department of Health Services and other appropriate State agencies to determine public health and safety levels. Currently, Reclamation considers the public health and safety level to be based on interior residential use, sanitation, and fire protection. Reclamation estimates on the average interior residential use would be at 50 gallons/capita/day."

March 2001 Proposal

Comments received on the March 2000 Proposal and several position papers published in 2000 were used in the development of the March 2001 Proposal. This proposal had the following modifications to the March 2000 policy.

This draft proposal required each M&I water service contractor to provide a copy of the Urban Water Management Plan or similar water management plan that includes a drought contingency plan to protect public health and safety and a water conservation plan as required by CVPIA. This proposal did not include a specific public health and safety level.

The March 2001 Proposal stated that the shortage allocation should be based upon historical M&I water use adjusted for growth and extraordinary water conservation measures. The March 2001 Proposal also indicated that the M&I allocation would be based upon the M&I demand projected as of September 30, 1994 (as shown in Schedule A-12 of the 1996 Municipal and Industrial Water Rates book for the year 2030). Water converted or transferred after September 30, 1994 would be subject to the agricultural water allocation.

During shortages, CVP water would be allocated using Steps 1 through 8, as described in Table 2-1. When agricultural allocations are below 25 percent, M&I water allocations would depend upon CVP water supply availability and possibly consider the availability of other water supplies available to CVP contractors. However, the proposal stated that Reclamation would consider public health and safety to be a priority. The proposal indicated that the M&I water allocations may be reduced below 75 percent and does not include reductions to Level 2 refuge water supplies or Section 3406(b)(2) water minimum allocations to less than CVPIA-mandated levels.

The proposal stated that Reclamation would provide all M&I contractors (including those with water converted or transferred to M&I purposes after September 30, 1994) with a water supply at public health and safety levels. The proposal did not identify specific quantities of water needed for public health and safety levels, but Reclamation had assumed that such levels were less than 75 percent of M&I water service contract quantities.

September 2001 Proposal

Following review of comments received on the March 2001 Proposal, Reclamation prepared a draft proposal for M&I Water Shortage Policy in September 2001. The September 2001 Proposal was published in the October 30, 2001 Federal Register, Volume 66, No. 210 for a 30-day public review and

comment period. The proposal was similar to the March 2001 proposal. However, several provisions were significantly different.

The draft proposal stated that the shortage allocation should be based upon historical M&I water use adjusted for growth, extraordinary water conservation measures, and use of non-CVP water sources. The draft proposal also indicated that the M&I allocation would be based upon the M&I demand projected as of September 30, 1994 (as shown in Schedule A-12 of the 1996 Municipal and Industrial Water Rates book for the year 2030). Water converted or transferred after September 30, 1994 would be subject to the agricultural water allocation. The transferred water may become eligible for M&I water allocation following a separate analysis of impacts to agricultural water supplies and mitigation of all adverse impacts to agricultural water supplies; converted water may become eligible for M&I water allocation following a separate analysis of impacts to agricultural water supplies and to other water supplies and mitigation of all of those impacts.

During shortages, CVP water would be allocated using Steps 1 through 8, as described in Table 2-1. When agricultural allocations are below 25 percent, M&I water allocations would depend upon CVP water supply availability and possibly consider the availability of other water supplies available to CVP contractors. However, the proposal stated that Reclamation would consider public health and safety to be a priority. For an M&I contractor to be eligible for the "minimum shortage allocation" of 75 percent of adjusted historical use, the contractor's water service contract must reference M&I water shortage policy. In addition, the water service contractor must (1) have developed and be implementing a water conservation plan that meets CVPIA criteria and (2) be measuring such water consistent with section 3405(b) of the CVPIA. Reclamation intends to incorporate in all new, renewed, and amended water service contracts, a provision that references the CVP M&I water shortage policy.

The proposal indicated that M&I water allocations may be reduced below 75 percent and does not include reductions to Level 2 refuge water supplies or Section 3406(b)(2) water minimum allocations to less than CVPIA-mandated levels.

The draft proposal indicates that when the Governor declares a water shortage emergency applicable to a specific contractor or contractors, or when Reclamation in consultation with the contractor determines a water shortage emergency exists, Reclamation would deliver CVP water to M&I contractors at not less than a public health and safety water supply level if CVP water is available. At that time the public health and safety level would be determined by the contractor and reviewed by Reclamation. The draft proposal does indicate that Reclamation would provide a water supply to all M&I contractors (including those with water converted or transferred to M&I purposes after September 30, 1994) with a water supply at public health and safety levels, if CVP water is available.

This draft proposal required each M&I water service contractor to develop and implement a water conservation plan and a water measuring plan consistent with the requirements of CVPIA. Each M&I contractor also must provide a drought contingency plan to protect public health and safety. This requirement may be met if a contractor provides a copy of the Urban Water Management Plan or similar water conservation plan that includes a drought contingency plan to protect public health and safety.

CHAPTER 3
DESCRIPTION OF ALTERNATIVES

CHAPTER 3
Description of Alternatives

INTRODUCTION

This chapter describes the frequency of shortage conditions when M&I CVP water service contract allocations would be less than 75 percent, assumptions for providing water to increase M&I CVP water allocations, methodology to calculate public health and safety water quantities, and alternatives considered in this EA.

FREQUENCY OF SHORTAGE CONDITIONS FOR CENTRAL VALLEY PROJECT M&I WATER SERVICE CONTRACTORS IN THE NO ACTION ALTERNATIVE

Reclamation uses the CALSIM II model to simulate operations of the CVP, as described in OCAP 2004. This model uses generalized rules to operate the CVP and SWP systems. Therefore, the results are a gross estimate and may not reflect how actual operations occur. The model can be used only in a comparative manner to reflect how changes in facilities and operations may affect the CVP-SWP system.

The CALSIM II model uses historical hydrologic records for the system from 1922 through 1994. The modeled system is operated for 72 consecutive years to reflect the impacts of critical dry to wet periods and associated carryover storage conditions. Reclamation has developed model assumptions with projected level of development and associated water demands for non-CVP water users for Existing Conditions and the Year 2020. The CALSIM II model for Year 2020 Level of Development indicated that M&I CVP water service contract allocations would be less than 75 percent in 13 years, as shown in Table 3-1.

SOURCE OF WATER TO INCREASE WATER ALLOCATIONS TO M&I WATER SERVICE CONTRACTORS FOR ACTION ALTERNATIVES

In years when allocations to Irrigation and M&I CVP water service contractors are less than Contract Totals, there are no surplus flows. It is also not possible to reduce deliveries to water rights holders, environmental commitments, or Level 2 refuge water supplies. These demands must be met prior to deliveries under water service contracts, as described in OCAP 2004.

As shown in Table 3-1, there are no allocations to Irrigation CVP water service contractors in 4 of the 13 years. In addition, the allocations are very small in two additional years when allocations to Irrigation CVP water service contractors are 2 to 3 percent.

As part of this analysis, several methods were considered to provide the additional water to the M&I CVP water service contractors. During the 13 drier years of the 72 years considered in the CALSIM II model runs when M&I CVP water service contract allocations are less than 75 percent, 10 of the 13 years are considered "Critical (Dry)" and 3 years are considered "Dry." Except for 2 years, these years occur following "Dry" or "Below Normal" years when the CVP reservoir volumes are extremely low; no flood control spills occur, and deliveries to Sacramento River Settlement Contractors, San Joaquin River

Exchange Contractors, and Central Valley refuges are reduced to 75 percent of Contract Total in accordance with contract agreements and federal law.

TABLE 3-1

WATER YEARS WITH M&I CENTRAL VALLEY PROJECT WATER ALLOCATIONS LESS THAN 75 PERCENT BASED ON CALSIM II MODEL RESULTS FOR 2020 LEVEL OF DEVELOPMENT

Water Year	M&I CVP Water Allocation based on CALSIM II 2020 Model Run	Irrigation CVP Water Allocation based on CALSIM II 2020 Model Run
1924	50 percent	0 percent
1933	50 percent	0 percent
1934	50 percent	0 percent
1990	50 percent	0 percent
1988	52 percent	2 percent
1929	53 percent	3 percent
1926	54 percent	4 percent
1977	54 percent	4 percent
1931	57 percent	7 percent
1991	63 percent	12 percent
1976	66 percent	17 percent
1932	70 percent	22 percent
1960	74 percent	23 percent

The CVP is operated in a manner to provide flood protection and to provide water for water rights holders, refuges in accordance with federal law, and instream flows and Delta outflow in accordance with the requirements of state and federal agencies. Therefore, to increase M&I CVP water service contract deliveries, concepts would include: 1) storage of additional water during wet years, 2) reduction of deliveries to Irrigation CVP water service contractors in all years with storage of the non-delivered water in CVP reservoirs, or 3) reduction of deliveries to Irrigation CVP water service contractors in the years when deliveries to M&I CVP water service contractors are less than 75 percent.

In all years, the CVP reservoirs are operated to maximize storage while providing storage space for flood control to protect downstream communities. Water stored in wetter years would probably be spilled to provide flood control space in the reservoirs. Therefore, it is very difficult to increase the amount of stored water in wetter years or in other years if deliveries to Irrigation water service contractors were reduced. Therefore, this analysis assumed that the additional water for deliveries to the M&I water service contractors in the 13 years would be made available by reducing deliveries to Irrigation CVP water service contractors within the shortage year considered.

In the American River Division, it is not possible to convey water from the Sacramento River to users that divert from the American River. The American River Division is not projected to include any Irrigation CVP water service contracts under the No Action Alternative. Therefore, it is not possible to increase M&I CVP water service contract allocations to the American River Division unless new conveyance facilities are constructed. Reclamation has initiated an evaluation of these types of facilities in a separate study. If those facilities are approved, increasing CVP water allocations to American River Division M&I CVP water service contractors could be implemented. However, for the purposes of this EA, increased allocations to American River Division water service contractors are identified but not evaluated.

MUNICIPAL AND INDUSTRIAL CENTRAL VALLEY PROJECT WATER SERVICE CONTRACTORS

To evaluate the alternatives, it is necessary to identify the M&I CVP water service contractors subject to the M&I Water Shortage Policy. The M&I CVP water service contractors that are subject to the M&I Water Shortage Policy and CVP Contract Totals are shown in Table 3-2. Also shown in Table 3-2 are the M&I Needs as determined by the 2004 Water Needs Assessment; and the projected M&I deliveries for year 2030 as of September 30, 1994 (1996 CVP M&I Ratebook Schedule A-12 Year 2030 Figure) and Contract Totals derived from Public Law 101-514, or amendatory contracts. Details about the assumptions used in the development of these values are described in Chapter 4.

TABLE 3-2

MUNICIPAL AND INDUSTRIAL CENTRAL VALLEY PROJECT WATER SERVICE CONTRACTORS CONSIDERED IN EVALUATION OF THE SHORTAGE POLICY

CVP Division	CVP Contractor	CVP Contract Total (acre-feet)	Total M&I Need (acre-feet) [a] (includes Needs met by CVP and other supplies)	1996 CVP M&I Ratebook Schedule A-12 Year 2030 Figure (acre-feet) [b]
Trinity River	Shasta Community Services District	1,000	1,000	1,000
	Shasta County Service Area - Keswick #25	500	500	500
	Bella Vista Water District (not including 140 acre-feet delivered by Shasta County Water Agency service area)	24,000	17,774	7,000
	Clear Creek Community Services District	15,300	8,283	10,300
	Centerville Community Services District (assignment from Shasta County Water Agency)	2,900	2,900	2,900
	Subtotal	**43,700**	**30,457**	**21,700**
Shasta	Shasta County Water Agency (after assignment to Centerville Community Services District)	2,100	2,100	2,100
	Mountain Gate Community Services District	350	350	350
	City of Shasta Lake	4,400	5,347	4,400 (based upon amended contract)
	City of Redding - Buckeye Contract	6,140	33,200	3,760
	U.S. Forest Service - Centimundi Boat Ramp	10	10	10
	Subtotal	**13,000**	**41,007**	**10,620**

TABLE 3-2

MUNICIPAL AND INDUSTRIAL CENTRAL VALLEY PROJECT WATER SERVICE CONTRACTORS CONSIDERED IN EVALUATION OF THE SHORTAGE POLICY

CVP Division	CVP Contractor	CVP Contract Total (acre-feet)	Total M&I Need (acre-feet) [a] (includes Needs met by CVP and other supplies)	1996 CVP M&I Ratebook Schedule A-12 Year 2030 Figure (acre-feet) [b]
Sacramento River	Colusa County Water District	62,200	150	0
	County of Colusa - Stonyford	40	40	40
	Whitney Construction	25	25	25
	Elk Creek Community Services District	15	100	15
	U.S. Forest Service - campground	45	45	0
	Subtotal	**62,325**	**360**	**80**
American River	El Dorado Irrigation District - El Dorado Hills and Lake Hills Estate, only (does not include PL 101-514 contract because NEPA not complete)	7,550	7,500	7,500
	City of Roseville	32,000	54,900	32,000
	San Juan Water District	24,200	76,632	10,800
	Sacramento Municipal Utility District - Rancho Seco (assumes 30,000 acre-feet assigned to Sacramento County Water Agency)	15,000	33,942	15,000
	Sacramento County Water Agency (includes 30,000 acre-feet assigned from Sacramento Municipal Utility District)	52,000	93,554	52,000
	Placer County Water Agency	35,000	74,500	133,000
	East Bay Municipal Utility District (per amendatory contract) [c]	150,000	193,200	150,000
	Subtotal	**298,750**	**534,228**	**298,750**
Eastside	Tuolumne Utilities District	9,000	9,000	not included
Delta	Broadview Water District	27,000	20	20
	Del Puerto Water District	140,210	200	200
	Plainview Water District	20,600	800	420

TABLE 3-2

MUNICIPAL AND INDUSTRIAL CENTRAL VALLEY PROJECT WATER SERVICE CONTRACTORS CONSIDERED IN EVALUATION OF THE SHORTAGE POLICY

CVP Division	CVP Contractor	CVP Contract Total (acre-feet)	Total M&I Need (acre-feet) [a] (includes Needs met by CVP and other supplies)	1996 CVP M&I Ratebook Schedule A-12 Year 2030 Figure (acre-feet) [b]
Delta - continued	City of Tracy	10,000	46,000	10,000
	Patterson Irrigation District	16,500	1,000	0
	Contra Costa Water District	195,000	207,200	194,000
	U.S. Department of Veterans Affairs - Cemetery	450	450	450
	Subtotal	**409,760**	**230,475**	**205,090**
West San Joaquin	Westlands Water District	1,150,000	4,938	11,000
	San Luis Water District	125,080	2,000	578
	Pacheco Water District	10,080	80	175
	Panoche Water District	94,000	100	
	City of Avenal	3,500	3,891	3,500
	City of Coalinga	10,000	9,018	10,000
	City of Huron	3,000	2,266	3,000
	California Department of Fish and Game	10	10	10
	Subtotal	**1,395,670**	**22,303**	**16,510**
San Felipe	San Benito County Water Conservation and Flood Control District	43,800	16,273	8,250
	Santa Clara Valley Water District	152,500	549,995	130,000
	Subtotal	**196,300**	**566,268**	**138,250**
TOTAL		**2,428,505**	**1,440,923**	**691,000**

[a] Projected M&I Need for Year 2025 based upon 2004 Water Needs Assessment and information from local agency reports for contractors without detailed M&I Water Needs Assessment. Includes demands to be served by CVP water service contract water and all other water supplies for the service area; therefore, value may be greater than CVP water service contract

[b] Based upon M&I contract amounts as determined as of September 30, 1994 and first published in Schedule A-12 of the 1996 M&I Ratebook, or contract amounts in Public Law 101-514, or contract amounts in amendatory contracts completed since 1994.

[c]Up to 133,000 acre-feet/year and 165,000 acre-feet over three consecutive dry years per the Amendatory Contract

DEVELOPMENT OF PUBLIC HEALTH AND SAFETY WATER QUANTITIES TO BE USED IN THE ACTION ALTERNATIVES

The M&I Water Shortage Policy refers to the allocation of CVP water based upon "public health and safety" criteria when the allocation to CVP agricultural water service contractors would be less than 25 percent and the allocation to M&I CVP water service contractors would be less than 75 percent. CVP contractors are required to develop water conservation plans that will include the identification of public health and safety water quantities for each M&I contractor. However, these quantities are not currently available for use in this analysis but are expected to be available under the terms and conditions of the CVP M&I Shortage Policy once that policy is finalized and implemented.

As part of this evaluation, information developed by Reclamation, water service contractors, and by other non-CVP water users was reviewed. A literature search was conducted to identify studies that either developed public health and safety criteria or extended water supply emergency criteria. Criteria used for short-term emergencies (such as a pipeline break) were not included in this analysis because those values generally were considered to be used for a period of less than a week and did not consider methods to maintain local economies or long-term changes in behavior.

Many studies identified BMPs to be implemented within the communities and incremental savings that could be achieved through these actions. Most studies acknowledged that the communities had implemented long-term measures to reduce water demands. Therefore, the incremental savings for emergency conservation measures were limited. Only a limited number of reports included specific reduction targets for overall water system demand. The results of these reports are summarized in Table 3-3.

Public Health and Safety Criteria for M&I Central Valley Project Water Service Contracts

This EA recognizes that specific values would be developed by each water service contractor following execution of the long-term contract renewals. However, for the purposes of the evaluations in this EA, it is assumed that the "public health and safety residential water use" value would be:

- **Residential = 50 gallons/capita/day**
- **Commercial = 80 percent of average commercial water demand**
- **Industrial = 90 percent of average industrial water demand**
- **System Losses = 80 percent of identified system losses**

The residential criteria is consistent with criteria presented in Reclamation reports. The commercial criteria can be accomplished by reducing landscape irrigation at commercial complexes. Many commercial establishments, such as retail stores and restaurants, cannot further reduce water use without major changes in business hours or other actions that could effect local economies. The industrial criteria reflects recent efforts by industries to implement water conservation, especially for manufacturing facilities. System water losses usually occur due to leakage at pipeline joints and at reservoirs and are difficult to reduce except with major construction projects. Many communities will consider implementation of some construction projects during extreme droughts. Therefore, for the purpose of this EA, it is assumed that system losses can feasibly be reduced to 80 percent of system losses.

In summary, the public health and safety water quantities have been developed for use in this EA to estimate adequate water for consumption, operation of necessary water and wastewater facilities, and to avoid economic disruption.

TABLE 3-3

SUMMARY OF PUBLIC HEALTH AND SAFETY CRITERIA DEVELOPED BY WATER AGENCIES TO BE USED IN ACTION ALTERNATIVES

Study	Water Condition	Suggested Values for Residential Use	Suggested Values for Commercial and Industrial Use	Suggested Values for Overall M&I Use
U.S. Bureau of Reclamation Drought Handbook - Section 2.B, April 2003	Drought Stage 4: Critical 35 to 50 percent reduction in water supply	50 gallons/capita/day (200 cubic feet/month/person)	65 percent of average use	Not included
U.S. Bureau of Reclamation Letter to City of Shasta Lake - March 31, 1994	Public Health and Safety Requirements	50 gallons/capita/day	80 percent of average use	Not included
Alameda County Water District Urban Water Management Plan, Section 7, 2001	30 to 50 percent reduction in water supply	64 gallons/capita/day at 30 percent reduction and 52 gallons/capita/day at 50 percent reduction	Commercial: 85 percent of average use at 30 percent reduction and 45 percent of average use at 50 percent reduction Industrial: 85 percent of average use at 30 percent reduction and 75 percent of average use at 50 percent reduction	Not included
Contra Costa Water District Urban Water Management Plan, 2000	Public Health and Safety Requirements occurring during droughts	68 gallons/capita/day (includes allocation for commercial and industrial uses)	Large industrial: 90 percent of average use	65 percent of average use based upon suggestions from California Department of Water Resources
Marin Municipal Water District (based upon Perspectives on Water, 1988)	Water rationing program during 1976-77 drought	50 gallons/capita/day	Not included	Not included
Tuolumne Utilities District Urban Water Management Plan 2000 Update	Stage 3 Water Conservation Lifeline Usage	3,740 gallons/dwelling unit/month (38 gallons/capita/day if 3.2 people/unit)	Not included	Not included
California Urban Water Association, Drought Management Measures Compendium of Results, 1991	Summary of measures adopted by California water agencies by June 1, 1991	87.5 to 62.5 gallons/household assuming 4 persons/household	Not included	Not included
State of Pennsylvania Guidelines for the Development of a Local Water Rationing Plan, August 2001	Public Health and Safety within Emergency Service Area	40 gallons/capita/day	Not included	Not included

TABLE 3-3

SUMMARY OF PUBLIC HEALTH AND SAFETY CRITERIA DEVELOPED BY WATER AGENCIES TO BE USED IN ACTION ALTERNATIVES

Study	Water Condition	Suggested Values for Residential Use	Suggested Values for Commercial and Industrial Use	Suggested Values for Overall M&I Use
Morris County, New Jersey Local Water Emergency Regulations, March 2000	Public Health, Safety, and Welfare under Phase 2. Further rationing under Phase 3. Disaster stage in Phase 4 and does not guarantee public health and safety	40 gallons/capita/day	Not included	Not included
Cash (Texas) Water Supply Corporation, Water Conservation Plan	Public Health and Safety Requirements	8,000 gallons/dwelling unit/month (83 gallons/capita/day if 3.2 people/unit)	Not included	Not included
Evaluations of Alternatives for Middle Rio Grande Regional Water Plan (Texas)	Drought Emergency	45 gallons/capita/day	Not included	90 gallons/capita/day
Rockland County, New York	Severe Drought Emergency	50 gallons/capita/day	Commercial: 75 percent of average use	Not included

Specific public health and safety water quantities for the M&I CVP water service contractors developed for use in this EA are described for each contractor in Chapter 4. These values will be eventually replaced by public health and safety water quantities to be developed by CVP contractors under the terms and conditions of the CVP M&I Shortage Policy once that policy is finalized and implemented.

DEVELOPMENT OF NO ACTION ALTERNATIVE AND ACTION ALTERNATIVES

Alternatives to the M&I Water Shortage Policy were developed based upon information compiled during the review of previous proposals as described in Chapter 2 and information collected during the scoping process. Two main alternatives, each with two sub-alternatives, were considered in addition to the No Action Alternative.

Alternative 1A is identical to the September 2001 draft water shortage policy. Implementation of Alternative 1B is similar in nature, but would require modification of the September 2001 draft water shortage policy. The September 2001 draft water shortage policy did not include provisions that are presented in Alternatives 2A and 2B. Therefore, implementation of Alternatives 2A or 2B would require modification of the September 2001 draft water shortage policy.

No Action Alternative

The No Action Alternative is defined by the operational criteria presented in the OCAP 2004. Allocations of CVP water service contract water would be in accordance with the current allocation process, as presented in Table 3-4. Some of the contractors are fully utilizing their M&I water service contracts. However, other contractors have not taken delivery of their full Contract Total at this time and will not fully utilize the contracts until expected build-out occurs. Specific water demands are described for each M&I water service contractor considered in this EA in Chapter 4.

TABLE 3-4

NO ACTION ALTERNATIVE WATER SHORTAGE ALLOCATIONS

Allocation Step	Allocation to Irrigation Users	Allocation to M&I Users
1	100 percent	100 percent
2	100 to 75 percent	100 percent
3	75 to 70 percent	100 to 95 percent
4	70 to 65 percent	95 to 90 percent
5	65 to 60 percent	90 to 85 percent
6	60 to 55 percent	85 to 80 percent
7	55 to 50 percent	80 to 75 percent
8	50 to 25 percent	75 percent
9	25 to 20 percent	75 to 70 percent
10	20 to 15 percent	70 to 65 percent
11	15 to 10 percent	65 to 60 percent
12	10 to 5 percent	60 to 55 percent
13	5 to 0 percent	55 to 50 percent
14	0 percent	50 percent

Under the No Action Alternative, allocations would be based upon historical use adjusted for growth, extraordinary water conservation measures, and use of non-CVP water sources.

The water demands assumed in the No Action Alternative are the values developed by the water service contractors and Reclamation for the Water Needs Assessment prepared as part of the Long-Term Contract Renewal process. It is anticipated that these demands would occur prior to 2029 and would be applied to 40-year M&I water service contracts and to 25-year Irrigation/M&I water service contracts.

Alternative 1

Under Alternative 1, the allocation methodology for M&I CVP water service contractors would be the same as under the No Action Alternatives when the M&I CVP allocations are greater or equal to 75 percent, as described in Table 3-5. In years when the M&I CVP allocations are less than 75 percent, water would be re-allocated from the Irrigation CVP water service contractors to provide at least the public health and safety water quantity up to 75 percent of the CVP water service contract total and up to the total amount allocated to the Irrigation CVP water service contractors, if and when the water is available. There are some years in which allocations to Irrigation CVP water service contractors are at or near zero. In those years, the increased allocations to M&I CVP contractors would not be fully realized.

TABLE 3-5

ALTERNATIVE 1 WATER SHORTAGE ALLOCATIONS

Allocation Step	Allocation to Irrigation Users	Allocation to M&I Users
1	100 percent	100 percent
2	100 to 75 percent	100 percent
3	75 to 70 percent	100 to 95 percent
4	70 to 65 percent	95 to 90 percent
5	65 to 60 percent	90 to 85 percent
6	60 to 55 percent	85 to 80 percent
7	55 to 50 percent	80 to 75 percent
8	50 to 25 percent	75 percent
9	25 to 20 percent[a]	The Maximum of: (1) 75 to 70 percent of M&I CVP contract total (2) Public health and safety water quantities up to 75 percent of Contract Total
10	20 to 15 percent[a]	The Maximum of: (1) 70 to 65 percent of M&I CVP contract total (2) Public health and safety water quantities up to 75 percent of Contract Total
11	15 to 10 percent[a]	The Maximum of: (1) 65 to 60 percent of M&I CVP contract total (2) Public health and safety water quantities up to 75 percent of Contract Total
12	10 to 5 percent[a]	The Maximum of: (1) 60 to 55 percent of M&I CVP contract total (2) Public health and safety water quantities up to 75 percent of Contract Total
13	5 to 0 percent[a]	The Maximum of: (1) 55 to 50 percent of M&I CVP contract total (2) Public health and safety water quantities up to 75 percent of Contract Total
14	0 percent[a]	The Maximum of: (1) 50 percent of M&I CVP contract total (2) Public health and safety water quantities up to 75 percent of Contract Total

[a]Allocations to Irrigation CVP contractors will be further reduced within the Water Year to provide public health and safety water quantities to M&I CVP contractors within the same Water Year, provided CVP water is available.

Allocations methodologies identical for Alternatives 1A and 1B.

Some of the contractors are fully utilizing their M&I water service contracts. However, other contractors have not taken delivery of their full Contract Total at this time and will not fully utilize the contracts until build-out occurs. Specific water demands are described for each M&I water service contractor considered in this EA in Chapter 4. Under Alternative 1, allocations would be based upon historical use adjusted for growth, extraordinary water conservation measures, and use of non-CVP water sources. An example of how the allocation is calculated for a contractor whose unadjusted historical use figure is less than Contract Total is presented in Exhibit 3-1.

There are two sub-alternatives for Alternative 1. Alternative 1A would apply M&I Allocation of the M&I Water Shortage Policy to the quantity of CVP water identified for M&I uses as of September 30, 1994, as shown on Schedule A-12 of the 1996 Municipal and Industrial Water Ratebook, and for those contract quantities specified in section 206 of Public Law 101-514. Alternative 1A is identical to the September 2001 draft proposal described in Chapter 2. Alternative 1B would apply the M&I allocation of the M&I Water Shortage Policy to quantity of CVP water identified for M&I uses under the Water Needs Assessment. The definition of water quantities that would be subject to public health and safety criteria would be defined in the M&I Water Shortage Policy. Figures 3-1 and 3-2 provide flow charts showing how M&I allocations are calculated under Alternatives 1A and 1B, respectively. Exhibits 3-2 and 3-3 provide examples of applications of Alternatives 1A and 1B, respectively. Under Alternatives 1A and 1B, a M&I contractor could request, following completion of separate environmental documentation, an M&I allocation for CVP water transferred or converted that would not otherwise be eligible for the M&I allocation under either Alternatives 1A or 1B (ie, for quantities over and above the maximum quantity of water to which the M&I allocation under the M&I Water Shortage Policy is applied under Alternatives 1A and 1B as described above).

Alternative 2

Alternative 2 provides a two-tier level of water supply allocations to M&I CVP water service contractors when M&I CVP allocations are less than 75 percent.

- First Tier: A portion of the M&I contract amount would be provided in a similar manner as defined in Alternative 1B.

- Second Tier: A portion of the M&I contract amount that when added to the First Tier provides up to 100 percent of industrial demand under Alternative 2A or 100 percent of total M&I demand under Alternative 2B, up to 75 percent of Contract Total. The second tier would be priced every year at a higher level than cost of service M&I water service contract rates. For the purpose of this EA, it is assumed that the second tier would be priced at 10 times the M&I cost of service rate shown in the 2003 CVP M&I Water Service Contract Ratebook as a "worst-case" scenario.

The M&I Water Shortage Policy would apply to that amount of M&I water identified under the Water Needs Assessment. Under Alternative 2, a M&I contractor could request, following completion of separate environmental documentation, an M&I allocation for CVP water transferred or converted that would not otherwise be eligible for the M&I allocation under either Alternatives 2A or 2B (ie, for quantities over and above the maximum quantity of water to which the M&I allocation under the M&I Water Shortage Policy is applied under Alternatives 2A and 2B as described above).

EXHIBIT 3-1
EXAMPLE CALCULATION OF ADJUSTED HISTORICAL USE

In 2004, Contractor X is an M&I CVP water service contractor located north of the Delta. Contractor X has a contract total of 100,000 acre-feet and a Year 2025 projected M&I CVP need of 100,000 acre-feet. Reclamation will calculate adjusted historical use in consultation with Contractor X in the following manner.

Year	Hydrologic Year Type	CVP M&I Allocation (Water Made Available to Contractor X)	CVP M&I Water Delivery to (Diversion by) Contractor X (acre-feet)
2003	Above Normal	100 percent	100,000
2002	Dry	100 percent	100,000
2001	Dry	85 percent	83,000
2000	Above Normal	100 percent	90,000
1999	Wet	95 percent	95,000

Calculations Not Adjusted for Historical Use

Assume that the last three years of water deliveries that are unconstrained by availability of CVP water were 2000, 2002, and 2003; and that Contractor X put all water to beneficial use the same year that it was diverted. Then, the unadjusted historical use is the average of deliveries for these years:

(100,000 + 100,000 + 90,000) / 3 = 96,667 acre-feet.

Calculations Adjusted for Growth

Assume that the population served by Contractor X increased by five percent in 2003 over and above that population level which would have been determined from an examination of Contractor X's Water Needs Assessment prepared by Reclamation. Assume similarly, that in 2003, the demand for CVP water for commercial and industrial activity was 15,000 acre-feet, and that the percentage of increased commercial and industrial water demand not attributable to population increase is 10 percent over the 2003 level. Contractor X submits supporting documentation for all increases. Then, the adjustment for growth is calculated as follows.

(.05)(100,000 – 15,000) + (.10)(15,000) = 4,250 + 1,500 = +5,750 acre-feet.

This adjustment is not applicable to the maximum portion of contract total amount to which the M&I Allocation is applied under Alternative 1B.

Calculations Adjusted for Extraordinary Water Conservation Measures

It is expected that implementation of the minimum existing standards (as defined by the California Urban Water Conservation Council Best Management Practices) by Contractor X yields approximately one percent/year in demand reduction. Implementation of further extraordinary conservation measures each year by Contractor X is estimated to yield a demand reduction of approximately two percent/year savings.

EXHIBIT 3-1 - continued

EXAMPLE CALCULATION OF ADJUSTED HISTORICAL USE

Then, the adjustment for implementation of extraordinary water conservation measures begun in 2003 (one year ago) would be as follows.

(.02)(1)(100,000) = 2,000 = + 2,000 acre-feet above the minimum conservation baseline.

There is no additional adjustment to account for the one percent savings/year in demand reduction achieved through implementation of the minimum existing standards. The one percent demand reduction is already incorporated into the unadjusted historical use figure since it is already reflected in the actual M&I deliveries.

Calculation Adjusted for Use of Non-CVP Water

Assume that in year 2000, Contractor X purchased and beneficially used 5,000 acre-feet of non-CVP supply. As a result, an additional 5,000 acre-feet of CVP supply remained available in carryover storage into year 2001. Contractor X submitted to Reclamation documentation showing that in year 2001 it had beneficially used 83,000 acre-feet of CVP supply instead of the full 85,000 acre-feet of CVP supply allocated to it by Reclamation for that year. The extent of the reduction by Contractor X in use of CVP water that resulted in CVP water being made available in other years is:

85,000 – 83,000 = +2,000 acre-feet out of the 5,000 acre-feet of non-CVP purchased supply.

This adjustment does not include all 5,000 acre-feet of non-CVP supply. Use of non-CVP supply has reduced use of CVP water by only 2,000 acre-feet below the CVP allocation. All 5,000 acre-feet were beneficially used in 2001 and are not available for reducing CVP use in later years.

Calculation Adjusted for Historical Use

Therefore, the adjusted historical use for Contractor X prior to subsequent limitations explained below, would be:

96,667 + 5,750 + 2,000 + 2,000 = 106,417 acre-feet.

Under the proposed alternative, CVP M&I shortage policy, when the irrigation allocation drops to 50 percent the M&I allocation for Contractor X would be as follows.

(.75) x 100,000 acre-feet = 75,000 acre-feet.

Only 3,333 acre-feet of the sum of the adjustments to historical use are applied because the adjusted historical use quantity utilized for the M&I allocation shall exceed neither the contract total nor the Year 2025 projected M&I CVP need.

FIGURE 3-1
CALCULATION OF WATER ALLOCATIONS
UNDER ALTERNATIVE 1A FOR
M&I CVP WATER ALLOCATIONS OF LESS THAN 75 PERCENT

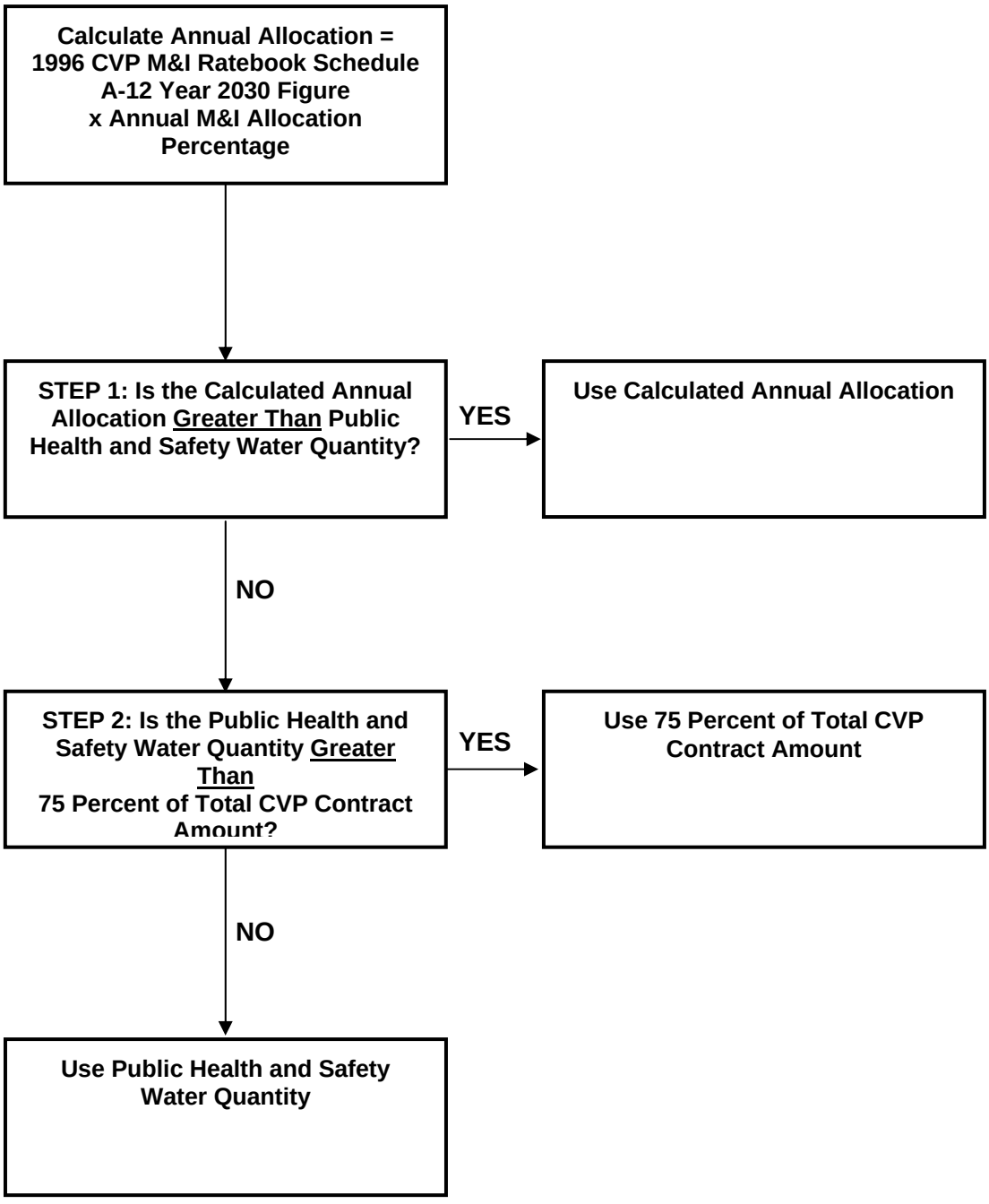
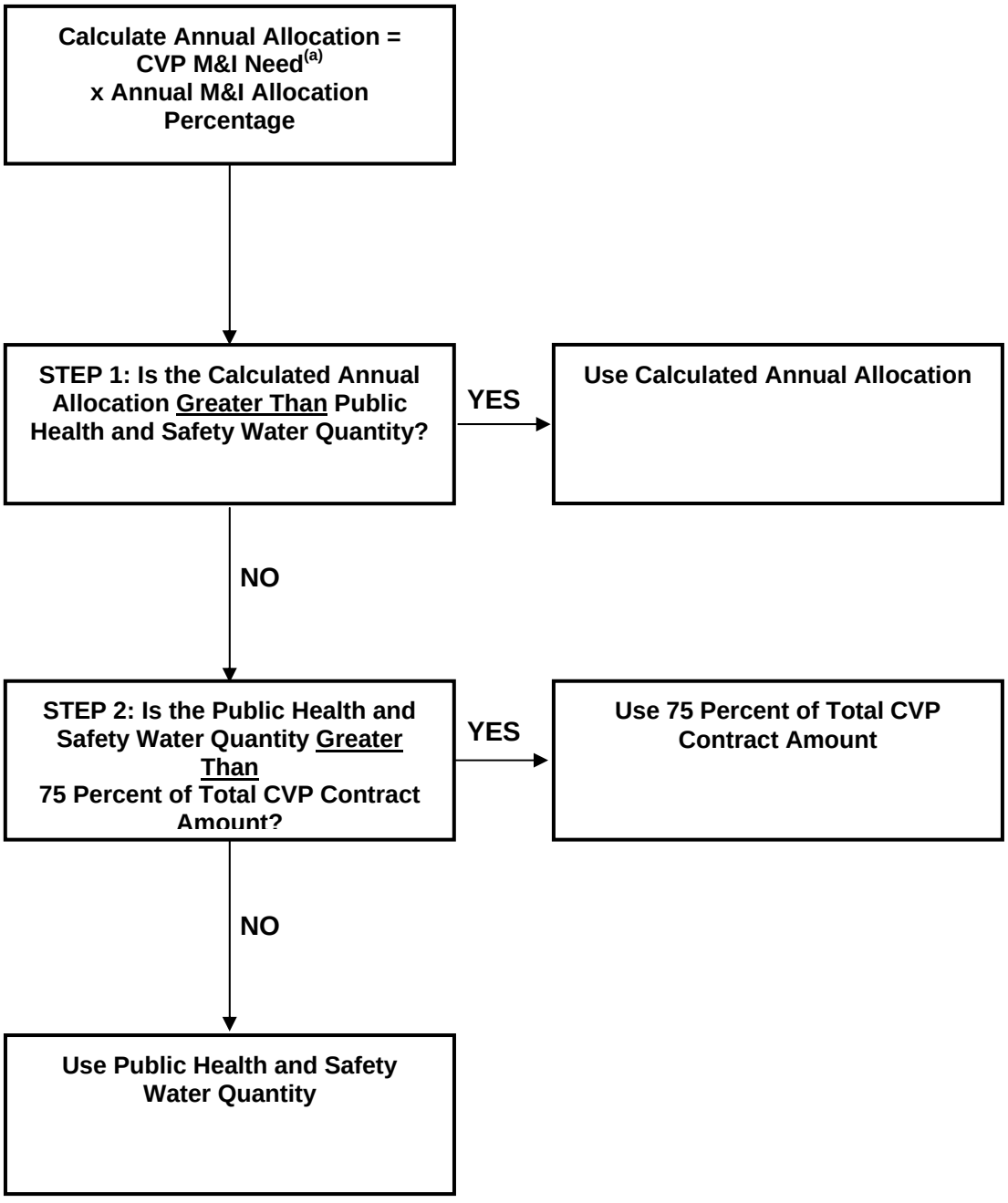


FIGURE 3-2
CALCULATION OF WATER ALLOCATIONS
UNDER ALTERNATIVE 1B FOR
M&I CVP WATER ALLOCATIONS OF LESS THAN 75 PERCENT



Note: (a) If M&I Need is greater than Contract Total, Use Contract Total

EXHIBIT 3-2
EXAMPLE APPLICATION OF ALTERNATIVE 1A

Three M&I CVP water service contractors were selected for this example to illustrate several scenarios. First, Santa Clara Valley Water District represents a contractor with multiple water sources and a M&I/Irrigation water service contract. The City of Avenal represents a contractor that only uses CVP water and has a M&I water service contract. Clear Creek Community Services District represents a contractor that only uses CVP water and has a M&I/Irrigation water service contract.

EXAMPLE OF ALTERNATIVE 1A FOR WATER YEAR WITH 60 PERCENT M&I CVP WATER ALLOCATION

Items	Santa Clara Valley Water District	City of Avenal	Clear Creek Community Services District
CVP Contract Total	152,500	3,500	15,300
1996 M&I 2030 Ratebook	130,000	3,500	10,300
Total Public Health and Safety Water Quantity (details presented in Chapter 4 of this EA)	228,957	2,438	3,063
75 percent of CVP Contract Total	114,375	2,625	11,475
60 percent M&I Allocation (applied to 1996 M&I 2030 Ratebook quantity)	78,000	2,100	6,180
Step 1: Greater of Total Public Health and Safety quantity OR 60 percent Allocation	228,957 Public Health and Safety	2,438 Public Health and Safety	6,180 60 Percent Allocation
Step 2: Lesser of Result of Step 1 OR 75 percent of CVP Contract Total	114,375 75 Percent CVP Contract Total	2,438 Public Health and Safety	6,180 60 Percent Allocation
Maximum Delivery during Water Year with 60 percent M&I Allocation	114,375	2,438	6,180
Comments	Public health and safety water quantity is greater than M&I allocation in this water year, however, maximum delivery limited to 75 percent of CVP Contract Total	Public health and safety water quantity is greater than M&I allocation in this water year and less than 75 percent of CVP Contract Total	M&I allocation in this water year is greater than public health and safety water quantity

All values in acre-feet

EXHIBIT 3-3

EXAMPLE APPLICATION OF ALTERNATIVE 1B

Three M&I CVP water service contractors were selected for this example to illustrate several scenarios. First, Santa Clara Valley Water District represents a contractor with multiple water sources and a M&I/Irrigation water service contract. The City of Avenal represents a contractor that only uses CVP water and has a M&I water service contract. Broadview Water District represents a contractor that only uses CVP water and has a M&I/Irrigation water service contract.

EXAMPLE OF ALTERNATIVE 1B FOR WATER YEAR WITH 60 PERCENT M&I CVP WATER ALLOCATION

Items	Santa Clara Valley Water District	City of Avenal	Broadview Water District
CVP Contract Total	152,500	3,500	27,000
Total M&I Need from CVP (based on Water Needs Assessment)	130,000	3,500	20
Total Public Health and Safety Water Quantity (details presented in Chapter 4 of this EA)	228,957	2,438	6
75 percent of CVP Contract Total	114,375	2,625	20,250
60 percent M&I Allocation (applied to M&I Need from CVP)	78,000	2,100	12
Step 1: Greater of Total Public Health and Safety quantity OR 60 percent Allocation	228,957 Public Health and Safety	2,438 Public Health and Safety	12 60 Percent Allocation
Step 2: Lesser of Result of Step 1 OR 75 percent of CVP Contract Total	114,375 75 Percent CVP Contract Total	2,438 Public Health and Safety	12 60 Percent Allocation
Maximum Delivery during Water Year with 60 percent M&I Allocation	114,375	2,438	12
Comments	Public health and safety water quantity is greater than M&I allocation in this water year, however, maximum delivery limited to 75 percent of CVP Contract Total	Public health and safety water quantity is greater than M&I allocation in this water year and less than 75 percent of CVP Contract Total	M&I allocation in this water year is greater than public health and safety water quantity

All values in acre-feet

In years when the M&I CVP allocations are less than 75 percent, water would be re-allocated from the Irrigation CVP water service contractors to provide the additional water to M&I users. There are some years in which allocations to Irrigation CVP water service contractors at or near zero. In those years, the increased allocations to M&I CVP contractors would not be fully realized.

Under Alternative 2A, the second tier would only be offered to M&I water service contractors that provide water to a portion of the manufacturing sector for which nearly no reduction in water use can be tolerated as part of the manufacturing process, such as electronic industries. For the purposes of this EA, it was assumed that 100 percent allocations would be provided for industrial water demand when M&I CVP contract allocations are less than 75 percent. However, the maximum allocations would be limited to 75 percent of the CVP Contract Total. Allocations for the remaining M&I demands would be provided as described under Alternative 1B. This allocation method is summarized in Table 3-6. Figure 3-3 provides a flow chart showing how M&I allocations are calculated under Alternative 2A. Exhibit 3-3 provides examples of applications of Alternatives 2A.

Under Alternative 2B, the second tier would be offered to all M&I water service contractors. For the purposes of this EA, it was assumed that Alternative 2B would attempt to provide up to 100 percent allocation of M&I water demands when M&I CVP contract allocations are less than 75 percent. However, the maximum allocations would be limited to 75 percent of CVP Contract Total. Allocations for the remaining M&I demands would be provided as described under Alternative 1B. This allocation method is summarized in Table 3-7. Figure 3-4 provides a flow chart showing how M&I allocations are calculated under Alternative 2B. Exhibit 3-4 provides examples of applications of Alternative 2B.

ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER CONSIDERATION

During the preparation of this EA, three other alternatives were considered. One of the alternatives would include historical policies based upon provisions in M&I CVP water service contracts that were negotiated in the 1970s. The language in these M&I contracts provided that during a shortage the quantity of water available to CVP contractors would be apportioned among water users capable of receiving water from the same project water supply in a manner that Reclamation deemed equitable and physically possible, provided that the M&I water supplies were not reduced until CVP agricultural water allocations were reduced to 75 percent. At that time, allocations would be reduced in consistent steps between agricultural and M&I water users. This concept could be implemented in the 1970s because several water service contractors had not completely constructed diversion and distribution facilities, and therefore; could not fully utilize the contract water. This alternative is not considered in detail because the alternatives considered in this EA do apportion the water among users that can receive water with a more detailed shortage policy in furtherance of policy purposes.

Another alternative would provide for irrigation and M&I allocations to be reduced concurrently and at the same levels. The minimum M&I allocations would be equivalent to public health and safety levels. This alternative is not considered in detail because the alternatives considered in this EA incorporate this concept to the extent possible in furtherance of policy purposes.

The third alternative provides a minimum water supply level for all existing CVP water service contractors, including agricultural and M&I users, that agree to water rates that are higher than cost of service rates. This alternative is not considered in detail because of the lack of CVP water availability and because this concept was considered and eliminated during the CVPIA Administrative Proposal process.

TABLE 3-6

ALTERNATIVE 2A WATER SHORTAGE ALLOCATIONS

Allocation Step	Allocation to Irrigation Users	Allocation to M&I Users
1	100 percent	100 percent
2	100 to 75 percent	100 percent
3	75 to 70 percent	100 to 95 percent
4	70 to 65 percent	95 to 90 percent
5	65 to 60 percent	90 to 85 percent
6	60 to 55 percent	85 to 80 percent
7	55 to 50 percent	80 to 75 percent
8	50 to 25 percent	75 percent
9	25 to 20 percent[a]	FIRST TIER: The Maximum of: (1) 75 to 70 percent of M&I CVP contract total (2) Public health and safety water quantities up to 75 percent of Contract Total SECOND TIER: Increment of water that when added to the First Tier provides 100 percent of industrial demand **MAXIMUM DELIVERY: 75 percent of Contract Total**
10	20 to 15 percent[a]	FIRST TIER: The Maximum of: (1) 70 to 65 percent of M&I CVP contract total (2) Public health and safety water quantities up to 75 percent of Contract Total SECOND TIER: Increment of water that when added to the First Tier provides 100 percent of industrial demand **MAXIMUM DELIVERY: 75 percent of Contract Total**
11	15 to 10 percent[a]	FIRST TIER: The Maximum of: (1) 65 to 60 percent of M&I CVP contract total (2) Public health and safety water quantities up to 75 percent of Contract Total SECOND TIER: Increment of water that when added to the First Tier provides 100 percent of industrial demand **MAXIMUM DELIVERY: 75 percent of Contract Total**
12	10 to 5 percent[a]	FIRST TIER: The Maximum of: (1) 60 to 55 percent of M&I CVP contract total (2) Public health and safety water quantities up to 75 percent of Contract Total SECOND TIER: Increment of water that when added to the First Tier provides 100 percent of industrial demand **MAXIMUM DELIVERY: 75 percent of Contract Total**
13	5 to 0 percent[a]	FIRST TIER: The Maximum of: (1) 55 to 50 percent of M&I CVP contract total (2) Public health and safety water quantities up to 75 percent of Contract Total SECOND TIER: Increment of water that when added to the First Tier provides 100 percent of industrial demand **MAXIMUM DELIVERY: 75 percent of Contract Total**
14	0 percent[(a)]	FIRST TIER: The Maximum of: (1) 50 percent of M&I CVP contract total (2) Public health and safety water quantities up to 75 percent of Contract Total SECOND TIER: Increment of water that when added to the First Tier provides 100 percent of industrial demand **MAXIMUM DELIVERY: 75 percent of Contract Total**

[a]Allocations to Irrigation CVP contractors will be further reduced within the Water Year to provide public health and safety water quantities to M&I CVP contractors within the same Water Year, provided CVP water is available.

FIGURE 3-3
CALCULATION OF WATER ALLOCATIONS
UNDER ALTERNATIVE 2A FOR
M&I CVP WATER ALLOCATIONS OF LESS THAN 75 PERCENT

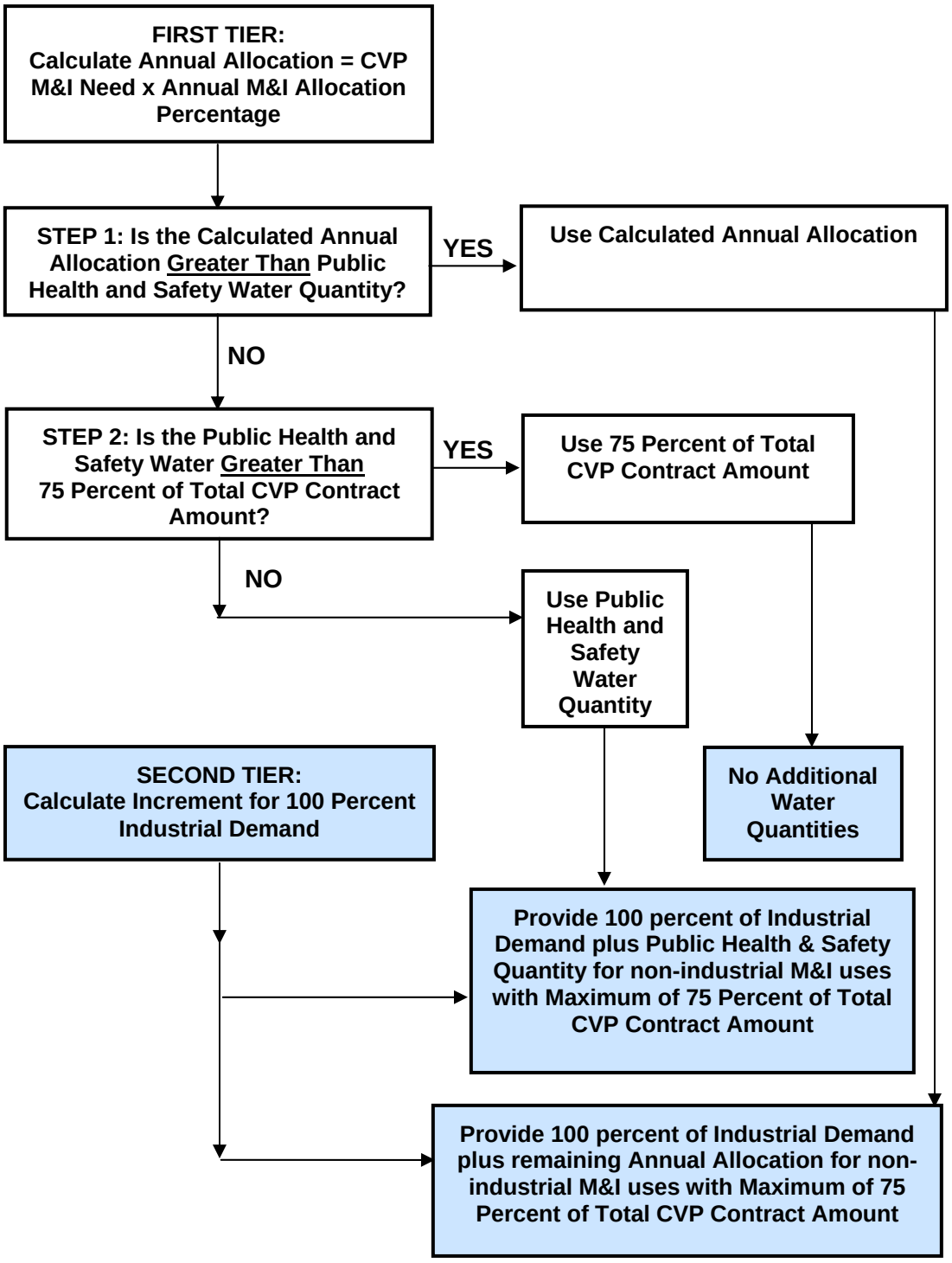


EXHIBIT 3-3

EXAMPLE APPLICATION OF ALTERNATIVE 2A

Three M&I CVP water service contractors were selected for this example to illustrate several scenarios.

EXAMPLE OF ALTERNATIVE 2A FOR WATER YEAR WITH 60 PERCENT M&I CVP WATER ALLOCATION

Items	Santa Clara Valley Water District	City of Avenal	Contra Costa Water District
CVP Contract Total	152,500	3,500	195,000
Total M&I Need from CVP (based on Water Needs Assessment)	130,000	3,500	207,200
Industrial Demand	75,428	57	57,000
Total Public Health and Safety Water Quantity (details presented in Chapter 4 of this EA)	228,957	2,438	91,114
75 percent of CVP Contract Total	114,375	2,625	146,250
60 percent M&I Need	78,000	2,100	117,000
FIRST TIER			
Step 1: Greater of Total Public Health and Safety quantity OR 60 percent Allocation	228,957 Public Health and Safety	2,438 Public Health and Safety	117,000 60 Percent Allocation
Step 2: Lesser of Result of Step 1 OR 75 percent of CVP Contract Total	114,375 75 percent of CVP Contract Total	2,438 Public Health and Safety	117,000 60 Percent Allocation
SECOND TIER			
Additional Water towards 100 percent Industrial Demand	0 75 percent of CVP Contract Total	6 Additional to provide 100 percent of Industrial Demand	22,800 Additional to provide 100 percent of Industrial Demand
TOTAL DELIVERY	114,375	2,444	139,800
Comments	Tier 1: M&I Allocation limited to 75 percent of CVP Contract Total; public health and safety quantity exceeds 75 percent of Contract Total No additional water because maximum delivery limited to 75 percent of CVP Contract Total	Tier 1: Public health and safety quantity is greater than M&I allocation in this water year and less than 75 percent of CVP Contract Total Tier 2 would provide water for 100 percent of industrial demand	Tier 1: M&I Allocation provides 60 percent of M&I Contract Total, including 60 percent of Industrial demand Tier 2 would provide water for 100 percent of industrial demand up to 75 percent of CVP Contract Total

All values in acre-feet

TABLE 3-7

ALTERNATIVE 2B WATER SHORTAGE ALLOCATIONS

Allocation Step	Allocation to Irrigation Users	Allocation to M&I Users
1	100 percent	100 percent
2	100 to 75 percent	100 percent
3	75 to 70 percent	100 to 95 percent
4	70 to 65 percent	95 to 90 percent
5	65 to 60 percent	90 to 85 percent
6	60 to 55 percent	85 to 80 percent
7	55 to 50 percent	80 to 75 percent
8	50 to 25 percent	75 percent
9	25 to 20 percent[a]	FIRST TIER: The Maximum of: (1) 75 to 70 percent of M&I CVP contract amount (2) Public health and safety water quantities up to 75 percent of Contract Total SECOND TIER: Increment of water that when added to First Tier provides 100 percent of total M&I demand **MAXIMUM DELIVERY: 75 percent of Contract Total**
10	20 to 15 percent[a]	FIRST TIER: The Maximum of: (1) 70 to 65 percent of M&I CVP contract amount (2) Public health and safety water quantities up to 75 percent of Contract Total SECOND TIER: Increment of water that when added to First Tier provides 100 percent of total M&I demand **MAXIMUM DELIVERY: 75 percent of Contract Total**
11	15 to 10 percent[a]	FIRST TIER: The Maximum of: (1) 65 to 60 percent of M&I CVP contract amount (2) Public health and safety water quantities up to 75 percent of amount contract SECOND TIER: Increment of water that when added to First Tier provides 100 percent of M&I demand **MAXIMUM DELIVERY: 75 percent of Contract Total**
12	10 to 5 percent[a]	FIRST TIER: The Maximum of: (1) 60 to 55 percent of M&I CVP contract total (2) Public health and safety water quantities up to 75 percent of total amount SECOND TIER: Increment of water that when added to First Tier provides 100 percent of total M&I demand **MAXIMUM DELIVERY: 75 percent of Contract Total**
13	5 to 0 percent[a]	FIRST TIER: The Maximum of: (1) 55 to 50 percent of M&I CVP contract total (2) Public health and safety water quantities up to 75 percent of total amount SECOND TIER: Increment of water that when added to First Tier provides 100 percent of M&I demand **MAXIMUM DELIVERY: 75 percent of Contract Total**
14	0 percent[a]	FIRST TIER: The Maximum of: (1) 50 percent of M&I CVP contract amount (2) Public health and safety water quantities up to 75 percent of Contract Total SECOND TIER: Increment of water that when added to First Tier provides 100 percent of total M&I demand **MAXIMUM DELIVERY: 75 percent of Contract Total**

[a]Allocations to Irrigation CVP contractors will be further reduced within the Water Year to provide public health and safety water quantities to M&I CVP contractors within the same Water Year, provided CVP water is available.

FIGURE 3-4
CALCULATION OF WATER ALLOCATIONS
UNDER ALTERNATIVE 2B FOR
M&I CVP WATER ALLOCATIONS OF LESS THAN 75 PERCENT

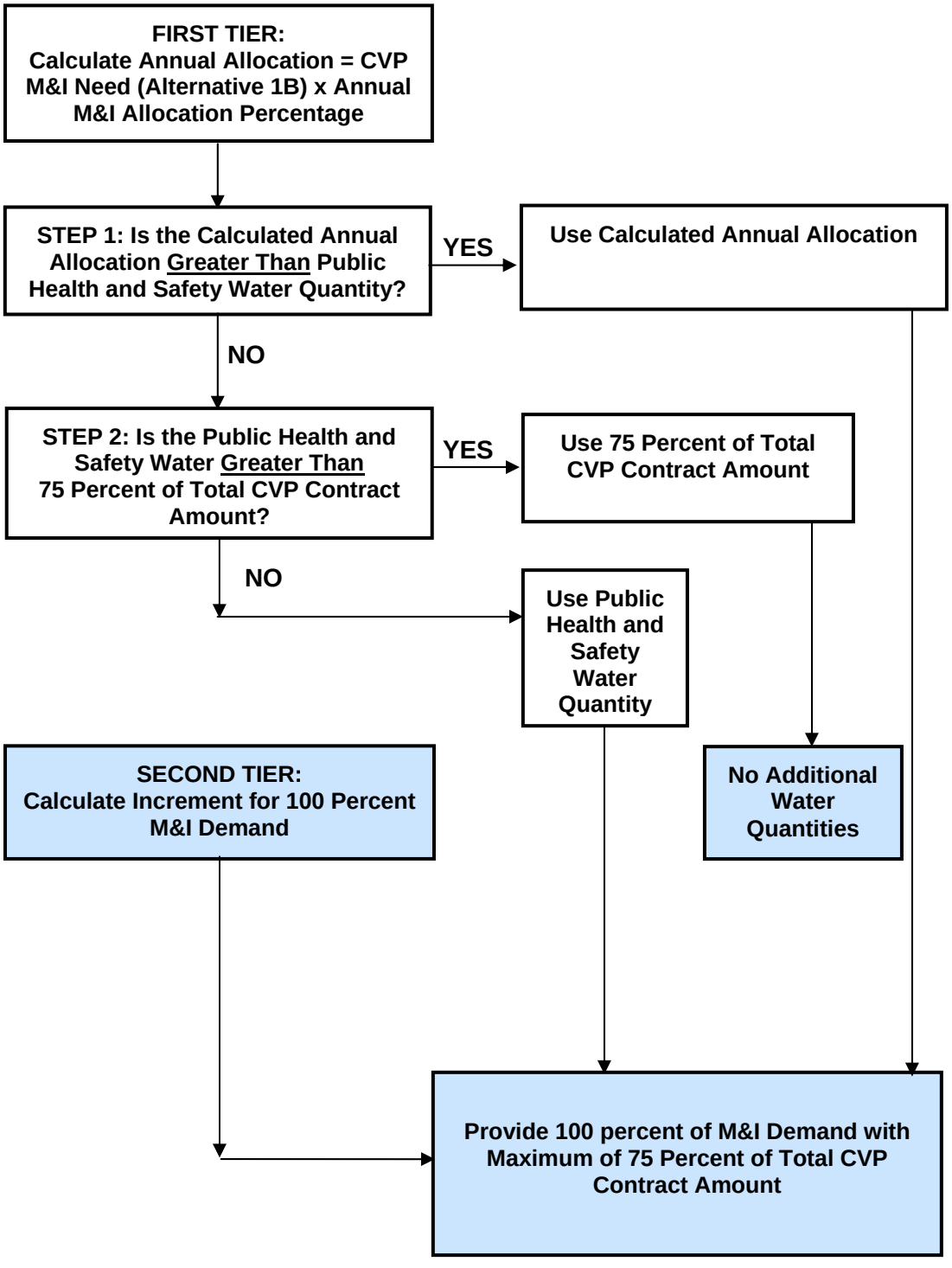


EXHIBIT 3-4
EXAMPLE APPLICATION OF ALTERNATIVE 2B

Three M&I CVP water service contractors were selected for this example to illustrate several scenarios.

EXAMPLE OF ALTERNATIVE 2B FOR WATER YEAR WITH 60 PERCENT M&I CVP WATER ALLOCATION

Items	Santa Clara Valley Water District	Broadview Water District	Contra Costa Water District
CVP Contract Total	152,500	27,000	195,000
Total M&I Need from CVP (based on Water Needs Assessment)	130,000	20	207,200
Total Public Health and Safety Water Quantity (details presented in Chapter 4 of this EA)	228,957	6	91,114
75 percent of CVP Contract Total	114,375	20,250	146,250
60 percent M&I Need	78,000	12	117,000
FIRST TIER			
Step 1: Greater of Total Public Health and Safety quantity OR 60 percent Allocation	228,957 Public Health and Safety	12 Public Health and Safety	117,000 60 Percent Allocation
Step 2: Lesser of Result of Step 1 OR 75 percent of CVP Contract Total	114,375 75 percent of CVP Contract Total	12 75 percent of CVP Contract Total	117,000 60 Percent Allocation
SECOND TIER			
Additional Water towards 100 percent M&I Demand	0	8	29,250
TOTAL DELIVERY	114,375	20	146,250
Comments	Tier 1 M&I Allocation limited to 75 percent of CVP Contract Total; public health and safety quantity exceeds 75 percent of Contract Total No additional water because maximum delivery limited to 75 percent of CVP Contract Total	Tier 1 M&I Allocation is greater than public health and safety water quantity Additional water for M&I demand is equal to 40 percent of M&I demand Delivery less than 75 percent of Total CVP Contract Total	Tier 1 M&I Allocation provides 60 percent of M&I Contract Total Tier 2 would provide water for 100 percent of M&I demand up to 75 percent of CVP Contract Total

All values in acre-feet

SUMMARY OF IMPACT ASSESSMENTS

The alternatives considered in this EA were analyzed to determine the potential for adverse and beneficial impacts associated with their implementation as compared to continuation of the No Action Alternative conditions. The results of this analysis are presented in Chapter 5 of this EA. Changes that would occur during implementation of the alternatives as compared to the No Action Alternative conditions are summarized in Table 3-8.

The Proposed Action, Alternative 1B, represents an alternative that balances environmental benefits, affordability, and technical feasibility. All of the alternatives affect physical and biological resources in a similar manner. The alternatives cause different impacts to economic resources of CVP agricultural water service contractors. Alternative 2B causes the most adverse impacts to agricultural economics.

An effects determination for Alternative 1B with respect to special status species is presented in Attachment D.

TABLE 3-8

IMPACT ASSESSMENT RESULTS

	No Action Alternative	Alternative 1A	Alternative 1B	Alternative 2A	Alternative 2B
Surface Water Resources	CVP water supply allocations in the future will be slightly less than under existing conditions. M&I CVP water service contractors deliveries are less than 75 percent in 13 of the 72 years analyzed in the CALSIM II model used for this EA. Zero deliveries would occur to Irrigation CVP water service contractors in four of the 72 years.	Reductions to Irrigation CVP water service contractors would be from 0 to 2 percent. One additional year with zero deliveries to Irrigation CVP water service contractors for a total of five of the 72 years.	Reductions to Irrigation CVP water service contractors would be from 0 to 3 percent. Two additional years with zero deliveries to Irrigation CVP water service contractors for a total of six of the 72 years.	Reductions to Irrigation CVP water service contractors would be from 0 to 4 percent. Four additional year with zero deliveries to Irrigation CVP water service contractors for a total of eight of the 72 years.	Reductions to Irrigation CVP water service contractors would be from 0 to 5 percent. Four additional year with zero deliveries to Irrigation CVP water service contractors for a total of eight of the 72 years.
Groundwater	It is anticipated that groundwater withdrawals will be increased as municipal growth occurs to directly use groundwater or reduce availability of irrigation water supplies.	Groundwater withdrawals by M&I CVP water service contractors may be reduced in 9 of 72 years under this alternative. Groundwater withdrawals by Irrigation CVP water service contractors may increase unless other water supplies are available or fields are fallowed more frequently.	Similar to Alternative 1A	Similar to Alternative 1A	Similar to Alternative 1A
Municipal and Industrial Land Use and CVP Water Cost	Growth would continue in M&I communities, as described in the county general plans and associated environmental documentation.	No increase in Contract Totals, therefore, no change in land use. Slightly higher allocations of CVP water in drier years. Water supply costs similar to those under the No Action Alternative.	Similar to Alternative 1A	Similar to Alternative 1A with slightly higher allocations of CVP water in drier years.	Similar to Alternative 1A with slightly higher allocations of CVP water in drier years.

TABLE 3-8

IMPACT ASSESSMENT RESULTS

	No Action Alternative	Alternative 1A	Alternative 1B	Alternative 2A	Alternative 2B
Agricultural Land Use and Economics	Increased groundwater withdrawals may increase costs. Cropping patterns of may be modified if adequate water supplies are not available.	Land use would be similar to No Action Alternative. Water supply costs may be higher if additional groundwater or other water supplies are used in drier years. Reduction in farm income during drier years due to more frequent fallowing if additional groundwater is not available	Similar to Alternative 1A.	Similar to Alternative 1A, with higher water supply costs and more frequent occurrence of reduced Irrigation CVP water allocations.	Similar to Alternative 2A.
Fisheries and Wildlife Resources	Growth would continue in M&I communities, as described in the county general plans and associated environmental documentation. The general plans include protection measures for biological resources.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.
Recreation	CVP operations would be similar to those under existing conditions. Therefore, recreational opportunities related to CVP operations would be similar to those under existing conditions.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.
Cultural Resources	CVP operations would be similar to those under existing conditions.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.
Indian Trust Assets	Indian Trust Assets would be the same as under the existing conditions.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.

TABLE 3-8

IMPACT ASSESSMENT RESULTS

	No Action Alternative	Alternative 1A	Alternative 1B	Alternative 2A	Alternative 2B
Air Quality	Growth would continue in M&I communities, as described in the county general plans and associated environmental documentation. The general plans include air quality improvement and protection measures.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.
Soils	Soil conditions would be similar to existing conditions.	No impact as compared to the No Action Alternative for M&I CVP water service contractors. Potential increase in soil salinity in irrigated areas due to increased frequency of fallowing	Similar to Alternative 1A.	Similar to Alternative 1A.	Similar to Alternative 1A.
Visual Resources	Conditions would be similar to existing conditions.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.
Power Resources	Reservoir and power generation operations will continue as described in OCAP 2004.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.

TABLE 3-8

IMPACT ASSESSMENT RESULTS

	No Action Alternative	Alternative 1A	Alternative 1B	Alternative 2A	Alternative 2B
Social Conditions	In the future, M&I communities will continue to grow and agricultural activities may be reduced as lands are converted to accommodate the growth as compared to existing conditions.	Increased deliveries of M&I CVP water supplies may encourage industries to continue to operate in the urban areas. If other water supplies are used by irrigation users, there may be no change in employment. If the frequency of fallowing is increased, employment may be reduced in 9 of 72 years.	Similar to Alternative 1A.	Similar to Alternative 1A	Similar to Alternative 1A.
Environmental Justice	Projections by U.S. Census Bureau and the State of California were used to develop the basis of comparison for Environmental Justice.	Increased deliveries of M&I CVP water supplies may encourage industries to continue to operate in the urban areas. If other water supplies are used by irrigation users, there may be no change in employment. If the frequency of fallowing is increased, employment may be reduced in 9 of 72 years.	Similar to Alternative 1A.	Similar to Alternative 1A	Similar to Alternative 1A.
Secondary Growth Impacts	Growth would continue in M&I communities, as described in the county general plans and associated environmental documentation.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.	No impact as compared to the No Action Alternative.

CHAPTER 4

CENTRAL VALLEY PROJECT MUNICIPAL AND INDUSTRIAL WATER SERVICE CONTRACTORS WATER DEMANDS AND PUBLIC HEALTH AND SAFETY WATER QUANTITIES

CHAPTER 4

Central Valley Project Municipal and Industrial Water Service Contractors Water Demands and Public Health and Safety Water Quantities

INTRODUCTION

This chapter describes the characteristics of the M&I contractors considered in this EA, including existing and projected M&I water demands. This chapter also describes the values and calculations used to identify the public health and safety water quantities used in the impact assessment described in Chapter 5.

The contractors are organized by division starting in the north with the Shasta and Trinity Divisions. A summary of the calculations for the public health and safety water quantities are presented at the end of the descriptions for each water service contractors.

Public Health and Safety Water Quantities for Central Valley Project M&I Water Service Contracts

Residential, commercial, and industrial demands for 2029 were identified through the Water Needs Assessment if detailed analyses were completed. However, detailed analyses were not completed for users with relatively small amounts of M&I water demand, especially for combined irrigation/M&I users. For contractors without detailed Needs Analyses, information from local agency reports was used to define population projections and water demands for residential, commercial, and industrial users. The local agency reports included urban water management plans, general plans, long-term contract renewal draft environmental documentation and draft biological assessments, and studies by Local Area Formation Commission (LAFCO). The assumptions used in the development of public health and safety water quantities are described in Chapter 3 and summarized below.

- **Residential = 50 gallons/capita/day**
- **Commercial = 80 percent of average commercial water demand**
- **Industrial = 90 percent of average industrial water demand**
- **System Losses = 80 percent of identified system losses**

SHASTA AND TRINITY DIVISIONS

The Shasta and Trinity divisions include nine water service contractors, as described below.

Shasta Community Services District

Shasta Community Services District encompasses 6,400 acres west of Redding. This district provides water for municipal uses and fire protection for the town of Shasta and surrounding areas. This district also delivers 10 acre-feet of water to another CVP water service contractor, U.S. Forest Service Centimundi Boat Ramp. CVP water is supplied to the district from Whiskeytown Lake from the Spring Creek Conduit. Due to geological characteristics of this area, groundwater is not available.

The CVP water services contract for this district is for 1,000 acre-feet and is classified as an M&I contract. Reclamation did not complete a detailed Water Needs Assessment for this contract as the quantity of CVP water under contract is below the 2,000 acre-foot threshold established for conducting a Water Needs Assessment. The following information was used to determine the future water demands for this district.

The 2001 "Draft Environmental Assessment for the Long-Term Contract Renewals of Shasta and Trinity Divisions" (Shasta-Trinity LTCR EA) identified 710 connections in the district. The 1998 "Shasta County General Plan, Housing Element" assumed that there were 2.67 persons/household in unincorporated areas of Shasta County. Using these values, it could be calculated that population was about 1,896 in 2000. The 2003 "Redding Basin Water Management Plan, Phase 2C Report" projects a population increase of 206 percent for this district between 2000 and 2025. Using these values, it could be calculated that population would be about 3,905 in 2025.

The CVP water service contract is the only water supply for this district. Unit water rates have not been calculated for this rural residential area. Due to the rural nature of this community, unit water rates may be less than in Bella Vista Water District where unit water rates were calculated by Reclamation as part of the Water Needs Assessment at 257 gallons/capita/day. Unit water rates for this area were calculated assuming complete use of the CVP water in 2025, or 229 gallons/capita/day for residential uses.

Shasta Community Services District CVP Contract: 1,000 acre-feet for M&I

(all values in acre-feet/year unless noted)

2025 Water Demand	Population[a]	Gallons/ capita/day[a]	Total Residential Water Demand	Commercial Water Demand[a]	Industrial Water Demand[a]	System Loss per Needs Assessment	Total M&I Water Demand
	3,905	229	1,000	0	0	0	1,000
Public Health and Safety	**Total Residential @ 50 gallons/ capita/day**	**80% of Commercial**	**90% of Industrial**	**80% of System Loss**	**Total Public Health and Safety water quantity for M&I Demand**	**75% of CVP Contract Total**	**Public Health and Safety water quantity for this EA**
	219	0	0	0	219	750	219

[a] Based on local agency reports

Shasta County Service Area #25 - Keswick County Service Area

Keswick County Service Area encompasses 5,500 acres and provides water for municipal uses and fire protection for the town of Keswick and surrounding areas. Older single-family dwellings on small lots, a fire hall, and very limited commercial development are served by this agency. Newer homes on large lots are located in the eastern area along Rock Creek Road. Water also is provided to a lumber operation on Iron Mountain Road. CVP water is supplied from Whiskeytown Lake from the Spring Creek Conduit. Due to geological characteristics of this area, groundwater is not available.

The CVP water services contract for this district is for 500 acre-feet and is classified as an M&I contract. Reclamation did not complete a detailed Water Needs Assessment for this contract as the quantity of CVP water under contract is below the 2,000 acre-foot threshold established for conducting a Water Needs Assessment. The following information was used to determine the future water demands for this district.

The Shasta-Trinity LTCR EA identified 191 connections in the district. The 1998 "Shasta County General Plan, Housing Element" assumed that there were 2.67 persons/household in unincorporated areas of Shasta County. Using these values, it could be calculated that population was about 510 in 2000. The 2003 "Redding Basin Water Management Plan, Phase 2C Report" projects a population increase of 150 percent for this district between 2000 and 2025. Using these values, it could be calculated that population would be about 765 in 2025.

The CVP water service contract is the only water supply for this district. Unit water rates have not been calculated for this rural residential area. Due to the nature of this community, unit water rates may be similar to those calculated for Bella Vista Water District by Reclamation as part of the Water Needs Assessment, or 257 gallons/capita/day. Therefore, in 2025, the annual water demands for this district would be 220 acre-feet for residential users and 280 acre-feet for commercial users. It is assumed that the industrial water demand is included in the commercial demands.

Shasta County Service Area #25 - Keswick County Service Area CVP Contract: 500 acre-feet for M&I
(all values in acre-feet/year unless noted)

2025 Water Demand	Population[a]	Gallons/ capita/day[a]	Total Residential Water Demand	Commercial Water Demand[a]	Industrial Water Demand[a]	System Loss per Needs Assessment	Total M&I Water Demand
	765	257	220	280	0	0	500
Public Health and Safety	**Total Residential @ 50 gallons/ capita/day**	**80% of Commercial**	**90% of Industrial**	**80% of System Loss**	**Total Public Health and Safety water quantity for M&I Demand**	**75% of CVP Contract Total**	**Public Health and Safety water quantity for this EA**
	43	224	0	0	267	375	267

[a] Based on local agency reports

Bella Vista Water District - not including areas served by Shasta County Water Agency

Bella Vista Water District encompasses 34,016 acres and is located east of Redding and south of Shasta Lake and includes areas around Little Cow Creek, Bella Vista, Palo Cedro, and eastern portions of the community of Redding. The district was formed to provide agricultural water. However, municipal areas are located in the southeast corner of the district. Two colleges in the service area have large irrigation and municipal demands. Agricultural areas are located along Stillwater and Cow creeks. CVP water also is used for fire protection water. CVP water is provided to the district from the Sacramento River through the Wintu Pump Station. The district also uses groundwater wells for about 1,500 acre-feet/year, however the aquifer capacity is limited. The CVP water services contract for this district is for 24,000 acre-feet and is classified as an Irrigation/M&I contract. Bella Vista Water District also obtains up to 578 acre-feet through a CVP water service contract served by Shasta County Water Agency, as described in a subsequent subsection of this chapter

Population projections, water demands, and unit water rates were calculated by the district and Reclamation as part of the Water Needs Assessment. The Water Needs Assessment indicates that the 2025 population would be 52,500 including 488 in the Palo Cedro area served by Shasta County Water Agency, as described below. The 2025 population that can be served directly by the CVP water service contract with Bella Vista Water District would be 52,012 with a unit water rate would be 257 gallons/capita/day and a 2025 demand of 14,974 acre-feet. The Palo Cedro area served by the CVP water service contract with Shasta County Water Agency has a demand of 240 acre-feet. It is assumed that the CVP water service contract with the district can serve 2,000 acre-feet for commercial uses and no water for industrial uses. The Water Needs Assessment also includes 800 acre-feet of system losses for this contract. The M&I demand is 17,774 acre-feet for the area served by the contract with Bella Vista Water District.

The district also has 12,646 acre-feet of water demand for agricultural users. It is assumed that 12,207 acre-feet of this demand can be provided by the CVP contract with Bella Vista Water District. The remaining 439 acre-feet of water demand is located in the Palo Cedro area and can be served by the CVP water service contract with Shasta County Water Agency. Approximately 25 acre-feet/year is transferred out of the Bella Vista Water District.

Bella Vista Water District CVP Contract: 24,000 acre-feet for Irrigation/M&I

(all values in acre-feet/year unless noted)

2025 Water Demand	Population[a]	Gallons/ capita/day[a]	Total Residential Water Demand	Commercial Water Demand[a]	Industrial Water Demand[a]	System Loss per Needs Assessment	Total M&I Water Demand
	52,012	257	14,974	2,000	0	800	17,774
Public Health and Safety	**Total Residential @ 50 gallons/ capita/day**	**80% of Commercial**	**90% of Industrial**	**80% of System Loss**	**Total Public Health and Safety water quantity for M&I Demand**	**75% of CVP Contract Total**	**Public Health and Safety water quantity for this EA**
	2,913	1,600	0	640	5,153	18,000	5,153

[a] Based on local agency reports

Clear Creek Community Services District

Clear Creek Community Services District encompasses 14,314 acres located southwest of Redding and west of the town of Anderson. However only 4,000 acres receives CVP municipal and industrial water. The district serves the rural Happy Valley area, including Olinda and Cloverdale. CVP water is provided to the district from Whiskeytown Lake. The district has one well for emergency and drought purposes.

The CVP water services contract for this district is for 15,300 acre-feet and is classified as an Irrigation/M&I contract. Population projections, water demands, and unit water rates were calculated by the district and Reclamation as part of the Water Needs Assessment. The Water Needs Assessment indicates that the 2025 population would be 20,721 with a unit water rate of 254 gallons/capita/day. The residential water demand for 2025 would be 5,905 acre-feet plus 1,028 acre-feet for commercial uses and no water for industrial uses. The Water Needs Assessment also includes 1,350 acre-feet of system losses for this contract. Clear Creek Community Services District total M&I demand served with the CVP contract is 8,223 acre-feet. The district also has 26,550 acre-feet of water demand for agricultural users.

Clear Creek Community Services District CVP Contract: 15,300 acre-feet for Irrigation/M&I

(all values in acre-feet/year unless noted)

2025 Water Demand	Population[a]	Gallons/ capita/day[a]	Total Residential Water Demand	Commercial Water Demand[a]	Industrial Water Demand[a]	System Loss per Needs Assessment	Total M&I Water Demand
	20,721	254	5,905	1,028	0	1,350	8,283
Public Health and Safety	**Total Residential @ 50 gallons/ capita/day**	**80% of Commercial**	**90% of Industrial**	**80% of System Loss**	**Total Public Health and Safety water quantity for M&I Demand**	**75% of CVP Contract Total**	**Public Health and Safety water quantity for this EA**
	1,161	822	0	1,000	3,063	11,475	3,063

[a] Based on local agency reports

Centerville Community Services District

Shasta County Water Agency assigned 2,900 acre-feet to Centerville Community Services District. Centerville is located along the southwestern border of the City of Redding and consists of residential and commercial connections. The Water Needs Assessment indicates that the 2025 population for this district would be 7,965 with a unit water rate of 357 gallons/capita/day. The residential water demand for 2025 would be 3,185 acre-feet with no water for commercial or industrial uses or system losses.

Centerville Community Services District CVP Contract: 2,900 acre-feet for M&I

(all values in acre-feet/year unless noted)

2025 Water Demand	Population[a]	Gallons/ capita/day[a]	Total Residential Water Demand	Commercial Water Demand[a]	Industrial Water Demand[a]	System Loss per Needs Assessment	Total M&I Water Demand
	7,965	357	3,185	0	0	0	3,185
Public Health and Safety	**Total Residential @ 50 gallons/ capita/day**	**80% of Commercial**	**90% of Industrial**	**80% of System Loss**	**Total Public Health and Safety water quantity for M&I Demand**	**75% of CVP Contract Total**	**Public Health and Safety water quantity for this EA**
	446	0	0	0	446	2,175	446

[a] Based on local agency reports

Shasta County Water Agency - Subcontracts with Bella Vista Water District, Mountain Gate Community Services District, Jones Valley County Service Area #6, Crag View County Service Area #23, Castella County Service Area #3, and Silverthorn/French Gulch School/Shasta Holiday Municipal Water Company

Shasta County Water Agency provides water through wholesale subcontracts to Bella Vista Water District (578 acre-feet), Mountain Gate Community Services District (1,000 acre-feet), Jones Valley County Service Area #6 (190 acre-feet), Crag View County Service Area #23 (119 acre-feet), Castella County Service Area #3 (77 acre-feet), and Silverthorn development/French Gulch School/Shasta Holiday Municipal Water Company (135 acre-feet).

CVP water is directly used by Bella Vista Water District, Mountain Gate Community Services District, Centerville Community Services District, and Silverthorn development/French Gulch School/Shasta Holiday Municipal Water Company. CVP water is purchased by Jones Valley County Service Area #6, Crag View County Service Area #23, and Castella County Service Area #3 to replace water diverted upstream of Shasta Dam in accordance with water rights provisions.

Reclamation did not complete a detailed Water Needs Assessment for this contract as the quantity of CVP water under contract is below the 2,000 acre-foot threshold established for conducting a Water Needs Assessment. The following information includes the results of the Water Needs Assessment and calculated water demands for the other members. CVP water is used for fire protection by most of these agencies.

Bella Vista Water District - Palo Cedro Estates County Service Area No. 8. Palo Cedro Estates uses CVP water from Shasta County Water Agency. This area was initially a separate agency and then annexed to Bella Vista Water District. The service area includes several schools, churches, shopping center, restaurants, and other businesses. The portion of Palo Cedro served by CVP water from Shasta County Water Agency includes 116 parcels, of which 69 were connected in 2003. The estimated population was reported to be 290 in 2003 in a Local Area Formation Commission report. This would be equivalent to 4.2 persons/connection. Using these values, it could be calculated that population would be 488 at build-out which is assumed to occur prior to 2025.

The CVP water service contract is the only water supply for this district. Unit water rates have not been calculated for this rural residential area. Due to the nature of this community, unit water rates may be similar to those calculated for Bella Vista Water District by Reclamation as part of the Water Needs Assessment, or 257 gallons/capita/day. Therefore, the annual water demand for this district would be 140 acre-feet for residential users in 2025. A portion of the water would be used for commercial purposes, however this has not been quantified. The CVP water is also used for fire protection.

Mountain Gate Community Services District. Shasta County Water Agency delivers 1,000 acre-feet of CVP water to a portion of Mountain Gate Community Services District. The district has a separate CVP contract, as described below. Because there does not appear to be specific areas served by Mountain Gate Community Services District with CVP water provided by Shasta County Water Agency, this analysis proportionately allocated needs between the two contracts.

Water demand calculations for Mountain Gate Community Services District are described below. It is assumed that the CVP water service contract water provided by Shasta County Water Agency would be used for a population of 1,000 in 2025. Due to the nature of this community, unit water rates may be similar to those calculated for Bella Vista Water District by Reclamation as part of the Water Needs Assessment, or 257 gallons/capita/day. Therefore, the annual water demand for this district would be 288

acre-feet for residential in 2025. It is also assumed that 500 acre-feet would be used for commercial users and 200 acre-feet for industrial users.

Jones Valley County Service Area No. 6. Jones Valley is located northeast of Redding downstream of Shasta Lake, and is surrounded by National Forest lands and land with extremely steep slopes. This area is located south of the Silverthorn Summer Homes and Silverthorn Resort developments. Jones Valley is a residential community with a fire hall and limited commercial uses. The estimated 2003 population is 950 persons with 581 parcels of which 378 are connected to the water system. Assuming the same density of persons/connection, the build-out population would be 1,460. Due to the nature of this community, unit water rates may be similar to those calculated for Bella Vista Water District by Reclamation as part of the Water Needs Assessment, or 257 gallons/capita/day. Therefore the annual water demand for this district would be 420 acre-feet for residential in 2025.

The sphere of influence also includes Shasta Lake Ranchos with 132 connections. However, this area is not connected to the water system at this time.

Jones Valley also has an appropriative water right for 270 acre-feet on the Sacramento River, for year-round diversion. However, diversions between June 16 and August 31 can only occur if replacement water is made available to downstream water rights holders. Jones Valley uses the 190 acre-feet of CVP water service contract water purchased through Shasta County Water Agency for the replacement water to meet a portion of the 420 acre-feet of water demand.

Crag View County Service Area No. 23. Crag View is located near the Siskiyou County line on the Sacramento River near Castella. Crag View includes 73 parcels, of which 69 were connected to the water system in 2003. The estimated population in this area was reported to be 180 in a Local Area Formation Commission report in 2003. Assuming the same density of persons/connection, the build-out population would be 190. Due to the nature of this community, unit water rates may be similar to those calculated for Bella Vista Water District by Reclamation as part of the Water Needs Assessment, or 257 gallons/capita/day. Therefore, the annual water demand for this district would be 55 acre-feet for residential in 2025.

Crag View County Service Area No. 23 has an appropriative water right on Castle Creek, a tributary of the Sacramento River, for year-round diversion. However, diversions can only occur if replacement water is made available to downstream water rights holders. The Crag View County Service Area No. 23 purchases up to 119 acre-feet of CVP water through Shasta County Water Agency for the replacement water.

Castella County Service Area No. 3. Castella is located 50 miles north of Redding near Siskiyou County. The community includes seasonal (summer) residences, year-round residences, two small grocery stores, a tavern, a beauty shop, an elementary school, and a fire station. There are 111 parcels with 90 connections to the water system. The 2003 population was estimated at 230 by a Local Area Formation Commission report. Assuming the same density of persons/connection, the build-out population would be 284. Due to the nature of this community, unit water rates may be similar to those calculated for Bella Vista Water District by Reclamation as part of the Water Needs Assessment, or 257 gallons/capita/day. Therefore, the annual water demand for this district would be 82 acre-feet for residential use in 2025.

Castella has an appropriative water right for 157 acre-feet on Castle Creek, a tributary of the Sacramento River, for year-round diversion. However, diversions between June 16 and August 31 can only occur if replacement water is made available to downstream water rights holders. Castella purchases 77 acre-feet of CVP water service contract water through Shasta County Water Agency for the replacement water.

Silverthorn, French Gulch School, and Shasta Holiday Mutual Water Company. The Silverthorn Resort area near Jones Valley, French Gulch School in Anderson, and Shasta Holiday mobile home park near Shasta Lake are served CVP water from Shasta County Water Agency. These entities subcontract with Shasta County Water Agency for 135 acre-feet/year of CVP water primarily to serve commercial/institutional users. The water is provided from Shasta Lake or the Sacramento River.

Shasta County Water Agency CVP Contract: 2,100 acre-feet for M&I

(all values in acre-feet/year unless noted)

2025 Water Demand	Population[a]	Gallons/ capita/day[a]	Total Residential Water Demand	Commercial Water Demand[a]	Industrial Water Demand[a]	System Loss per Needs Assessment	Total M&I Water Demand
	3,422	257	986	635	200	0	1,821
Public Health and Safety	**Total Residential @ 50 gallons/ capita/day**	**80% of Commercial**	**90% of Industrial**	**80% of System Loss**	**Total Public Health and Safety water quantity for M&I Demand**	**75% of CVP Contract Total**	**Public Health and Safety water quantity for this EA**
	192	508	180	0	880	1,575	880

[a] Based on local agency reports

Mountain Gate Community Services District

Mountain Gate Community Services District encompasses 4,160 acres. The district provides water to residential areas and the Bay Bridge Resort. The district serves over 593 residential connections, recreational vehicle parks, a cement plant that uses about 200 acre-feet/year, and a rock company that uses about 20 acre-feet/year based upon information provided in the 2001 Shasta-Trinity LTCR EA. CVP water also is used for fire protection. CVP water is provided to the district from Shasta Lake. The district also uses groundwater wells for about 600 acre-feet/year. However the aquifer capacity is limited.

The CVP water services contract for this district is for 350 acre-feet and is classified as an M&I contract. The district also obtains up to 1,000 acre-feet through a CVP water service contract held by Shasta County Water Agency, as described above.

The 2001 Shasta-Trinity LTCR EA identified 593 connections in the district. The 1998 "Shasta County General Plan, Housing Element" assumed that there were 2.67 persons/household in unincorporated areas of Shasta County. Using these values, it could be calculated that population was about 510 in 2000. The 2003 "Redding Basin Water Management Plan, Phase 2C Report" projects a population increase of 140 percent for this district between 2000 and 2025. Using these values, it could be calculated that the population would be about 2,217 in 2025

Because there does not appear to be specific areas served by Mountain Gate Community Services District and Shasta County Water Agency, this analysis proportionately allocated needs to the two contracts. It is assumed that in 2025 1,217 persons would be served by the CVP water service contract with the district and 1,000 persons would be served by the CVP water service contract with Shasta County Water Agency.

The CVP water service contract is the only water supply for this district. Unit water rates have not been calculated for this rural residential area. Due to the nature of this community, unit water rates may be similar to those calculated for Bella Vista Water District by Reclamation as part of the Water Needs Assessment, or 257 gallons/capita/day. The annual water demand for this district would be 350 acre-feet for residential users in 2025. It is assumed that the commercial and industrial users and the remaining residential users are served by water from the CVP contract under Shasta County Water Agency.

Mountain Gate Community Services District CVP Contract: 350 acre-feet for M&I

(all values in acre-feet/year unless noted)

2025 Water Demand	Population[a]	Gallons/ capita/day[a]	Total Residential Water Demand	Commercial Water Demand[a]	Industrial Water Demand[a]	System Loss per Needs Assessment	Total M&I Water Demand
	1,217	257	350	0	0	0	350
Public Health and Safety	**Total Residential @ 50 gallons/ capita/day**	**80% of Commercial**	**90% of Industrial**	**80% of System Loss**	**Total Public Health and Safety water quantity for M&I Demand**	**75% of CVP Contract Total**	**Public Health and Safety water quantity for this EA**
	68	0	0	0	68	263	68

[a] Based on local agency reports

City of Shasta Lake

The City of Shasta Lake encompasses 7,785 acres. Water users in the city include residential and commercial uses and several industrial parks with industries such as Knauf Fiber Glass. One of the industries, the lumber mill, relies upon groundwater and does not use CVP water service contract water. The CVP water service contract water is delivered from Shasta Lake.

The city also delivers a portion of the water under CVP water service contract to the Buckeye portion of the City of Redding. Groundwater is not considered a reliable source. Therefore, during periods of shortage, the City of Shasta Lake has purchased up to 240 acre-feet of water from Centerville Community Services District for short-term uses.

The CVP water services contract for the city is for 4,400 acre-feet and is classified as an M&I contract. Population projections, water demands, and unit water rates were calculated by the city and Reclamation as part of the Water Needs Assessment. The Water Needs Assessment indicates that the 2025 population would be 14,720 with a unit water rate of about 182 gallons/capita/day. The residential water demand for 2025 would be 3,007 acre-feet plus 1,035 acre-feet/year for commercial uses and 475 acre-feet/year for industrial uses. The Water Needs Assessment also includes 830 acre-feet of system losses for this contract. The total M&I demand that can be served with the CVP contract with the city is 5,347 acre-feet in 2025.

City of Shasta Lake CVP Contract: 4,400 acre-feet for M&I

(all values in acre-feet/year unless noted)

2025 Water Demand	Population[a]	Gallons/ capita/day[a]	Total Residential Water Demand	Commercial Water Demand[a]	Industrial Water Demand[a]	System Loss per Needs Assessment	Total M&I Water Demand
	14,720	182	3,007	1,035	475	830	5,347
Public Health and Safety	**Total Residential @ 50 gallons/ capita/day**	**80% of Commercial**	**90% of Industrial**	**80% of System Loss**	**Total Public Health and Safety water quantity for M&I Demand**	**75% of CVP Contract Total**	**Public Health and Safety water quantity for this EA**
	824	828	428	664	2,744	3,300	2,744

[a] Based on local agency reports

City of Redding

In 1967, the City of Redding annexed Buckeye County Water District. The district had a CVP water service contract for 6,140 acre-feet to serve the Buckeye and Summit City zones. The Buckeye Zone encompasses 17,220 acres. The Summit City Zone encompasses 640 acres. The Buckeye and Summit City zones are located where there is no groundwater.

The overall City of Redding service area includes 59,044 acres. The California Department of Water Resources data for 1994 indicated that there were 18,643 single family and 456 multiple family connections in Redding with a population of about 72,000. Using these values, there were approximately 3.8 persons/ water connection.

The water is diverted from the Sacramento River. The city also diverts up to 21,000 acre-feet of water under a water rights settlement contract with Reclamation. Wellfields in the city provide up to 6,608 acre-feet of groundwater, as calculated by the city and Reclamation as part of the Water Needs Assessment.

The CVP water services contract for the city is for 6,140 acre-feet and is classified as an M&I contract. Population projections, water demands, and unit water rates were calculated by the city and Reclamation as part of the Water Needs Assessment. The Water Needs Assessment indicates that the 2020 population for the city would be 108,326 with a unit water rate of about 158.7 gallons/capita/day. The residential water demand for 2020 would be 19,260 acre-feet/year for all of the City of Redding. The Water Needs Assessment indicated that the commercial and industrial water demands in 2020 would be 12,280 acre-feet/year and 660 acre-feet/year, respectively, and there would be 1,000 acre-feet/year in system losses. The total M&I water demand is projected to be 33,200 acre-feet for all of the City of Redding for 2020.

The Buckeye and Summit City zones have 4,179 and 58 connections, respectively. These zones are not anticipated by the City planning documents to support extensive growth. Assuming 3.8 persons/water connection, as described above, the CVP water service contract water would serve about 16,100 persons in 2020.

City of Redding CVP Contract: 6,140 acre-feet for M&I

(all values in acre-feet/year unless noted)

2025 Water Demand	Population[a]	Gallons/ capita/day[a]	Total Residential Water Demand	Commercial Water Demand[a]	Industrial Water Demand[a]	System Loss per Needs Assessment	Total M&I Water Demand
	108,326	158.7	19,260	12,280	660	1,000	33,200
Public Health and Safety	**Total Residential @ 50 gallons/ capita/day**	**80% of Commercial**	**90% of Industrial**	**80% of System Loss**	**Total Public Health and Safety water quantity for M&I Demand**	**75% of CVP Contract Total**	**Public Health and Safety water quantity for this EA**
	6,067	9,824	594	800	17,285	4,605	4,605

[a] Based on local agency reports

U.S. Forest Service - Centimundi Boat Ramp

The U.S. Forest Service uses 10 acre-feet/year for the Centimundi Boat Ramp. This water is delivered by Shasta Community Services District, as described above. The CVP water services contract for the U.S. Forest Service is for 10 acre-feet and is classified as an M&I contract. Reclamation did not complete a detailed Water Needs Assessment for this contract as the quantity of CVP water under contract is below the 2,000 acre-foot threshold established for conducting a Water Needs Assessment.

U.S. Forest Service - Centimundi Boat Ramp CVP Contract: 10 acre-feet for M&I

(all values in acre-feet/year unless noted)

2025 Water Demand	Population [a]	Gallons/capita/day [a]	Total Residential Water Demand	Commercial Water Demand [a]	Industrial Water Demand [a]	System Loss per Needs Assessment	Total M&I Water Demand
	0	0	0	10	0	0	10
Public Health and Safety	**Total Residential @ 50 gallons/ capita/day**	**80% of Commercial**	**90% of Industrial**	**80% of System Loss**	**Total Public Health and Safety water quantity for M&I Demand**	**75% of CVP Contract Total**	**Public Health and Safety water quantity for this EA**
	0	8	0	0	8	8	8

[a] Based on local agency reports

SACRAMENTO RIVER DIVISION

The Sacramento River Division includes five water service contractors. The surface water operations for the contractors are described below.

Colusa County Water District

Colusa County Water District encompasses 40,661 acres north of Dunnigan in Colusa and Yolo counties. The district primarily serves agricultural lands. The primary crops are almonds and field crops. Municipal water use is primarily for the Arbuckle Golf Course and 36 acres of nurseries.

The district obtains water from the Tehama-Colusa Canal under a 62,200 acre-foot CVP water service contract for irrigation/M&I. The district also has a subcontract with the County of Colusa for delivery up to 5,965 acre-feet. About 22,000 acre-feet of groundwater is used within the district. The district also anticipates purchasing 25,000 acre-feet from Westside Water District each year.

Due to the relative small volume of water for M&I users, the district and Reclamation only completed the Water Needs Assessment for the agricultural users. It is assumed that there is no CVP water service contract water used for populations and 150 acre-feet/year is used for nurseries and other commercial uses.

Colusa County Water District CVP Contract: 62,200 acre-feet for Irrigation/M&I

(all values in acre-feet/year unless noted)

2025 Water Demand	Population[a]	Gallons/ capita/day[a]	Total Residential Water Demand	Commercial Water Demand[a]	Industrial Water Demand[a]	System Loss per Needs Assessment	Total M&I Water Demand
	0	0	0	0	150	0	150
Public Health and Safety	**Total Residential @ 50 gallons/ capita/day**	**80% of Commercial**	**90% of Industrial**	**80% of System Loss**	**Total Public Health and Safety water quantity for M&I Demand**	**75% of CVP Contract Total**	**Public Health and Safety water quantity for this EA**
	0	0	120	0	120	46,650	120

[a] Based on local agency reports

County of Colusa

County of Colusa provides water to Stonyford for restaurants, a gas station, associated residential units, and a timber industry. The primary activity in this town is to support recreational activities in the area. Therefore, the peak water use occurs during the summer months beginning with Memorial Day through and including Labor Day.

Water is delivered from Black Butte Reservoir to Stonyford under a 40 acre-foot CVP water service contract for M&I uses. Reclamation did not complete a detailed Water Needs Assessment for this contract as the quantity of CVP water under contract is below the 2,000 acre-foot threshold established for conducting a Water Needs Assessment. The following information was used to determine the future water demands for this district.

The 2001 "Draft Environmental Assessment for the Long-Term Contract Renewals of West Sacramento Canals Water Districts" (Sacramento LTCR EA) identified a population of 20 in Stonyford. It is assumed that there would not be significant growth by 2025.

The CVP water service contract is the only water supply for the County of Colusa. Unit water rates have not been calculated for Stonyford. Due to the nature of this community, unit water rates may be similar to those calculated for Bella Vista Water District by Reclamation as part of the Water Needs Assessment, or 257 gallons/capita/day. Therefore, in 2025, the annual water demands for this community would be six acre-feet for residential users. It is anticipated that one acre-foot would be used for commercial users and the remaining 33 acre-feet would be used by the industry.

County of Colusa CVP Contract: 40 acre-feet for M&I

(all values in acre-feet/year unless noted)

2025 Water Demand	Population[a]	Gallons/ capita/day[a]	Total Residential Water Demand	Commercial Water Demand[a]	Industrial Water Demand[a]	System Loss per Needs Assessment	Total M&I Water Demand
	20	257	6	1	33	0	40
Public Health and Safety	**Total Residential @ 50 gallons/ capita/day**	**80% of Commercial**	**90% of Industrial**	**80% of System Loss**	**Total Public Health and Safety water quantity for M&I Demand**	**75% of CVP Contract Total**	**Public Health and Safety water quantity for this EA**
	1	1	30	0	32	30	30

[a] Based on local agency reports

Whitney Construction

Whitney Construction (formerly Louisiana-Pacific) is located in Glenn County and is a forestry industry. Water is delivered from Black Butte Reservoir under a 25 acre-foot CVP water service contract for M&I uses. Reclamation did not complete a detailed Water Needs Assessment for this contract as the quantity of CVP water under contract is below the 2,000 acre-foot threshold established for conducting a Water Needs Assessment. The CVP water service contract is the only water supply for this contractor. The water supply is for industrial uses only.

Whitney Construction CVP Contract: 23 acre-feet for M&I

(all values in acre-feet/year unless noted)

2025 Water Demand	Population[a]	Gallons/ capita/day[a]	Total Residential Water Demand	Commercial Water Demand[a]	Industrial Water Demand[a]	System Loss per Needs Assessment	Total M&I Water Demand
	0	0	0	0	25	0	25
Public Health and Safety	**Total Residential @ 50 gallons/ capita/day**	**80% of Commercial**	**90% of Industrial**	**80% of System Loss**	**Total Public Health and Safety water quantity for M&I Demand**	**75% of CVP Contract Total**	**Public Health and Safety water quantity for this EA**
	0	0	23	0	23	19	19

[a] Based on local agency reports

Elk Creek Community Services District

The Elk Creek Community Services District provides water to Elk Horn Lodge, Elk Creek School, and a gas station. Water is delivered from Black Butte Reservoir under a 100 acre-foot CVP water service contract for M&I uses. Reclamation did not complete a detailed Water Needs Assessment for this contract as the quantity of CVP water under contract is below the 2,000 acre-foot threshold established for conducting a Water Needs Assessment. It is assumed that the need is 15 acre-feet based on information provided by the district in 1994. It also is assumed that the entire Contract Total is used for commercial users.

Elk Creek Community Services District CVP Contract: 100 acre-feet for M&I

(all values in acre-feet/year unless noted)

2025 Water Demand	Population[a]	Gallons/ capita/day[a]	Total Residential Water Demand	Commercial Water Demand[a]	Industrial Water Demand[a]	System Loss per Needs Assessment	Total M&I Water Demand
	0	0	0	15	0	0	15
Public Health and Safety	**Total Residential @ 50 gallons/ capita/day**	**80% of Commercial**	**90% of Industrial**	**80% of System Loss**	**Total Public Health and Safety water quantity for M&I Demand**	**75% of CVP Contract Total**	**Public Health and Safety water quantity for this EA**
	0	12	0	0	12	75	12

[a] Based on local agency reports

U.S. Forest Service

The CVP water service contract water is used in Glenn County for a conservation camp. Water is delivered from Black Butte Reservoir under a 45 acre-foot CVP water service contract for M&I uses. Reclamation did not complete a detailed Water Needs Assessment for this contract as the quantity of CVP water under contract is below the 2,000 acre-foot threshold established for conducting a Water Needs Assessment. It is assumed that the entire Contract Total is used for commercial users.

U.S. Forest Service CVP Contract: 45 acre-feet for M&I

(all values in acre-feet/year unless noted)

2025 Water Demand	Population[a]	Gallons/ capita/day[a]	Total Residential Water Demand	Commercial Water Demand[a]	Industrial Water Demand[a]	System Loss per Needs Assessment	Total M&I Water Demand
	0	0	0	0	45	0	45
Public Health and Safety	**Total Residential @ 50 gallons/ capita/day**	**80% of Commercial**	**90% of Industrial**	**80% of System Loss**	**Total Public Health and Safety water quantity for M&I Demand**	**75% of CVP Contract Total**	**Public Health and Safety water quantity for this EA**
	0	0	36	0	36	34	34

[a] Based on local agency reports

AMERICAN RIVER DIVISION

The American River Division includes eight water service contractors. The surface water operations for the contractors are described below.

El Dorado Irrigation District

El Dorado Irrigation District serves water to 139,000 acres of El Dorado County. El Dorado Irrigation District serves CVP water in some areas and local water rights water in other areas. The CVP water service contract water is provided for El Dorado Hills and Lake Hills Estate near Folsom Lake. The El Dorado Hills and Lake Hills Estate areas are primarily residential with some commercial and office parks.

Until 2004, water from Jenkinson Lake was provided by the CVP. However, this facility and the water rights have been transferred to El Dorado Irrigation District. Water rights from Folsom Lake are used in El Dorado Hills, Cameron Park, Shingle Springs, and Monte Vista near Folsom Lake. In the future, the district will receive water under a CVP contract authorized for El Dorado County Water Agency under PL 101-514. However, the environmental documentation for this contract are being developed and are not evaluated in this EA.

The CVP water services contract for the district is 7,550 acre-feet and is classified as an M&I contract. Population projections, water demands, and unit water rates were calculated by the district and Reclamation as part of the Water Needs Assessment. The Water Needs Assessment indicates that the 2025 population for the entire district would be 177,802 with a unit water rate of about 170.1 gallons/capita/day. The residential water demand for 2025 would be 26,811 acre-feet/year for all of the district. The Water Needs Assessment indicated that the commercial and industrial water demands in 2025 would be 33,870 acre-feet/year and 335 acre-feet/year, respectively, and there would be 7,484 acre-feet/year in system losses. The total M&I water demand would be 40,956 acre-feet for all of the district for 2025. The total agricultural water demand for the district would be 19,071 acre-feet/year. The total water demand for the district would be 24,466 acre-feet/year in 2025.

El Dorado Hills and Lake Hills Estates is projected to include a population of 39,633 in 2025 based upon information developed for the 2004 El Dorado County General Plan. Assuming the unit water rate developed for the district, the residential water demand would be 7,550 acre-feet. The commercial water demand is assumed to be 7,903 acre-feet based upon information presented in the General Plan. There are no industrial water uses in this area and system losses are assumed to be included in the other water demands.

El Dorado Irrigation District CVP Contract: 7,550 acre-feet for M&I

(all values in acre-feet/year unless noted)

2025 Water Demand	Population[a]	Gallons/ capita/day[a]	Total Residential Water Demand	Commercial Water Demand[a]	Industrial Water Demand[a]	System Loss per Needs Assessment	Total M&I Water Demand
	39,633	170.1	7,550	7,903	0	0	15,453
Public Health and Safety	**Total Residential @ 50 gallons/ capita/day**	**80% of Commercial**	**90% of Industrial**	**80% of System Loss**	**Total Public Health and Safety water quantity for M&I Demand**	**75% of CVP Contract Total**	**Public Health and Safety water quantity for this EA**
	2,220	6,322	0	0	8,542	5,663	5,663

[a] Based on local agency reports

City of Roseville

The City of Roseville extends over approximately 19,789 acres. A 1990 land use inventory indicated that about 21 percent of the land that uses water was residential, four percent was commercial, six percent was industrial, 12 percent was urban reserve, and 57 percent was public lands and vacant lands. The Roseville 1992 General Plan Update projected land use in 2010 for the land that uses water to be 34 percent residential, 13 percent commercial, 15 percent industrial, 22 percent urban reserve, and 16 percent public lands and vacant lands.

The City of Roseville has CVP water contract for up to 32,000 acre-feet/year for M&I purposes. Groundwater supplies are extremely limited in Roseville due to the geological formations. However, during emergencies, such as drought periods, groundwater may be used for a limited time period. Roseville also contracts with Placer County Water Agency to deliver 10,000 acre-feet.

Population projections, water demands, and unit water rates were calculated by the city and Reclamation as part of the Water Needs Assessment. The Water Needs Assessment indicates that the 2025 population would be 120,000 with a unit water rate of about 207 gallons/capita/day. The residential water demand for 2025 would be 27,779 acre-feet/year. The Water Needs Assessment indicated that the commercial and industrial water demands in 2025 would be 16,163 acre-feet/year and 6,566 acre-feet/year, respectively, and there would be 4,392 acre-feet/year in system losses. The total M&I water demand would be 54,900 acre-feet in 2025. There are no agricultural water demands projected for 2025.

City of Roseville CVP Contract: 32,000 acre-feet for M&I

(all values in acre-feet/year unless noted)

2025 Water Demand	Population[a]	Gallons/ capita/day[a]	Total Residential Water Demand	Commercial Water Demand[a]	Industrial Water Demand[a]	System Loss per Needs Assessment	Total M&I Water Demand
	120,000	207	27,779	16,163	6,566	4,392	54,900
Public Health and Safety	**Total Residential @ 50 gallons/ capita/day**	**80% of Commercial**	**90% of Industrial**	**80% of System Loss**	**Total Public Health and Safety water quantity for M&I Demand**	**75% of CVP Contract Total**	**Public Health and Safety water quantity for this EA**
	6,721	12,930	5,900	3,514	29,066	24,000	24,000

[a] Based on local agency reports

San Juan Water District

San Juan Water District provides water for Fair Oaks Water District, the Orange Vale Water Company, Citrus Heights Water District, the Ashland area of Folsom, and adjacent unincorporated areas.

The district has a CVP water service contract for 24,200 acre-feet for M&I users. The district also has a water right of 33,000 acre-feet. San Juan Water District also conveys 25,000 acre-feet for Placer County Water Agency to portions of Placer County that cannot be easily served through Placer County Water Agency facilities. Groundwater resources are not adequate for water supply within the San Juan Water District near the City of Folsom. However, groundwater resources are located within the boundaries of Orange Vale Water Company, Fair Oaks Water District, Citrus Heights Water District, and Northridge Water District. The district uses about 5,700 acre-feet/year for groundwater recharge.

The portion of Sacramento County served by San Juan Water District extends over approximately 20,420 acres. A 1991 land use inventory indicated that of the land that uses water 71 percent was residential, six percent was commercial, less than 0.5 percent was industrial, 10.5 percent was urban reserve, and 12 percent was public lands and vacant lands.

Population projections, water demands, and unit water rates were calculated by the district and Reclamation as part of the Water Needs Assessment. The Water Needs Assessment indicates that the 2025 population would be 214,234 with a unit water rate of about 244 gallons/capita/day. The residential water demand for 2025 would be 58,616 acre-feet/year. The Water Needs Assessment indicated that the commercial water demands in 2025 would be 11,896 acre-feet/year, and there would be 6,120 acre-feet/year in system losses. There would be no industrial water demands. The total M&I water demand would be 76,632 acre-feet in 2025. There are no agricultural water demands projected for 2025.

San Juan Water District CVP Contract: 24,200 acre-feet for M&I

(all values in acre-feet/year unless noted)

2025 Water Demand	Population[a]	Gallons/ capita/day[a]	Total Residential Water Demand	Commercial Water Demand[a]	Industrial Water Demand[a]	System Loss per Needs Assessment	Total M&I Water Demand
	214,234	244	58,616	11,896	0	6,120	76,632
Public Health and Safety	**Total Residential @ 50 gallons/ capita/day**	**80% of Commercial**	**90% of Industrial**	**80% of System Loss**	**Total Public Health and Safety water quantity for M&I Demand**	**75% of CVP Contract Total**	**Public Health and Safety water quantity for this EA**
	11,999	9,517	0	4,896	26,412	18,150	18,150

[a] Based on local agency reports

Sacramento County Water Agency

Sacramento County Water Agency provides CVP water as authorized under PL 101-514 to Zone 40 and through a subcontract with the City of Folsom. Both areas are characterized by extensive residential and commercial areas with specific industrial users.

Zone 40 has historically relied upon groundwater to serve municipal users in an unincorporated area located south of the City of Sacramento. The CVP contract provides up to 15,000 acre-feet of CVP water for M&I uses. Water is currently provided through an exchange agreement with the City of Sacramento through a diversion at the Fairbairn Water Treatment Plant on the American River. In the future, water will be diverted from the Sacramento River near Freeport. An additional 30,000 acre-feet of CVP water service contract water is planned to be assigned to Zone 40 from Sacramento Municipal Utility District, as described below. During drier years, Sacramento County Water Agency would increase groundwater use based upon a future conjunctive use program.

The City of Folsom provides water rights water to municipal users throughout the city. The CVP water is for 7,000 acre-feet of M&I uses in the southeastern portion of the city. All water for Folsom is delivered from the American River at Folsom Lake. Groundwater resources are not readily available in the Folsom area.

Population projections, water demands, and unit water rates were calculated by the agency and Reclamation as part of the Water Needs Assessment. The Water Needs Assessment indicates that the 2025 population for Sacramento County Water Agency's use of CVP water (including Zone 40 and the City of Folsom) would be 411,815 with a unit water rate of about 204 gallons/capita/day. The residential water demand for 2025 would be 63,605 acre-feet/year. The Water Needs Assessment indicated that the commercial and industrial water demands in 2025 would be 17,076 and 9,200 acre-feet/year, respectively, and there would be 3,673 acre-feet/year in system losses. The total M&I water demand would be 93,554 acre-feet in 2025. There are no agricultural water demands projected for 2025.

Sacramento County Water Agency CVP Contract: 22,000 acre-feet for M&I

(all values in acre-feet/year unless noted)

2025 Water Demand	Population[a]	Gallons/ capita/day[a]	Total Residential Water Demand	Commercial Water Demand[a]	Industrial Water Demand[a]	System Loss per Needs Assessment	Total M&I Water Demand
	411,815	204	63,605	17,076	9,200	3,673	93,554
Public Health and Safety	**Total Residential @ 50 gallons/ capita/day**	**80% of Commercial**	**90% of Industrial**	**80% of System Loss**	**Total Public Health and Safety water quantity for M&I Demand**	**75% of CVP Contract Total**	**Public Health and Safety water quantity for this EA**
	23,066	13,661	8,280	2,938	47,945	39,000	39,000

[a] Based on local agency reports

Placer County Water Agency

Placer County Water Agency provides water service to municipal users in western and central Placer County. The agency has 220,400 acre-feet in water rights on the American River. Approximately 84,000 acre-feet of water rights is either delivered by other agencies due to proximity of facilities or sold to other agencies to serve users within or adjacent to Placer County. The agency signed a recent CVP Amendatory Contract for water service contract water from the American River for 35,000 acre-feet of water for M&I purposes. This water is not currently delivered but will be used prior to 2025.

Population projections, water demands, and unit water rates were calculated by the agency and Reclamation as part of the Water Needs Assessment. The Water Needs Assessment indicates that the 2025 population for the agency would be 199,569 with a unit water rate of about 204 gallons/capita/day. The residential water demand for 2025 would be 45,500 acre-feet/year. The Water Needs Assessment indicated that the commercial and industrial water demands in 2025 would be 14,000 and 10,000 acre-feet/year, respectively, and there would be 5,000 acre-feet/year in system losses. The total M&I water demand would be 74,500 acre-feet in 2025. The agricultural water demands would be 81,867 acre-feet for 2025. The total water demand for the agency in 2025 would be 156,187 acre-feet.

Placer County Water Agency CVP Contract: 35,000 acre-feet for M&I

(all values in acre-feet/year unless noted)

2025 Water Demand	Population[a]	Gallons/ capita/day[a]	Total Residential Water Demand	Commercial Water Demand[a]	Industrial Water Demand[a]	System Loss per Needs Assessment	Total M&I Water Demand
	199,569	204	45,500	14,000	10,000	5,000	74,500
Public Health and Safety	**Total Residential @ 50 gallons/ capita/day**	**80% of Commercial**	**90% of Industrial**	**80% of System Loss**	**Total Public Health and Safety water quantity for M&I Demand**	**75% of CVP Contract Total**	**Public Health and Safety water quantity for this EA**
	11,178	11,200	9,000	4,000	35,378	26,250	26,250

[a] Based on local agency reports

Sacramento Municipal Utility District

Sacramento Municipal Utility District uses the CVP water service contract water at the Rancho Seco Power Plant site. The power plant site initially was planned to use 75,000 acre-feet/year. The water demand was to be provided by 15,000 acre-feet of water rights provided from the City of Sacramento and a 60,000 acre-foot CVP water service contract water. However, the power plant site is being modified to eliminate the nuclear generation plant and utilize fossil fuel. The projected 2025 water demand is 33,942 acre-feet. The water rights will continue to be used to provide 15,000 acre-feet. 30,000 acre-feet is to be assigned to Sacramento County Water Agency. Groundwater resources are not adequate for water supply for the Rancho Seco site.

Water demands and unit water rates were calculated by the district and Reclamation as part of the Water Needs Assessment.

Sacramento Municipal Utility District CVP Contract: 15,000 acre-feet for M&I

(all values in acre-feet/year unless noted)

2025 Water Demand	Population[a]	Gallons/ capita/day[a]	Total Residential Water Demand	Commercial Water Demand[a]	Industrial Water Demand[a]	System Loss per Needs Assessment	Total M&I Water Demand
	0	0	0	0	33,942	0	33,942
Public Health and Safety	**Total Residential @ 50 gallons/ capita/day**	**80% of Commercial**	**90% of Industrial**	**80% of System Loss**	**Total Public Health and Safety water quantity for M&I Demand**	**75% of CVP Contract Total**	**Public Health and Safety water quantity for this EA**
	0	0	30,548	0	30,548	11,250	11,250

[a] Based on local agency reports

East Bay Municipal Utility District

Under the terms of the current CVP Amendatory Contract for East Bay Municipal Utility District, the CVP water service Contract Total would 150,000 acre-feet to be delivered below the confluence of the American and Sacramento rivers near Freeport, in accordance with the limitations described below. This is considered a dry year water supply and is provided with the following specific conditions under Reclamation's water rights for the American River near Freeport.

> "At Freeport on the Sacramento River, their contract shall be entitled to take delivery of up to a total of 133,000 acre-feet of Project Water for M&I purposes in any Year in which the Contractor's March 1 forecast of its October 1 Total System Storage, as revised monthly through May 1 is less than 500,000 acre-feet based on a 50 percent (50 %) exceedance, or any different reasonable exceedance used by the Contractor to declare rationing within the Contractor's Water Service Area, or as otherwise agreed to by the parties (referred to as the TSS forecast). Said entitlement shall not exceed a total of 165,000 acre-feet of Water delivered in any three consecutive Year period that the Contractor's Total System Storage forecast remains below 500,000 acre-feet."

The CVP water service contract is a dry year supply to improve water supply allocations for the district from the primary water supply, the Mokelumne River. In critical dry years, there is approximately 80,000 acre-feet of water available on the Mokelumne River for the district.

Population projections, water demands, and unit water rates were calculated by the district and Reclamation as part of the Water Needs Assessment. The Water Needs Assessment indicates that the 2025 population for the district would be 1,317,000 with a unit water rate of about 72 gallons/capita/day. The residential water demand for 2025 would be 106,100 acre-feet/year. The Water Needs Assessment indicated that the commercial and industrial water demands in 2025 would be 40,300 and 25,700 acre-feet/year, respectively, and there would be 21,000 acre-feet/year in system losses. The total M&I water demand would be 193,200 acre-feet in 2025. There are no agricultural water demands.

East Bay Municipal Utility District CVP Contract: 133,000 acre-feet for M&I

(all values in acre-feet/year unless noted)

2025 Water Demand	Population[a]	Gallons/ capita/day[a]	Total Residential Water Demand	Commercial Water Demand[a]	Industrial Water Demand[a]	System Loss per Needs Assessment	Total M&I Water Demand
	1,317,000	72	106,100	40,300	25,700	21,000	193,200
Public Health and Safety	**Total Residential @ 50 gallons/ capita/day**	**80% of Commercial**	**90% of Industrial**	**80% of System Loss**	**Total Public Health and Safety water quantity for M&I Demand**	**75% of CVP Contract Total**	**Public Health and Safety water quantity for this EA**
	73,766	32,240	23,130	16,880	146,016	99,750 if contract allowed delivery	Limited by contract - as described above

[a] Based on local agency reports

EASTSIDE DIVISION

Only one contractor in the Eastside Division, that for Tuolumne Utilities District, is expected to reference the CVP M&I Water Shortage Policy. However, the contract would be subject to additional constraints on the availability of project water beyond those provided in the policy and that specifically relate to a project supply from New Melones Reservoir. A new contract with Tuolumne Utilities District is expressly authorized under Section 3404(b) of the CVPIA.

Tuolumne Utilities District

Tuolumne Utilities District provides water to several municipal areas in western and central Tuolumne County. Water rights of 21,870 acre-feet from the Stanislaus River are used to meet most of the demands. As part of the implementation program for the New Melones Reservoir on the Stanislaus River, Reclamation included provisions for a water service contract to serve areas in the upper watershed of the Stanislaus River. Recently, Tuolumne Utilities District constructed a pump station on the New Melones Reservoir to serve residential communities near Columbia. This contract would be executed in accordance with an agreement negotiated prior to completion of the New Melones Reservoir, and in accordance with State and Federal law. It would also be subject to verification of Contract Total by means of a completed Water Needs Assessment by Reclamation. About 260 acre-feet of groundwater is available in limited portions of the district.

The CVP water services contract for this district is for 9,000 acre-feet and is classified as an M&I contract. Due to the nature of this contract, Reclamation did not complete a detailed Water Needs Assessment at this time. The following information was used to determine the future water demands for this district.

The 2000 "Urban Water Management Plan Update for Tuolumne Utility District" identified a total population of 47,500 for the entire district in 2020 with a unit water demand of 151 gallons/capita/day for a total residential water demand of 8,035 acre-feet. The plan also projects a commercial and industrial demand of 200 and 530 acre-feet, respectively, with system losses of 7,050 acre-feet for the entire services area. The total M&I demand would be 15,815 acre-feet in 2020. The projected agricultural demand would be 3,200 acre-feet. The total demand is projected to be 19,015 acre-feet in 2020. However, this area is larger than the area served by the CVP.

Tuolumne Utilities District: CVP Contract: Potentially up to 9,000 acre-feet for M&I

(all values in acre-feet/year unless noted)

2025 Water Demand	Population[a]	Gallons/ capita/day[a]	Total Residential Water Demand	Commercial Water Demand[a]	Industrial Water Demand[a]	System Loss per Needs Assessment	Total M&I Water Demand
	47,500	151	8,035	200	530	7,050	15,815
Public Health and Safety	**Total Residential @ 50 gallons/ capita/day**	**80% of Commercial**	**90% of Industrial**	**80% of System Loss**	**Total Public Health and Safety water quantity for M&I Demand**	**75% of CVP Contract Total**	**Public Health and Safety water quantity for this EA**
	2,661	160	477	5,640	8,938	6,750	6,750

[a] Based on local agency reports

DELTA DIVISION

The Delta Division includes seven water service contractors. The surface water operations for the contractors are described below.

Broadview Water District

Broadview Water District is an agricultural district that encompasses 9,515 acres. The district is within the Grasslands drainage area and implements strict water conservation and other measures to reduce drainage flows or seepage to the groundwater.

The district receives CVP water service contract water from the Delta Mendota Canal for agricultural uses. The M&I uses have historically included 20 acre-feet to serve the district headquarters and neighboring residences, as reported in the 2001 "Draft Environmental Assessment for Long-Term Contract Renewal for the Delta Division" (Delta Division LTCR EA). The M&I water is diverted and conveyed by Westlands Water District to the Broadview Water District. There are no operable groundwater wells in the area.

The CVP water services contract for this district is for 26,000 acre-feet and is classified as an Irrigation/M&I contract. Due to the limited use of M&I water under this contract, Reclamation did not include the M&I component details in the Water Needs Assessment. The following information was used to determine the future water demands for this district.

It was assumed that the water demand for the district office and commercial and institutional users would be four acre-feet in 2025. The remaining 16 acre-feet would be residential demand for 58 persons assuming 250 gallons/capita/day. The Water Needs Assessment identified an agricultural water demand in 2025 of 25,100 acre-feet. Therefore, the total district water demand would be 25,120 acre-feet in 2025. The Water Needs Assessment also indicates that the district sells about 1,880 acre-feet/year.

Broadview Water District CVP Contract: 27,000 acre-feet for Irrigation/M&I

(all values in acre-feet/year unless noted)

2025 Water Demand	Population[a]	Gallons/ capita/day[a]	Total Residential Water Demand	Commercial Water Demand[a]	Industrial Water Demand[a]	System Loss per Needs Assessment	Total M&I Water Demand
	58	250	16	4	0	0	20
Public Health and Safety	**Total Residential @ 50 gallons/ capita/day**	**80% of Commercial**	**90% of Industrial**	**80% of System Loss**	**Total Public Health and Safety water quantity for M&I Demand**	**75% of CVP Contract Total**	**Public Health and Safety water quantity for this EA**
	3	3			6	20,250	6

[a] Based on local agency reports

Del Puerto Water District

Del Puerto Water District was reorganized in 1995 to incorporate eleven water districts located along both sides of the Delta Mendota Canal. The consolidated districts included Del Puerto, Hospital, Kern Canyon, Salado, Sunflower, Orestimba, Foothill, Davis, Mustang, Quinto, and Romero water districts. The new district includes about 47,400 acres along the western boundary of Stanislaus, San Joaquin, and Merced counties. The district is primarily located in Stanislaus County.

The district is located near the communities of Tracy and Patterson. However, the Delta Division LTCR EA indicates that land owners want to maintain an agricultural area and would de-annex land to municipal areas. The historic municipal use of about 12 acre-feet/year is used for dust control at the municipal landfill.

The district receives CVP water from the Delta Mendota Canal. Groundwater use is limited from shallow groundwater and is balanced with recharge operations. The Water Needs Assessment assumes that there is no net use of groundwater. There are no other sources of water supply for the district.

The CVP water service contract for this district is for 140,120 acre-feet and is classified as an Irrigation/M&I contract. Due to the limited use of M&I water under this contract, Reclamation did not include the M&I component details in the Water Needs Assessment. The following information was used to determine the future water demands for this district.

The majority of the population in the district is located in the Santa Nella area. It is assumed that 12 acre-feet would continue to be used for dust control as an industrial water demand and the remaining 188 acre-feet would be used to serve residential users near Santa Nella.

The Water Needs Assessment identified an agricultural water demand in 2025 of 142,735 acre-feet. Therefore, the total district water demand would be 142,935 acre-feet in 2025.

Del Puerto Water District CVP Contract: 140,210 acre-feet for Irrigation/M&I

(all values in acre-feet/year unless noted)

2025 Water Demand	Population[a]	Gallons/ capita/day[a]	Total Residential Water Demand	Commercial Water Demand[a]	Industrial Water Demand[a]	System Loss per Needs Assessment	Total M&I Water Demand
	670	250	188	0	12	0	200
Public Health and Safety	**Total Residential @ 50 gallons/ capita/day**	**80% of Commercial**	**90% of Industrial**	**80% of System Loss**	**Total Public Health and Safety water quantity for M&I Demand**	**75% of CVP Contract Total**	**Public Health and Safety water quantity for this EA**
	38		11		48	105,158	48

[a] Based on local agency reports

Plainview Water District

Plainview Water District is located near Tracy. Crops in the district are primarily alfalfa, row crops, almonds, and cherries. About 500 acres of land has been converted to M&I use. M&I water is delivered to this area by the City of Tracy. The district plans to transfer about 3,800 acres and 9,500 acre-feet of water to the City of Tracy by 2025. The district also plans to transfer water to other users.

The CVP water services contract for this district is for 20,600 acre-feet and is classified as an Irrigation/M&I contract. The Water Needs Assessment identified an agricultural water demand in 2025 of 7,995 acre-feet and an industrial water demand of 800 acre-feet in 2025.

Plainview Water District CVP Contract: 20,600 acre-feet for Irrigation/M&I

(all values in acre-feet/year unless noted)

2025 Water Demand	Population[a]	Gallons/ capita/day[a]	Total Residential Water Demand	Commercial Water Demand[a]	Industrial Water Demand[a]	System Loss per Needs Assessment	Total M&I Water Demand
			0	0	800	0	800
Public Health and Safety	**Total Residential @ 50 gallons/ capita/day**	**80% of Commercial**	**90% of Industrial**	**80% of System Loss**	**Total Public Health and Safety water quantity for M&I Demand**	**75% of CVP Contract Total**	**Public Health and Safety water quantity for this EA**
			720		720	15,450	720

[a] Based on local agency reports

City of Tracy

The City of Tracy provides water to a growing municipal area in San Joaquin County. In addition to the existing areas in the city, there are plans to expand into areas currently served by Plainview Water District, Widren Water District, Banta-Carbona Irrigation District, and The West Side Irrigation District. The agricultural districts have initiated or are planning to initiate the process to transfer water for these lands to the City of Tracy. The projected water supply to be transferred from agricultural districts would be 32,000 acre-feet in 2025 (10,000 acre-feet from South San Joaquin Irrigation District, 3,000 acre-feet from Widren Water District, 5,000 from Banta-Carbona Irrigation District, 5,000 acre-feet from The West Side Irrigation District, and 9,500 acre-feet from Plainview Water District). The city also relies upon 5,000 acre-feet/year of groundwater. The CVP water service contract is for 10,000 acre-feet to be used for M&I uses.

Population projections, water demands, and unit water rates were calculated by the city and Reclamation as part of the Water Needs Assessment. The Water Needs Assessment indicates that the 2025 population for the city would be 160,000 with a unit water rate of about 256.7 gallons/capita/day. The residential water demand for 2025 would be 46,000 acre-feet/year. The Water Needs Assessment did not include values for commercial or industrial uses. However, for the purposes of this analysis, information from 2003 and 2004 reports by the City of Tracy was used to further define the water demands. Assuming a unit water rate of 186 gallons/capita/day with the population projection from the Water Needs Assessment would result in a projected residential water demand of 33,000 acre-feet in 2025. The Tracy Urban Water Management Plan indicated that the commercial and industrial uses would be 9,000 and 3,700 acre-feet, respectively. The total M&I water demand would continue to be 46,000 acre-feet.

City of Tracy CVP Contract: 10,000 acre-feet for M&I

(all values in acre-feet/year unless noted)

2025 Water Demand	Population[a]	Gallons/ capita/day[a]	Total Residential Water Demand	Commercial Water Demand[a]	Industrial Water Demand[a]	System Loss per Needs Assessment	Total M&I Water Demand
	160,000	186	33,000	9,000	3,700	0	46,000
Public Health and Safety	**Total Residential @ 50 gallons/ capita/day**	**80% of Commercial**	**90% of Industrial**	**80% of System Loss**	**Total Public Health and Safety water quantity for M&I Demand**	**75% of CVP Contract Total**	**Public Health and Safety water quantity for this EA**
	8,962	7,200	3,300	0	19,492	7,500	7,500

[a] Based on local agency reports

Patterson Irrigation District

The Patterson Irrigation District is an agricultural district in Stanislaus County encompassing 13,225 acres. The primary crops in the district are alfalfa, apricots, beans, almonds, and row crops. Historically, users that require M&I water have been required by the district to de-annex from the district. Future growth is anticipated to occur near Tracy.

The district also holds 23,000 acre-feet of water rights on the San Joaquin River of which 2,465 acre-feet are used for groundwater recharge.

The CVP water services contract for this district is for 16,500 acre-feet and is classified as an Irrigation/M&I contract. Due to the limited use of M&I water under this contract, Reclamation did not include the M&I component details in the Water Needs Assessment. The following information was used to determine the future water demands for this district.

The projected population of the district in 2025 is anticipated to be 3,750 in 2025 based upon information included in the Water Needs Assessment. It is assumed that the unit water rate for residential use is 250 gallons/capita/day. Using these values, the projected residential water demand would be 1,000 acre-feet in 2025. It is anticipated that there would not be any additional commercial and industrial water demands. The Water Needs Assessment identified an agricultural water demand in 2025 of 53,242 acre-feet. Therefore, the total district water demand would be 54,242 acre-feet in 2025.

Patterson Irrigation District CVP Contract: 16,500 acre-feet for Irrigation/M&I

(all values in acre-feet/year unless noted)

2025 Water Demand	Population[a]	Gallons/ capita/day[a]	Total Residential Water Demand	Commercial Water Demand[a]	Industrial Water Demand[a]	System Loss per Needs Assessment	Total M&I Water Demand
	3,570	250	1,000	0	0	0	1,000
Public Health and Safety	**Total Residential @ 50 gallons/ capita/day**	**80% of Commercial**	**90% of Industrial**	**80% of System Loss**	**Total Public Health and Safety water quantity for M&I Demand**	**75% of CVP Contract Total**	**Public Health and Safety water quantity for this EA**
	200	0	0	0	200	12,375	200

[a] Based on local agency reports

Contra Costa Water District

The Contra Costa Water District is comprised of a raw water service area and a treated water service area. Raw water is provided to the cities of Antioch, Martinez, and Pittsburg; Southern California Water Company (for Bay Point); and Diablo Water District (Oakley). In addition, raw water is served to more than 50 industries and major businesses, agricultural users, and landscape irrigators. Treated water is provided to Clayton, Clyde, Concord, Pacheco, Port Costa; portions of Pleasant Hill, Martinez, and Walnut Creek; and other unincorporated areas of Contra Costa County.

The district has a CVP water service contract for 195,000 acre-feet for M&I purposes. The district also obtains 8,200 acre-feet from water rights held by East Contra Costa Irrigation District and 3,000 acre-feet of groundwater in the eastern portion of Contra Costa County. Groundwater is of poor quality throughout most of the district and is of limited availability.

Population projections, water demands, and unit water rates were calculated by the district and Reclamation as part of the Water Needs Assessment. The Water Needs Assessment indicates that the 2025 population for the district would be 568,000 with a unit water rate of about 220 gallons/capita/day. The residential water demand for 2025 would be 140,200 acre-feet/year. The Water Needs Assessment did not include separate values for commercial uses. The Water Needs Assessment indicated that the industrial water demand would be 57,000 acre-feet in 2025 and system losses would be 10,000 acre-feet. The total M&I water demand would be 207,200 acre-feet in 2025. The Water Needs Assessment did not specifically identify agricultural water demands.

Contra Costa Water District CVP Contract: 195,000 acre-feet for M&I

(all values in acre-feet/year unless noted)

2025 Water Demand	Population[a]	Gallons/ capita/day[a]	Total Residential Water Demand	Commercial Water Demand[a]	Industrial Water Demand[a]	System Loss per Needs Assessment	Total M&I Water Demand
	568,000	220	140,200	included	57,000	10,000	207,200
Public Health and Safety	**Total Residential @ 50 gallons/ capita/day**	**80% of Commercial**	**90% of Industrial**	**80% of System Loss**	**Total Public Health and Safety water quantity for M&I Demand**	**75% of CVP Contract Total**	**Public Health and Safety water quantity for this EA**
	31,814	0	51,300	8,000	91,114	146,250	91,114

[a] Based on local agency reports

Department of Veteran Affairs - San Joaquin National Cemetery

The San Joaquin National Cemetery is located near O'Neill Forebay for San Luis Reservoir. Water use is primarily for irrigation and use at the associated buildings.

The cemetery has a CVP water service contract for 450 acre-feet for M&I purposes. The cemetery has no other water supplies. Current and future water demands are 450 acre-feet.

Department of Veteran Affairs - San Joaquin National Cemetery CVP Contract: 450 acre-feet for M&I

(all values in acre-feet/year unless noted)

2025 Water Demand	Population[a]	Gallons/ capita/day[a]	Total Residential Water Demand	Commercial Water Demand[a]	Industrial Water Demand[a]	System Loss per Needs Assessment	Total M&I Water Demand
	0	0	0	450	0	0	450
Public Health and Safety	**Total Residential @ 50 gallons/ capita/day**	**80% of Commercial**	**90% of Industrial**	**80% of System Loss**	**Total Public Health and Safety water quantity for M&I Demand**	**75% of CVP Contract Total**	**Public Health and Safety water quantity for this EA**
	0	360	0	0	360	338	338

[a] Based on local agency reports

WEST SAN JOAQUIN DIVISION

The West San Joaquin Division includes eight water service contractors. The surface water operations for the contractors are described below.

Westlands Water District

Westlands Water District is an agricultural district in Fresno, Merced, and Kings counties encompassing over 605,648 acres. The primary crops in the district are alfalfa, cotton field crops, almonds, and row crops.

The CVP water services contract for this district is for 1,150,000 acre-feet and is classified as an Irrigation/M&I contract. The district also uses an average of 175,000 acre-feet/year of groundwater. Water is purchased during many years to replace CVP water service contract water that is not delivered due to availability.

The district receives CVP water service contract water from the Delta Mendota Canal and San Luis Canal. The M&I uses have historically included Lemore Naval Air Station (2,599 acre-feet) and food processing industries throughout the district (1,839 acre-feet).

Due to the limited use of M&I water under this contract, Reclamation did not include the M&I component details in the Water Needs Assessment. The following information was used to determine the future water demands for this district.

It was assumed that existing water demands would continue and additional commercial uses would be established along Interstate 5. Therefore, it was assumed that the industrial water demand would be 1,839 acre-feet. The commercial water demand would be 3,099 acre-feet, including continued service to Lemore Naval Air Station and an additional 500 acre-feet for new commercial uses. The total M&I water use would be 4,938 acre-feet in 2025. The Water Needs Assessment identified an agricultural water demand in 2025 of 1,394,349 acre-feet. Therefore, the total district water demand would be 1,409,287 acre-feet in 2025.

Westlands Water District CVP Contract: 1,150,000 acre-feet for Irrigation/M&I

(all values in acre-feet/year unless noted)

2025 Water Demand	Population[a]	Gallons/ capita/day[a]	Total Residential Water Demand	Commercial Water Demand[a]	Industrial Water Demand[a]	System Loss per Needs Assessment	Total M&I Water Demand
	0	0	0	3,099	1,839	0	4,938
Public Health and Safety	**Total Residential @ 50 gallons/ capita/day**	**80% of Commercial**	**90% of Industrial**	**80% of System Loss**	**Total Public Health and Safety water quantity for M&I Demand**	**75% of CVP Contract Total**	**Public Health and Safety water quantity for this EA**
	0	2,479	1,655	0	4,134	862,500	4,134

[a] Based on local agency reports

San Luis Water District

San Luis Water District is an agricultural district in Fresno and Merced counties encompassing over 64,668 acres. The primary crops in the district are alfalfa, cotton field crops, almonds, and row crops.

The CVP water services contract for this district is for 125,080 acre-feet and is classified as an Irrigation/M&I contract. The district also uses an average of 5,000 acre-feet/year of groundwater. The district sells an average of 2,894 acre-feet/year.

The district receives CVP water service contract water from the San Luis Canal. The M&I uses have historically been located in and near Santa Nella and along Interstate 5. Water Needs Assessment indicated that total M&I water demand in 2025 would be 2,000 acre-feet. However, specific uses of the water were not identified. The following information was used to determine the future water demands for this district.

It was assumed that existing water demands would continue and additional commercial uses would be established along Interstate 5. It was assumed that the district would provide about 60 percent of the water supply in the Santa Nella area based upon information in the 1995 "Draft Santa Nella Community Specific Plan Program Environmental Impact Report." It also is assumed that the unit water rate for residential use is 250 gallons/capita/day. Using these values, the projected residential water demand would be 1,200 acre-feet in 2025. The remaining 800 acre-feet considered for M&I water demands is assumed to be used by commercial users located along Interstate 5. The Water Needs Assessment identified an agricultural water demand in 2025 of 119,356 acre-feet. Therefore, the total district water demand would be 121,360 acre-feet in 2025.

San Luis Water District CVP Contract: 125,080 acre-feet for Irrigation/M&I

(all values in acre-feet/year unless noted)

2025 Water Demand	Population[a]	Gallons/ capita/day[a]	Total Residential Water Demand	Commercial Water Demand[a]	Industrial Water Demand[a]	System Loss per Needs Assessment	Total M&I Water Demand
	4,300	250	1,200	800	0	0	2,000
Public Health and Safety	**Total Residential @ 50 gallons/ capita/day**	**80% of Commercial**	**90% of Industrial**	**80% of System Loss**	**Total Public Health and Safety water quantity for M&I Demand**	**75% of CVP Contract Total**	**Public Health and Safety water quantity for this EA**
	241	640	0	0	881	93,810	881

[a] Based on local agency reports

Pacheco Water District

Pacheco Water District is an agricultural area located in Merced and Fresno counties. Historically, users that require M&I water have been required by the district to de-annex from the district.

The CVP water services contract for this district is for 10,080 acre-feet and is classified as an Irrigation/M&I contract. The district also uses an average of 4,399 acre-feet of water rights delivered by Central California Irrigation District. The district sells an average of 2,837 acre-feet/year to other users.

The district receives CVP water service contract water from the San Luis Canal. The M&I uses are assumed to be located in the future along Interstate 5. Due to the limited use of M&I water under this contract, Reclamation did not include the M&I component details in the Water Needs Assessment. The following information was used to determine the future water demands for this district.

It was assumed that the projected population of the district in 2025 would be 200. It is assumed that the unit water rate for residential use is 250 gallons/capita/day. Using these values, the projected residential water demand would be 56 acre-feet in 2025. It is anticipated that the existing commercial water demand of 24 acre-feet would remain and that there would be no industrial water demand. The Water Needs Assessment identified an agricultural water demand in 2025 of 11,630 acre-feet. Therefore, the total district water demand would be 11,710 acre-feet in 2025.

Pacheco Water District CVP Contract: 10,080 acre-feet for Irrigation/M&I

(all values in acre-feet/year unless noted)

2025 Water Demand	Population[a]	Gallons/ capita/day[a]	Total Residential Water Demand	Commercial Water Demand[a]	Industrial Water Demand[a]	System Loss per Needs Assessment	Total M&I Water Demand
	200	250	56	24	0	0	80
Public Health and Safety	**Total Residential @ 50 gallons/ capita/day**	**80% of Commercial**	**90% of Industrial**	**80% of System Loss**	**Total Public Health and Safety water quantity for M&I Demand**	**75% of CVP Contract Total**	**Public Health and Safety water quantity for this EA**
	11	19	0	0	30	7,560	30

[a] Based on local agency reports

Panoche Water District

Panoche Water District is an agricultural area located in Merced and Fresno counties. The CVP water services contract for this district is for 94,000 acre-feet and is classified as an Irrigation/M&I contract. The district has no other sources of water.

The district receives CVP water service contract water from the San Luis Canal. The M&I uses are assumed to be located in the future along Interstate 5. Due to the limited use of M&I water under this contract, Reclamation did not include the M&I component details in the Water Needs Assessment. The following information was used to determine the future water demands for this district.

It was assumed that the projected population of the district in 2025 would be 250. It is assumed that the unit water rate for residential use is 250 gallons/capita/day. Using these values, the projected residential water demand would be 70 acre-feet in 2025. It is assumed that the commercial water demand would be 30 percent of the total M&I water demand, or 30 acre-feet and there would be no industrial water demand. The Water Needs Assessment identified an agricultural water demand in 2025 of 92,916 acre-feet. Therefore, the total district water demand would be 92,916 acre-feet in 2025.

Panoche Water District CVP Contract: 94,000 acre-feet for Irrigation/M&I

(all values in acre-feet/year unless noted)

2025 Water Demand	Population[a]	Gallons/ capita/day[a]	Total Residential Water Demand	Commercial Water Demand[a]	Industrial Water Demand[a]	System Loss per Needs Assessment	Total M&I Water Demand
	250	250	70	30	0	0	100
Public Health and Safety	**Total Residential @ 50 gallons/ capita/day**	**80% of Commercial**	**90% of Industrial**	**80% of System Loss**	**Total Public Health and Safety water quantity for M&I Demand**	**75% of CVP Contract Total**	**Public Health and Safety water quantity for this EA**
	14	24	0	0	38	70,500	38

[a] Based on local agency reports

City of Avenal

The City of Avenal is located in Kings County. Recent rapid growth has occurred due to the completion of the Avenal State Prison. The Avenal Urban Water Management Plan indicates that the prison employs about 1,300 and is projected to have a prison population of 9,000 in 2030. Other larger employers in Avenal include Paramount Farms, the Reef Sunset Unified School District, and the Pacific Gas & Electric Company natural gas compressor plant. There are about 300 acres of land within the city limits and near Interstate 5 that are designated for future industrial.

The CVP water service contract is for 3,500 acre-feet to be used for M&I uses. The city has no other sources of water.

Population projections, water demands, and unit water rates were calculated by the city and Reclamation as part of the Water Needs Assessment. The Water Needs Assessment indicates that the 2025 population for the city would be 12,000 with a unit water rate of about 97 gallons/capita/day. The residential water demand for 2025 would be 1,300 acre-feet/year. The Water Needs Assessment identified projected commercial and industrial uses as 2,143 and 57 acre-feet, respectively. The total M&I water demand is projected to be 3,500 acre-feet in 2025.

City of Avenal CVP Contract: 3,500 acre-feet for M&I

(all values in acre-feet/year unless noted)

2025 Water Demand	Population[a]	Gallons/ capita/day[a]	Total Residential Water Demand	Commercial Water Demand[a]	Industrial Water Demand[a]	System Loss per Needs Assessment	Total M&I Water Demand
	12,000	97	1,300	2,143	57	0	3,500
Public Health and Safety	**Total Residential @ 50 gallons/ capita/day**	**80% of Commercial**	**90% of Industrial**	**80% of System Loss**	**Total Public Health and Safety water quantity for M&I Demand**	**75% of CVP Contract Total**	**Public Health and Safety water quantity for this EA**
	672	1,714	51	0	2,438	2,625	2,438

[a] Based on local agency reports

City of Coalinga

The City of Coalinga is located along Interstate 5 in Fresno County. Major employers include the Pleasant Valley State Prison, the future Coalinga State Hospital, community college, airport, regional hospital, Harris Ranch Inn-Restaurant, Harris Farms, Harris Feeding Co., West Hills College District, and the City of Coalinga.

The CVP water service contract is for 10,000 acre-feet to be used for M&I uses. The city has no other sources of water.

Population projections, water demands, and unit water rates were calculated by the city and Reclamation as part of the Water Needs Assessment. The Water Needs Assessment indicates that the 2025 population for the city would be 27,000 with a unit water rate of about 280 gallons/capita/day. The residential water demand for 2025 would be 8,455 acre-feet/year. At this time, no documentation was found to separately identify the commercial and industrial water uses. Therefore, these values are considered to be included in the total residential water demand. System losses are projected to be 563 acre-feet in 2025. The total M&I water demand is projected to be 9,018 acre-feet in 2025.

City of Coalinga CVP Contract: 10,000 acre-feet for M&I

(all values in acre-feet/year unless noted)

2025 Water Demand	Population[a]	Gallons/ capita/day[a]	Total Residential Water Demand	Commercial Water Demand[a]	Industrial Water Demand[a]	System Loss per Needs Assessment	Total M&I Water Demand
	27,000	280	8,455	0	0	563	9,081
Public Health and Safety	**Total Residential @ 50 gallons/ capita/day**	**80% of Commercial**	**90% of Industrial**	**80% of System Loss**	**Total Public Health and Safety water quantity for M&I Demand**	**75% of CVP Contract Total**	**Public Health and Safety water quantity for this EA**
	1,512	0	0	450	1,963	7,500	1,963

[a] Based on local agency reports

City of Huron

The City of Huron is located in Fresno County. The city provides support services for agricultural activities in the surrounding area. Seasonal workers increase the population by 50 percent during the summer and early fall months. Local industries include a tomato-processing plant, pistachio processing plant, and farm equipment service center.

The CVP water service contract is for 3,000 acre-feet to be used for M&I uses. The city has no other sources of water.

Population projections, water demands, and unit water rates were calculated by the city and Reclamation as part of the Water Needs Assessment. The Water Needs Assessment indicates that the 2025 population for the city would be 12,810 with a unit water rate of about 76 gallons/capita/day. The residential water demand for 2025 would be 1,090 acre-feet/year. The Water Needs Assessment identified projected commercial and industrial uses as 260 and 710 acre-feet, respectively. System losses are projected to be 206 acre-feet in 2025. The total M&I water demand is projected to be 2,266 acre-feet in 2025.

City of Huron CVP Contract: 3,000 acre-feet for M&I

(all values in acre-feet/year unless noted)

2025 Water Demand	Population[a]	Gallons/ capita/day[a]	Total Residential Water Demand	Commercial Water Demand[a]	Industrial Water Demand[a]	System Loss per Needs Assessment	Total M&I Water Demand
	12,810	76	1,090	260	710	206	2,266
Public Health and Safety	**Total Residential @ 50 gallons/ capita/day**	**80% of Commercial**	**90% of Industrial**	**80% of System Loss**	**Total Public Health and Safety water quantity for M&I Demand**	**75% of CVP Contract Total**	**Public Health and Safety water quantity for this EA**
	718	208	639	165	1,729	2,250	1,729

[a] Based on local agency reports

California Department of Fish and Game

The California Department of Fish and Games uses CVP water in the vicinity of the San Luis Reservoir. CVP water is delivered from the San Luis Reservoir complex. Reclamation did not complete a detailed Water Needs Assessment for this contract as the quantity of CVP water under contract is below the 2,000 acre-foot threshold established for conducting a Water Needs Assessment. It is assumed that the entire Contract Total of 10 acre-feet is used for commercial/institutional purposes.

California Department of Fish and Game CVP Contract: 10 acre-feet for M&I

(all values in acre-feet/year unless noted)

2025 Water Demand	Population[a]	Gallons/ capita/day[a]	Total Residential Water Demand	Commercial Water Demand[a]	Industrial Water Demand[a]	System Loss per Needs Assessment	Total M&I Water Demand
	10	0	0	10	0	0	10
Public Health and Safety	**Total Residential @ 50 gallons/ capita/day**	**80% of Commercial**	**90% of Industrial**	**80% of System Loss**	**Total Public Health and Safety water quantity for M&I Demand**	**75% of CVP Contract Total**	**Public Health and Safety water quantity for this EA**
	0	8	0	0	8	8	8

[a] Based on local agency reports

SAN FELIPE DIVISION

The San Felipe Division includes two contractors, Zone 6 of San Benito County Flood Control and Water Conservation District and Santa Clara Valley Water District.

San Benito County Flood Control and Water Conservation District

CVP water is used in Zone 6 of San Benito County Flood Control and Water Conservation District. Zone 6 is primarily an agricultural area that surrounds the cities of San Juan Bautista and Hollister. Water is also provided to these communities within Zone 6. Zone 6 also uses CVP water for groundwater recharge operations.

The CVP water service contract is for 43,800 acre-feet to be used for Irrigation/M&I uses. Zone 6 also uses 22,500 acre-feet of water.

Population projections, water demands, and unit water rates were calculated by the district and Reclamation as part of the Water Needs Assessment. The Water Needs Assessment indicates that the 2025 population for the city would be 72,000 with a unit water rate of about 177 gallons/capita/day. The residential water demand for 2025 would be 14,276 acre-feet/year. The Water Needs Assessment identified projected commercial and industrial uses as 1,000 and 1,000 acre-feet, respectively. System losses are included in these projections. The total M&I water demand is projected to be 16,276 acre-feet in 2025. The Water Needs Assessment identified an agricultural water demand in 2025 of 43,885 acre-feet in Zone 6. Therefore, the total Zone 6 water demand would be 60,161 acre-feet in 2025.

San Benito County Water Conservation and Flood Control District CVP Contract: 43,800 acre-feet for Irrigation/M& (all values in acre-feet/year unless noted)

2025 Water Demand	Population[a]	Gallons/ capita/day[a]	Total Residential Water Demand	Commercial Water Demand[a]	Industrial Water Demand[a]	System Loss per Needs Assessment	Total M&I Water Demand
	72,000	177	14,276	1,000	1,000	0	16,276
Public Health and Safety	**Total Residential @ 50 gallons/ capita/day**	**80% of Commercial**	**90% of Industrial**	**80% of System Loss**	**Total Public Health and Safety water quantity for M&I Demand**	**75% of CVP Contract Total**	**Public Health and Safety water quantity for this EA**
	4,033	800	900	0	5,733	32,850	5,733

[a] Based on local agency reports

Santa Clara Valley Water District

Santa Clara Valley Water District encompasses all of Santa Clara County. Urban users are located throughout the county and agricultural users are primarily located in the southern portion of the county. CVP water is used for municipal uses and for groundwater recharge. The district provides surface water on a wholesale basis to member municipal agencies within the county. The surface water directly diverted by the district includes CVP water, State Water Project water, and local water rights. The district also monitors and manages the groundwater by making surface water available to the member agencies. Some of the member agencies also purchase water from the San Francisco Public Utilities Commission.

The CVP water service contract is for 57,207 acre-feet to be used for Irrigation/M&I uses. The district also has an entitlement contract with the State Water Project for 74,000 acre-feet. The district and member agencies also withdraw an average of 33,000 acre-feet/year of groundwater, and use about 164,800 acre-feet/year of water rights water, including purchases from San Francisco Public Utilities Commission and local water rights.

Population projections, water demands, and unit water rates were calculated by the district and Reclamation as part of the Water Needs Assessment. The Water Needs Assessment indicates that the 2025 population for the city would be 2,175,800 with a unit water rate of about 117 gallons/capita/day. The residential water demand for 2025 would be 285,998 acre-feet/year. The Water Needs Assessment identified projected commercial and industrial uses as 188,569 and 75,428 acre-feet, respectively. System losses are included in these projections. The total M&I water demand is projected to be 549,995 acre-feet in 2025 as identified in the Water Needs Assessment and the Santa Clara Valley Water District Urban Water Management Plan. The Water Needs Assessment identified an agricultural water demand in 2025 of 57,207 acre-feet. Therefore, the total water demand would be 607,202 acre-feet in 2025.

Santa Clara Valley Water District CVP Contract: 152,500 acre-feet for Irrigation/M&I

(all values in acre-feet/year unless noted)

2025 Water Demand	Population[a]	Gallons/ capita/day[a]	Total Residential Water Demand	Commercial Water Demand[a]	Industrial Water Demand[a]	System Loss per Needs Assessment	Total M&I Water Demand
	2,175,800	117	285,998	188,569	75,428	0	549,995
Public Health and Safety	**Total Residential @ 50 gallons/ capita/day**	**80% of Commercial**	**90% of Industrial**	**80% of System Loss**	**Total Public Health and Safety water quantity for M&I Demand**	**75% of CVP Contract Total**	**Public Health and Safety water quantity for this EA**
	121,869	150,855	67,885	0	340,609	114,375	114,375

[a] Based on local agency reports

APPLICATION OF M&I WATER SHORTAGE POLICY FOR THE AMERICAN RIVER DIVISION

During recent droughts on the American River, CVP water allocations for the American River Division were less than allocations in the majority of the CVP system because of the relative small storage volume in Folsom Lake as compared to the water rights commitments on the Lower American River. CVP water users on the American River cannot physically receive water from the Sacramento River without the construction of new facilities, and therefore have limited benefit from the integrated operations of the CVP. In addition, there are no agricultural water suppliers that can be subjected to shortage allocations to increase deliveries for M&I water users.

In response to the limited water availability, and a recognition that unless adequate water supplies are made available, many existing residents, businesses, and agricultural users will suffer shortages during future periodic droughts, the majority of water rights holders and CVP water service contractors on the American River participated along with representatives from local environmental, businesses, and citizens organizations in the development of the Sacramento Area Water Forum (Water Forum) Agreement. A result of the Water Forum process was an agreement by the water users who take delivery of water from, or upstream of, Folsom Lake to limit their total diversion from the American River in drought periods. However, as discussed below, the delivery amounts for American River Division CVP water service contractors resulting from the CVP water service contract allocation methods evaluated in this EA are generally less than the quantities assumed in the development of the Water Forum Agreement.

The Water Forum approach to dry-year allocations has been used as the most likely future condition in the modeling methods used to represent the proposed action and the No Action Alternative scenarios for previous environmental documents, including evaluation of the American River Pump Station and East Bay Municipal Utility District amendatory contract. In addition, the OCAP 2004 study for future conditions includes the Water Forum Agreement in the assumptions. This subsection describes the Water Forum Agreement.

Sacramento Area Water Forum

The Water Forum, a diverse group of water agencies, business groups, agricultural interests, environmentalists, citizen groups, and local governments, has been engaged in a collaborative planning process to address future water use on the American River since the fall of 1993. The Water Forum formulated the Water Forum Agreement for the effective long-term management of the regional water resources based on the two co-equal objectives: (1) provide a reliable and safe water supply for the region’s economic health and planned development through the year 2030; and (2) preserve the fishery, wildlife, recreational, and aesthetic values of the Lower American River. The comprehensive approach to future water management presented in the Water Forum Agreement contains seven complementary elements, each of which is necessary for a solution to work: 1) increased surface water diversions, 2) actions to meet customer needs while reducing diversion impacts in drier years, 3) an improved pattern of fishery flow releases from Folsom Lake, 4) a lower American River habitat management element that also addresses recreation, 5) a water conservation element, 6) a groundwater management element, and 7) a Water Forum Successor effort.

To provide a more diverse dry-year allocation of water, the Water Forum signatories agreed to a process that allowed senior water rights holders and CVP water service contractors to re-allocate their water supplies in a cooperative manner through "dry year agreements." These agreements integrated with the management of local conjunctive use projects, water conservation, and sharing of recycled water opportunities would provide the basis for meeting their goal of increased water supply. A groundwater conjunctive use program in areas located north of the American River has been initiated and a similar

program will be initiated in Zone 40 of Sacramento County Water Agency following the completion of the Freeport Regional Water Authority facilities.

The Water Forum approach establishes a sliding scale of limits to dry-year diversions based on an index that considers conditions only within the American River Basin. Wet/Average Years are defined when the projected March through November unimpaired flow into Folsom Lake is greater than 950,000 acre-feet. Drier Years are defined when the projected March through November unimpaired flow into Folsom Lake is 950,000 to 400,000 acre-feet. Driest Years are defined when the projected March through November unimpaired flow into Folsom Lake is less than 400,000 acre-feet. The projections are based on the addition of calculated quantities for the remaining portion of the water year (March through September) plus 60,000 acre-feet as an estimate for the October through November period.

Based upon results of the OCAP 2004 CALSIM II model runs, Water Years 1931, 1934, 1939, 1959, 1961, 1976, 1981, 1987, 1988, 1990, 1992, and 1994 are considered to be Drier Years. Water Years 1924 and 1977 were considered to be Driest Years. During most of these years, water allocations for the CVP North of Delta CVP water service contractors are also less than 100 percent; however, the magnitude of the allocation reductions may be different on the American River than on the Sacramento River due to basic problems with patterns and quantities of locally available water supplies.

During the Drier and Driest Years, Sacramento County Water Agency (Zone 40 and City of Folsom), San Juan Water District, Sacramento Municipal Utility District, City of Roseville, Placer County Water Agency, and El Dorado Irrigation District will reduce diversions from the American River. This reduction will be a combination of reduced CVP water service contract water and senior water rights water. The Water Forum Agreement also includes releases from Placer County Water Agency during the Drier and Driest Years to provide water for instream flows and diverters. However, this water will only be released if Placer County Water Agency can successfully negotiate associated power generation contracts and water purchase contracts for the released water.

Comparison of Water Forum Proposal Allocations to Central Valley Project Water Service Contracts Allocations

This comparison considers three possible allocations for American River Division M&I water service contractors based on: 1) the CVP water service methodology as described in Table 3-1, 2) allocations modified to provide at least public health and safety water quantities as limited to 75 percent of the CVP water service Contract Totals, and 3) Water Forum Agreement allocations, as summarized in Table 4-1. Because the Water Forum Agreement re-allocates both CVP water and water rights water, the values in Table 4-1 include both types of water.

Nineteen of the 72 years considered in the CALSIM II model simulation are characterized by M&I water service allocations of less than 75 percent and/or Water Forum Agreement Drier or Driest years. During the Drier and Driest years, water is re-allocated among the users with CVP water service contracts and water rights holders rely upon conjunctive use to avoid diverting over 123,500 acre-feet of water. The 19 years are characterized as follows.

- In the 13 years with M&I CVP water service contract allocations less than 75 percent
- 6 years are categorized as Drier Years - Water Forum Allocations are greater than M&I CVP Allocations with or without public health and safety water quantities.
- 2 years are categorized as Driest Years - Water Forum Allocations are less than M&I CVP Allocations with or without public health and safety water quantities. However, the public

health and safety water quantities would not be delivered in these years because there are no Irrigation CVP water service contractors on the American River from which to obtain water, and therefore, as described under Alternatives 1 and 2, public health and safety water quantities could only be provided if and when available.

- 5 years are categorized as Wet to Average - Water Forum Allocations are identical to M&I CVP water service contract allocations. During these years the M&I CVP water allocations are 50, 53, 54, 63 and 70 percent. However, the public health and safety water quantities would not be delivered in these years because there are no Irrigation CVP water service contractors on the American River from which to obtain water, and therefore, as described under Alternatives 1 and 2, public health and safety water quantities could only be provided if and when available.

- In the 6 years with M&I CVP water service contract allocations equal to or greater than 75 percent

  - 4 years are categorized as Drier - Water Forum Allocations are greater than M&I CVP Allocations. During these years the M&I CVP water allocations are 75, 80, and 86 percent.

  - 2 years also are categorized as Drier - Water Forum Allocations are less than M&I CVP Allocations. During these years the M&I CVP water allocations are 100 percent. However, 100 percent of the CVP water service contracts may not be delivered in these years because of limited supplies on the American River.

In summary, public health and safety water quantities cannot be provided on the American River even under the Water Forum proposal because there are no facilities to convey water from Irrigation CVP water service contractors to the M&I water service contractors in the American River Division. It should be noted that Reclamation and others are evaluating new conveyance facilities to divert water from the Sacramento River for delivery to the American River Division CVP water service contractors and other water users. If and when those facilities are constructed and become operational, then it will be physically possible to deliver public health and safety water quantities to American River Division water service contractors. This possibility could be included in the environmental analyses for the new conveyance facilities.

East Bay Municipal Utility District

The American River Division also includes East Bay Municipal Utility District. Diversions by this district are not affected by the Water Forum Proposal re-allocations under the Amendatory Contract. However, the Amendatory Contract includes a provision that limits total water diversions to dry years only. The allocations under the Amendatory Contract were compared to allocations that could occur considering minimum levels of public health and safety water quantities, as summarized in Table 4-2.

As shown in Table 4-2, 13 years of the 72 years considered in the model simulations in this EA have M&I CVP water service contract allocations less than 75 percent. Of those 13 years, two years have no deliveries to East Bay Municipal Utility District under the Amendatory Contract definitions. Deliveries are limited in two years because deliveries in the current plus previous years exceed 165,000 acre-feet (a maximum limit for three consecutive years in the Amendatory Contract). In the remaining nine years, if deliveries were increased, deliveries in the following year would be decreased because the total amount over a three-year period would be greater than 165,000 acre-feet. Therefore, increasing deliveries as considered in Alternatives 1A, 1B, 2A, and 2B would not be feasible due to the limitations under the Amendatory Contract. Of the remaining 11 years that deliveries are provided to the district, deliveries are limited as described above in nine years.

TABLE 4-1

COMPARISON OF WATER DELIVERIES OF CENTRAL VALLEY PROJECT WATER SERVICE CONTRACT WATER AND SENIOR WATER RIGHTS WATER TO AMERICAN RIVER DIVISION CONTRACTORS WITH CENTRAL VALLEY PROJECT WATER ALLOCATIONS, PUBLIC HEALTH AND SAFETY WATER QUANTITIES, OR WATER FORUM PROPOSAL

Water Year Allocations for M&I Water Service Contractors	Water Year	Water Forum Year Designation	Standard Annual Deliveries without Water Forum [a] (acre-feet)	Annual Deliveries Assuming Public Health & Safety Water Quantities [b] (acre-feet)	Annual Deliveries with Water Forum only [c] (acre-feet)
50 percent	1924	Driest	272,875 [d]	314,313 [d]	267,050
	1933	Wet to Average	272,875	314,313 [d]	272,875
	1934	Drier	272,875 [d]	314,313 [d]	341,250
	1990	Drier	272,875	314,313 [d]	341,250
52 percent	1988	Drier	276,190	314,313 [d]	341,250
53 percent	1929	Wet to Average	277,848 [d]	314,313 [d]	277,848
54 percent	1926	Wet to Average	279,505 [d]	314,313 [d]	279,505
	1977	Driest	279,505 [d]	314,313 [d]	267,050
57 percent	1931	Drier	284,478[d]	314,313 [d]	341,250
63 percent	1991	Wet to Average	294,423	314,313 [d]	294,423
66 percent	1976	Drier	299,295	314,313 [d]	341,250
70 percent	1932	Wet to Average	301,053 [d]	314,313 [d]	301,053
74 percent	1960	Drier	312,655	314,313	341,250
75 percent	1987	Drier	314,313	314,313 [d]	341,250
	1992	Drier	314,313	314,313 [d]	341,250
80 percent	1939	Drier	322,600	322,600[d]	341,250
86 percent	1961	Drier	332,545	332,545	341,250
100 percent	1959	Drier	355,750[d]	355,750[d]	341,250
	1981	Drier	355,750[d]	355,750[d]	341,250
100 percent	53 other years in model	Wet to Average	355,750	355,750	355,750

TABLE 4-1

COMPARISON OF WATER DELIVERIES OF CENTRAL VALLEY PROJECT WATER SERVICE CONTRACT WATER AND SENIOR WATER RIGHTS WATER TO AMERICAN RIVER DIVISION CONTRACTORS WITH CENTRAL VALLEY PROJECT WATER ALLOCATIONS, PUBLIC HEALTH AND SAFETY WATER QUANTITIES, OR WATER FORUM PROPOSAL

[a] Water deliveries include CVP water service contract water for M&I water uses plus total senior water rights. CVP water service contract deliveries limited by M&I percentages shown in first column. These values do not include East Bay Municipal Utility District.

[b] Water deliveries include CVP water service contract water for M&I water uses plus total senior water rights. CVP water service contract deliveries limited by M&I allocation amounts shown in first column and public health and safety water quantities presented in previous section. These values do not include East Bay Municipal Utility District.

[c] Water deliveries as described in Water Forum Proposal for Dry and Driest Water Years. Allocations are equivalent to deliveries shown in "Annual Deliveries without Water Forum" for Wet to Average Water Years. These values do not include East Bay Municipal Utility District.

[d] Public health and safety values and Standard Annual Deliveries in excess of the Water Forum values cannot be delivered unless facilities are provided to convey water from the Sacramento River to all of the CVP water service contractors. CALSIM model runs used for the No Action Alternative, as described in Chapter 5, assumes delivery of the Water Forum values in these years.

TABLE 4-2

COMPARISON OF WATER DELIVERIES OF CENTRAL VALLEY PROJECT WATER SERVICE CONTRACT WATER TO EAST BAY MUNICIPAL UTILITY DISTRICT WITH THE AMENDATORY CONTRACT OR IMPLEMENTATION OF PUBLIC HEALTH AND SAFETY WATER QUANTITIES

Water Year Allocations for M&I Water Service Contractors	Water Year	Annual Deliveries Based upon CVP Water Service Contract Allocations (acre-feet)	Annual Deliveries under Amendatory Contract of 133,000 acre-feet/year and up to 165,000 acre-feet in three consecutive years (acre-feet)	Annual Deliveries Assuming Public Health and Safety Water Quantities [a] (acre-feet)
50 %	1924	66,500	68,900 [c]	99,750
	1933	66,500	72,100 [c]	99,750
	1934	66,500	83,800 [c]	99,750
	1990	66,500	66,500 [c]	99,750
52%	1988	69,160	65,300 [b]	99,750
53%	1929	70,490	73,000 [c]	99,750
54%	1926	71,820	85,900 [c]	99,750
	1977	71,820	76,600 [c]	99,750
57%	1931	75,810	0 [d]	99,750
63%	1991	83,790	78,300 [c]	99,750
66%	1976	87,780	82,400 [c]	99,750
70%	1932	93,100	0 [d]	99,750
74%	1960	98,420	52,900 [b]	99,750

[a] CVP water service contract deliveries limited by M&I allocation percentages are shown in the first column and public health and safety water quantities are presented in the previous portion of this chapter.

[b] The Amendatory Contract limits total deliveries to East Bay Municipal Utility District to 133,000 acre-feet/year and 165,000 acre-feet over three consecutive dry years per the Amendatory Contract

[c] Deliveries in this year will reduce or eliminate deliveries in the following year because total of deliveries would exceed the total of 165,000 acre-feet over three consecutive years per the Amendatory Contract.

[d] This year type does not meet the criteria to deliver water to East Bay Municipal Utility District under the Amendatory Contract

SUMMARY OF PUBLIC HEALTH AND SAFETY WATER QUANTITIES FOR M&I WATER SERVICE CONTRACTORS

The public health and safety water quantities that will be used in the impact assessment presented in Chapter 5 are summarized for the M&I water service contractors considered in this EA in Table 4-3.

TABLE 4-3

MUNICIPAL AND INDUSTRIAL CENTRAL VALLEY PROJECT WATER SERVICE CONTRACTORS PUBLIC HEALTH AND SAFETY WATER QUANTITIES

CVP Division	CVP Contractor	Public Health & Safety water quantity to be Used in Impact Assessment (acre-feet)	Total CVP Contract (acre-feet)
Trinity River	Shasta Community Services District	219	1,000
	Shasta County Service Area - Keswick #25	267	500
	Bella Vista Water District (Not including areas served Shasta County Water Agency Service Area)	5,153	24,000
	Clear Creek Community Services District	3,063	15,300
	Centerville Community Services District	446	2,900
	Subtotal	**9,148**	**43,700**
Shasta	Shasta County Water Agency (including a portion of Bella Vista Water District)	880	2,100
	Mountain Gate Community Services District (Not Shasta County Water Agency Service Area)	68	350
	City of Shasta Lake	2,744	4,400
	City of Redding	4,605 [a]	6,140
	U.S. Forest Service - Centimundi Boat Ramp	8	10
	Subtotal	**4,613**	**13,000**
Sacramento River	Colusa County Water District	120	62,200
	Colusa County	30 [a]	40
	Whitney Construction	19 [a]	25
	Elk Creek Community Services District	12	100
	U.S. Forest Service - campground	34 [a]	45
	Subtotal	**215**	**62,410**

TABLE 4-3

MUNICIPAL AND INDUSTRIAL CENTRAL VALLEY PROJECT WATER SERVICE CONTRACTORS PUBLIC HEALTH AND SAFETY WATER QUANTITIES

CVP Division	CVP Contractor	Public Health & Safety water quantity to be Used in Impact Assessment (acre-feet)	Total CVP Contract (acre-feet)
Eastside	Tuolumne Utility District	6,750 [a]	9,000
	Subtotal	**6,750**	**9,000**
Delta	Broadview Water District	6	27,000
	Del Puerto Water District	48	140,210
	Plainview Water District	720	20,600
	City of Tracy	7,500 [a]	10,000
	Patterson Irrigation District	200	16,500
	Contra Costa Water District	91,114	195,000
	U.S. Department of Veterans Affairs - Cemetery	338 [a]	450
	Subtotal	**99,319**	**409,760**
West San Joaquin	Westlands Water District	4,134	1,150,000
	San Luis Water District	881	125,080
	Pacheco Water District	30	10,080
	Panoche Water District	38	94,000
	City of Avenal	2,438	3,500
	City of Coalinga	1,963	10,000
	City of Huron	1,729	3,000
	California Department of Fish and Game	8	10
	Subtotal	**11,408**	**1,395,670**
San Felipe	San Benito County Water Conservation and Flood Control District	5,733	43,800
	Santa Clara Valley Water District	114,375 [a]	152,500
	Subtotal	**120,108**	**196,300**
TOTAL		**248,503**	**1,821,090**

TABLE 4-3

MUNICIPAL AND INDUSTRIAL CENTRAL VALLEY PROJECT WATER SERVICE CONTRACTORS PUBLIC HEALTH AND SAFETY WATER QUANTITIES

CVP Division	CVP Contractor	Public Health & Safety water quantity to be Used in Impact Assessment (acre-feet)	Total CVP Contract (acre-feet)

[a] Public health and safety water quantities reflect the 75 percent of contract total limitation because, in these cases, the total public health and safety water quantities for M&I demand exceeds 75 percent of contract total.

American River Division water service contractors are not included in this analysis because it is not feasible to provide additional water to these contractors without construction of conveyance facilities and Water Forum proposal provides a re-allocation of available American Rive water supplies.

CHAPTER 5
AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

CHAPTER 5
Affected Environment and Environmental Consequences

INTRODUCTION

This section describes the affected environment and the environmental consequences associated with all alternatives described in Chapter 2 as compared to the No Action Alternative. This chapter also describes cumulative impacts.

The resources and issues described in this chapter are as follows.

- Surface Water Resources and Central Valley Project Operations
- Groundwater
- Municipal and Industrial Land Use and Central Valley Project Water Supply Costs
- Agricultural Land Use and Economics
- Fishery and Wildlife Resources
- Recreation
- Cultural Resources
- Indian Trust Assets
- Air Quality
- Soils
- Visual Resources
- Power Resources
- Social Conditions
- Environmental Justice

The descriptions of the affected environment are organized by issue and within each issue by CVP-wide resources followed, if appropriate, by division areas including Shasta-Trinity, West Sacramento, American River, Delta, West San Joaquin, and San Felipe divisions. The analyses are based upon information presented in environmental documentation for the concurrent long-term contract renewal process.

SURFACE WATER RESOURCES AND CENTRAL VALLEY PROJECT OPERATIONS

This section describes surface water resources and CVP operations and specific issues associated with delivery of water to M&I users in each division considered in this EA. The description of the Affected Environment has been developed from information presented in previous projects prepared by and for Reclamation, including the OCAP 2004. Surface water impacts are presented at a divisional level in this EA.

Affected Environment

The Affected Environment description of surface water is limited to major streams and water supply facilities that are directly affected by the alternatives. The CVP is operated as an integrated system with reservoirs on the American, Sacramento, Trinity, Stanislaus, and San Joaquin rivers. Water from the Trinity, Sacramento, and American rivers flow into the Sacramento River. These flows are mixed with flows diverted and stored by the State Water Project (SWP) in Oroville Reservoir on the Feather River and other local water rights holders on Sacramento River tributaries. The combined flows are conveyed in the Sacramento River to the Delta and either become part of the Delta outflow or are diverted by the Delta export pumps. The CVP Delta export occurs at Tracy Pumping Plant in the southern Delta which conveys water into the Delta Mendota Canal, San Luis Reservoir, and/or San Luis Canal for delivery to users located south of the Delta. Water from New Melones Reservoir on the Stanislaus River also flows into the Delta upstream of the Delta export pumps.

The SWRCB decisions and orders and biological opinions issued by the National Oceanic and Atmospheric Administration Fisheries and U.S. Fish and Wildlife Service are the primary factors that determine regulatory requirements for water quality, and flow and operations.

Both the CVP and the SWP use the Sacramento River for conveyance and both divert surface water from the southern Delta export pumps. Therefore, the operations of the CVP and the SWP are regulated in a cooperative manner by Reclamation and the California Department of Water Resources through an agreement entitled "Agreement Between the United States of America and State of California for Coordinated Operations Agreement (COA)of the Central Valley Project and State Water Project." These requirements and others that are used to operate the CVP are described in detail in OCAP 2004.

As a result of these cooperative agreements and the integration of the regulatory requirements, changes in CVP operations must be considered in relationship to both changes for all CVP water users and changes for SWP and other non-CVP users that rely upon the Sacramento River watershed, Delta, and water facilities located south of the Delta.

Environmental Consequences

The effects of Alternatives 1A, 1B, 2A, and 2B on surface water resources are compared to conditions under the No Action Alternative.

No Action Alternative. The No Action Alternative represents the future conditions without implementation of the September 2001 Draft CVP M&I Water Shortage Policy. Projected CVP water supply allocations are described in the OCAP baseline model runs developed for the 2020 conditions which are considered in this EA to be indicative of conditions in 2029 and in 2044.

Alternative 1A. Under Alternative 1A, the allocations identified in the No Action Alternative were applied to the projected Year 2030 water deliveries identified as of September 30, 1994, as shown on Schedule A-12 of the 1996 Municipal and Industrial Water Rates book, and for those contract quantities specified in section 206 of Public Law 101-514. If the allocation amounts were less than the public health and safety water quantities for each of the contractors, the deliveries were increased to meet the public health and safety water quantities as limited to 75 percent of the CVP water service Contract Total.

As part of this analysis, several methods were considered to provide the additional water to the M&I CVP water service contractors. During the 13 drier years of the 72 years considered in the CALSIM II model runs when M&I CVP water service contract allocations are less than 75 percent, 10 of the 13 years are considered "Critical (Dry)" and 3 years are considered "Dry." Except for 2 years, these years occur

following "Dry" or "Below Normal" years when the CVP reservoir volumes are extremely low; no flood control spills occur, and deliveries to Sacramento River Settlement Contractors, San Joaquin River Exchange Contractors, and Central Valley refuges are reduced to 75 percent of Contract Total in accordance with contract agreements and federal law.

The CVP is operated in a manner to provide flood protection and to provide water for water rights holders, refuges in accordance with federal law, and instream flows and Delta outflow in accordance with the requirements of state and federal agencies. Therefore, to increase M&I CVP water service contract deliveries, concepts would include storage of additional water during wet years, reduction of deliveries to Irrigation CVP water service contractors in all years and storage of the water in CVP reservoirs, or reduction of deliveries to Irrigation CVP water service contractors in the years when deliveries to M&I CVP water service contractors are less than 75 percent. In all years, the CVP reservoirs are operated to maximize storage while providing storage for flood flows to protect downstream communities. Water stored in wetter years would probably be spilled to provide flood control space in the reservoirs. In a similar manner, water provided by reduced deliveries to Irrigation CVP water service contractors in other years, frequently would spill in sequences of wetter years preceding the 1924 through 1934 period, 1959 through 1960 period, 1975 through 1977 period, and 1987 through 1991 period. Therefore, this analysis assumed that the additional water for deliveries to the M&I water service contractors in the 13 years would be made available by reducing deliveries to Irrigation CVP water service contractors within the shortage year considered.

In the American River Division, it is not possible to convey water from the Sacramento River to users that divert from the American River. The American River Division is not projected to include any Irrigation CVP water service contracts under the No Action Alternative. Therefore, it is not possible to increase M&I CVP water service contract allocations to the American River Division unless new conveyance facilities are constructed. Reclamation has initiated an evaluation of these types of facilities in a separate study. If those facilities are approved, increasing CVP water allocations to American River Division M&I CVP water service contractors could be implemented. However, for the purposes of this EA, increased allocations to American River Division water service contractors are not evaluated in this EA.

The results were compared to the No Action Alternative to determine the extent of additional water supplies that would be needed to meet the M&I water shortage policy goals under Alternative 1A, as shown in Table 5-1.

The additional water supplies that would be needed to improve allocations to M&I water service contractors under Alternative 1A can only be obtained from deliveries to Irrigation CVP water service contractors during the same water year. Because most the years in this analysis are part of a series of dry years, it is not possible to re-allocate carryover storage over a series of water years without adversely impacting supplies used by non-CVP users or causing spills during wet weather periods, as shown in Table 5-2.

TABLE 5-1

CENTRAL VALLEY PROJECT WATER SERVICE CONTRACT DELIVERIES UNDER ALTERNATIVE 1A THAT WOULD PROVIDE PUBLIC HEALTH AND SAFETY WATER QUANTITIES FOR M&I CONTRACTORS UP TO 75 PERCENT OF CONTRACT TOTAL

	Divisions						
	Shasta and Trinity	**Sacramento River**	**Eastside**	**Delta**	**West San Joaquin**	**San Felipe**	**Total**
50 PERCENT ALLOCATION YEARS - Not Feasible, Water not available to increase deliveries **Occurs for 4 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions**							
No Action Alternative CVP M&I Deliveries	16,341	138	4,500	103,735	10,956	73,138	208,808
Alternative 1A M&I CVP Deliveries	21,102	61	0	105,668	15,644	120,108	262,583
Difference in M&I CVP deliveries	4,761	-77	-4,500	1,933	4,688	46,970	53,775
52 PERCENT ALLOCATION YEARS - Not Completely Feasible, Water not available to totally meet needs **Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions**							
No Action Alternative Deliveries	16,995	143	4,680	107,884	11,394	76,064	217,160
Alternative 1A M&I CVP Deliveries	21,435	57	0	109,548	16,067	120,108	267,215
Difference in M&I CVP deliveries	4,440	-86	-4,680	1,664	4,673	44,044	50,055
53 PERCENT ALLOCATION YEARS **Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions**							
No Action Alternative Deliveries	17,322	146	4,770	109,959	11,613	77,526	221,336
Alternative 1A M&I CVP Deliveries	21,602	61	0	111,494	16,279	120,108	269,544
Difference in M&I CVP deliveries	4,280	-85	-4,770	1,535	4,666	42,582	48,208
54 PERCENT ALLOCATION YEARS **Occurs for 2 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions**							
No Action Alternative Deliveries	17,649	149	4,860	112,034	11,832	78,989	225,513
Alternative 1A M&I CVP Deliveries	21,771	61	0	113,436	16,491	120,108	271,867
Difference in M&I CVP deliveries	4,122	-88	-4,860	1,402	4,659	41,119	46,354

TABLE 5-1

CENTRAL VALLEY PROJECT WATER SERVICE CONTRACT DELIVERIES UNDER ALTERNATIVE 1A THAT WOULD PROVIDE PUBLIC HEALTH AND SAFETY WATER QUANTITIES FOR M&I CONTRACTORS UP TO 75 PERCENT OF CONTRACT TOTAL

	Divisions						
	Shasta and Trinity	**Sacramento River**	**Eastside**	**Delta**	**West San Joaquin**	**San Felipe**	**Total**
57 PERCENT ALLOCATION YEARS							
Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions							
No Action Alternative Deliveries	18,629	157	5,130	118,258	12,490	83,377	238,041
Alternative 1A M&I CVP Deliveries	22,286	61	0	119,263	17,126	120,108	278,844
Difference in M&I CVP deliveries	3,657	-96	-5,130	1,005	4,636	36,731	40,803
63 PERCENT ALLOCATION YEARS							
Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions							
No Action Alternative Deliveries	20,590	173	5,670	130,706	13,805	92,154	263,098
Alternative 1A M&I CVP Deliveries	22,571	61	0	130,916	18,557	120,108	292,213
Difference in M&I CVP deliveries	1,981	-112	-5,670	210	4,752	27,954	29,115
66 PERCENT ALLOCATION YEARS							
Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions							
No Action Alternative Deliveries	21,571	182	5,940	136,930	14,462	96,542	275,627
Alternative 1A M&I CVP Deliveries	23,829	61	0	136,743	19,282	120,108	300,023
Difference in M&I CVP deliveries	2,258	-121	-5,940	-187	4,820	23,566	24,396
70 PERCENT ALLOCATION YEARS							
Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions							
No Action Alternative Deliveries	22,878	193	6,300	145,229	15,338	102,393	292,331
Alternative 1A M&I CVP Deliveries	24,515	61	0	144,512	20,261	120,150	309,499
Difference in M&I CVP deliveries	1,637	-132	-6,300	-717	4,923	17,757	17,168

TABLE 5-1

CENTRAL VALLEY PROJECT WATER SERVICE CONTRACT DELIVERIES UNDER ALTERNATIVE 1A THAT WOULD PROVIDE PUBLIC HEALTH AND SAFETY WATER QUANTITIES FOR M&I CONTRACTORS UP TO 75 PERCENT OF CONTRACT TOTAL

	Divisions						
	Shasta and Trinity	**Sacramento River**	**Eastside**	**Delta**	**West San Joaquin**	**San Felipe**	**Total**
74 PERCENT ALLOCATION YEARS							
Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions							
No Action Alternative Deliveries	24,185	204	6,600	153,528	16,215	108,244	309,036
Alternative 1A M&I CVP Deliveries	25,228	61	0	152,280	21,368	120,480	319,417
Difference in M&I CVP deliveries	1,043	-143	-6,660	-1,248	5,153	12,236	10,381

NOTES:

All values as acre-feet/year

No Action Alternative Values are based on values presented in Chapter 4 and aggregated into summary values for CVP divisions or units

Alternative 1A Values are based on calculations described in Figure 3-1

Difference values are based on the subtraction of the Alternative 1A value from the No Action Alternative value

American River Division values are not included in this table because there are no physical facilities to convey alternative water supplies to most of the American River Division. It is assumed that the American River Division would receive water under the Water Forum Proposal, as included in the OCAP 2004 model runs.

TABLE 5-2

SUMMARY OF CHANGES IN CENTRAL VALLEY PROJECT ALLOCATIONS FOR M&I AND IRRIGATION WATER SERVICE CONTRACTORS UNDER ALTERNATIVE 1A

50 PERCENT ALLOCATION YEARS

Occurs for 4 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions (1924, 1933, 1934, 1990)

CVP Allocations in No Action Alternative				CVP Allocation in Alternative 1A			
M&I	% Allocation	Irrigation	% Allocation	M&I	% Allocation	Irrigation	% Allocation
208,808	50%	0	0%	208,808	50%	0	0%

The M&I allocation is calculated to be 262,581 acre-feet. However, because there are no Irrigation CVP water service contract allocations to provide to the M&I CVP Contractors, there is no increase in M&I CVP allocations

52 PERCENT ALLOCATION YEARS

Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions (1988)

CVP Allocations in No Action Alternative				CVP Allocation in Alternative 1A			
M&I	% Allocation	Irrigation	% Allocation	M&I	% Allocation	Irrigation	% Allocation
217,160	52%	44,100	2%	261,260	63%	0	0%

The M&I allocation is calculated to be 267,215 acre-feet. However, because there are only 44,100 acre-feet of Irrigation CVP water service contract allocations to provide to the M&I CVP Contractors, there is no increase in M&I CVP allocations

53 PERCENT ALLOCATION YEARS

Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions (1929)

CVP Allocations in No Action Alternative				CVP Allocation in Alternative 1A			
M&I	% Allocation	Irrigation	% Allocation	M&I	% Allocation	Irrigation	% Allocation
221,336	53%	66,200	3%	269,544	65%	17,993	1%

54 PERCENT ALLOCATION YEARS

Occurs for 2 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions (1926, 1977)

CVP Allocations in No Action Alternative				CVP Allocation in Alternative 1A			
M&I	% Allocation	Irrigation	% Allocation	M&I	% Allocation	Irrigation	% Allocation
225,513	54%	81,350	4%	271,867	65%	34,996	2%

57 PERCENT ALLOCATION YEARS

Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions (1931)

CVP Allocations in No Action Alternative				CVP Allocation in Alternative 1A			
M&I	% Allocation	Irrigation	% Allocation	M&I	% Allocation	Irrigation	% Allocation
238,041	57%	154,500	7%	278,844	67%	113,698	5%

63 PERCENT ALLOCATION YEARS

Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions (1991)

CVP Allocations in No Action Alternative				CVP Allocation in Alternative 1A			
M&I	% Allocation	Irrigation	% Allocation	M&I	% Allocation	Irrigation	% Allocation
263,098	63%	287,100	13%	292,213	70%	257,985	12%

TABLE 5-2

SUMMARY OF CHANGES IN CENTRAL VALLEY PROJECT ALLOCATIONS FOR M&I AND IRRIGATION WATER SERVICE CONTRACTORS UNDER ALTERNATIVE 1A

66% PERCENT ALLOCATION YEARS **Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions (1976)**							
CVP Allocations in No Action Alternative				**CVP Allocation in Alternative 1A**			
M&I	% Allocation	Irrigation	% Allocation	M&I	% Allocation	Irrigation	% Allocation
275,627	66%	363,100	16%	300,023	72%	338,704	16%
70% PERCENT ALLOCATION YEARS **Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions (1932)**							
CVP Allocations in No Action Alternative				**CVP Allocation in Alternative 1A**			
M&I	% Allocation	Irrigation	% Allocation	M&I	% Allocation	Irrigation	% Allocation
292,331	70%	440,500	20%	309,499	74%	423,332	20%
74% PERCENT ALLOCATION YEARS **Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions (1960)**							
CVP Allocations in No Action Alternative				**CVP Allocation in Alternative 1A**			
M&I	% Allocation	Irrigation	% Allocation	M&I	% Allocation	Irrigation	% Allocation
309,036	74%	504,900	23%	319,417	76%	494,518	23%

NOTES:

All values as acre-feet/year

% Allocation for M&I is equal to the M&I allocation value as compared to 417,616 acre-feet, or 100 percent allocation for M&I as defined in the No Action Alternative.

% Allocation for Irrigation is equal to the Irrigation allocation value as compared to 2,164,000 acre-feet, or 100 percent allocation for Irrigation in the OCAP 2004 CALSIM II model run.

No Action Alternative and Alternative 1A values for M&I Allocations are values presented in Table 5-1

No Action Alternative values for Irrigation Allocations are values of Irrigation CVP water service contract allocations in the OCAP 2004 model run for the years with the specific M&I Allocation characteristics. These values take into account that allocation of Irrigation CVP water service contract water could be less in areas located south of the Delta than north of the Delta. Alternative 1A values for Irrigation Allocations are based upon the subtraction of additional water to be provided to M&I CVP water service contractors from the No Action Alternative value.

American River Division values are not included in this table because there are no physical facilities to convey alternative water supplies to most of the American River Division. It is assumed that the American River Division would receive water under the Water Forum Proposal, as included in the OCAP 2004 model runs.

As shown in Table 5-2, additional water supplies would be required under Alternative 1A in all 13 years. However, in 4 of the 13 years, the allocations to Irrigation CVP water service contractors are zero and the M&I CVP water service contract allocations remain at 50 percent. During the 1 year that M&I CVP water service contract allocations are 52 percent, Irrigation CVP water service contract allocations are 2 percent and are not adequate to fully meet the M&I CVP water service contract demand under Alternative 1A. The additional water for M&I CVP water service contractors is available in the remaining 8 of the 13 years. Allocations of 5 percent or less to Irrigation CVP water service contractors would occur in 9 of 13 years as compared to 8 of 13 years in the No Action Alternative. The reduction in allocation percentages to Irrigation CVP water service contractors in the remaining 4 years would be no more than 1 percent.

Because Delta exports are not limited due to capacity limitations during the water years with M&I CVP water service contract allocations less than 75 percent, there would be no adverse impacts to availability of Delta export capacity for other users.

Because the water is re-allocated between CVP M&I and irrigation water users in the same water year, there is no change to storage in CVP reservoirs or to allocation of water to refuge water supplies, instream flows, or senior water rights holders.

Alternative 1B. Under Alternative 1B, the allocations identified in the No Action Alternative were applied to the water amounts identified in the Water Needs Assessment as M&I need. If the allocation amounts were less than the public health and safety water quantities for each of the contractors, the deliveries were increased to meet the public health and safety water quantities as limited to 75 percent of the CVP water service Contract Total. The results were compared to the No Action Alternative to determine the extent of additional water supplies that would be needed to meet the M&I water shortage policy goals under Alternative 1B, as shown in Table 5-3. As described in Chapter 3 and in the discussion under Alternative 1A, additional water supplies would be provided by reductions in water supplies to Irrigation CVP water service contractors.

As shown in Table 5-4, additional water supplies would be required under Alternative 1B in all 13 years. However, in 4 of the 13 years, the allocations to Irrigation CVP water service contractors are zero, and the M&I CVP water service contract allocations remain at 50 percent. During the 1 year that M&I CVP water service contract allocations is 52 percent, Irrigation CVP water service contract allocations is 2 percent and not adequate to fully meet the M&I CVP water service contract demand under Alternative 1B. The additional water for M&I CVP water service contractors is available in the remaining 8 of the 13 years. Allocations of 5 percent or less to Irrigation CVP water service contractors would occur in 9 of 13 years as compared to 8 of 13 years in the No Action Alternative. The reduction in allocation percentages to Irrigation CVP water service contractors in the remaining 4 years would be no more than 2 percent.

Because Delta exports are not limited due to capacity limitations during the water years with M&I CVP water service contract allocations less than 75 percent, there would be no adverse impacts to availability of Delta export capacity for other users.

Because the water is re-allocated between CVP M&I and irrigation water users in the same water year, there is no change to storage in CVP reservoirs or to allocation of water to refuge water supplies, instream flows, or senior water rights holders.

TABLE 5-3

CENTRAL VALLEY PROJECT WATER SERVICE CONTRACT DELIVERIES UNDER ALTERNATIVE 1B THAT WOULD PROVIDE PUBLIC HEALTH AND SAFETY WATER QUANTITIES FOR M&I CONTRACTORS UP TO 75 PERCENT OF CONTRACT TOTAL

	Divisions						
	Shasta and Trinity	**Sacramento River**	**Eastside**	**Delta**	**West San Joaquin**	**San Felipe**	**Total**
50 PERCENT ALLOCATION YEARS - Not Feasible, Water not available to increase deliveries							
Occurs for 4 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions							
No Action Alternative CVP M&I Deliveries	16,341	138	4,500	103,735	10,956	73,138	208,808
Alternative 1B M&I CVP Deliveries	20,093	215	6,750	106,668	13,909	122,513	270,148
Difference in M&I CVP deliveries	3,752	77	2,250	2,933	2,953	49,375	61,340
52 PERCENT ALLOCATION YEARS - Not Completely Feasible, Water not available to totally meet needs							
Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions							
No Action Alternative Deliveries	16,995	143	4,680	107,884	11,394	76,064	217,160
Alternative 1B M&I CVP Deliveries	20,423	215	6,750	110,592	14,132	122,839	274,951
Difference in M&I CVP deliveries	3,428	72	2,070	2,708	2,738	46,775	57,791
53 PERCENT ALLOCATION YEARS							
Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions							
No Action Alternative Deliveries	17,322	146	4,770	109,959	11,613	77,526	221,336
Alternative 1B M&I CVP Deliveries	20,623	215	6,750	112,554	14,245	123,001	277,388
Difference in M&I CVP deliveries	3,301	69	1,980	2,595	2,632	45,475	56,052
54 PERCENT ALLOCATION YEARS							
Occurs for 2 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions							
No Action Alternative Deliveries	17,649	149	4,860	112,034	11,832	78,989	225,513
Alternative 1B M&I CVP Deliveries	20,826	215	6,750	114,516	14,357	123,164	279,828
Difference in M&I CVP deliveries	3,177	66	1,890	2,482	2,525	44,175	54,315

TABLE 5-3

CENTRAL VALLEY PROJECT WATER SERVICE CONTRACT DELIVERIES UNDER ALTERNATIVE 1B THAT WOULD PROVIDE PUBLIC HEALTH AND SAFETY WATER QUANTITIES FOR M&I CONTRACTORS UP TO 75 PERCENT OF CONTRACT TOTAL

	Divisions						
	Shasta and Trinity	**Sacramento River**	**Eastside**	**Delta**	**West San Joaquin**	**San Felipe**	**Total**
57 PERCENT ALLOCATION YEARS							
Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions							
No Action Alternative Deliveries	18,629	157	5,130	118,258	12,490	83,377	238,041
Alternative 1B M&I CVP Deliveries	21,440	215	6,750	120,403	14,692	123,652	287,152
Difference in M&I CVP deliveries	2,811	58	1,620	2,145	2,202	40,275	49,111
63 PERCENT ALLOCATION YEARS							
Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions							
No Action Alternative Deliveries	20,590	173	5,670	130,706	13,805	92,154	263,098
Alternative 1B M&I CVP Deliveries	22,600	215	6,750	132,176	15,364	124,629	301,734
Difference in M&I CVP deliveries	2,010	42	1,080	1,470	1,559	32,475	38,636
66 PERCENT ALLOCATION YEARS							
Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions							
No Action Alternative Deliveries	21,571	182	5,940	136,930	14,462	96,542	275,627
Alternative 1B M&I CVP Deliveries	23,823	215	6,750	138,063	15,700	125,117	309,128
Difference in M&I CVP deliveries	1,712	33	810	1,133	1,238	28,575	33,501
70 PERCENT ALLOCATION YEARS							
Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions							
No Action Alternative Deliveries	22,878	193	6,300	145,229	15,338	102,393	292,331
Alternative 1B M&I CVP Deliveries	24,102	215	6,750	145,912	16,160	125,768	318,907
Difference in M&I CVP deliveries	1,224	22	450	683	822	23,375	26,576

TABLE 5-3

CENTRAL VALLEY PROJECT WATER SERVICE CONTRACT DELIVERIES UNDER ALTERNATIVE 1B THAT WOULD PROVIDE PUBLIC HEALTH AND SAFETY WATER QUANTITIES FOR M&I CONTRACTORS UP TO 75 PERCENT OF CONTRACT TOTAL

	Divisions						
	Shasta and Trinity	**Sacramento River**	**Eastside**	**Delta**	**West San Joaquin**	**San Felipe**	**Total**
74 PERCENT ALLOCATION YEARS							
Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions							
No Action Alternative Deliveries	24,185	204	6,600	153,528	16,215	108,244	309,036
Alternative 1B M&I CVP Deliveries	24,248	215	6,750	153,760	16,748	126,419	328,140
Difference in M&I CVP deliveries	63	11	90	232	533	18,175	19,104

NOTES:

All values as acre-feet/year

No Action Alternative Values are based on values presented in Chapter 4 and aggregated into summary values for CVP divisions or units

Alternative 1B Values are based on calculations described in Figure 3-2

Difference values are based on the subtraction of the Alternative 1B value from the No Action Alternative value

American River Division values are not included in this table because there are no physical facilities to convey alternative water supplies to most of the American River Division. It is assumed that the American River Division would receive water under the Water Forum Proposal, as included in the OCAP 2004 model runs.

TABLE 5-4

SUMMARY OF CHANGES IN CENTRAL VALLEY PROJECT ALLOCATIONS FOR M&I AND IRRIGATION WATER SERVICE CONTRACTORS UNDER ALTERNATIVE 1B

50 PERCENT ALLOCATION YEARS

Occurs for 4 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions (1924, 1933, 1934, 1990)

CVP Allocations in No Action Alternative				CVP Allocation in Alternative 1B			
M&I	% Allocation	Irrigation	% Allocation	M&I	% Allocation	Irrigation	% Allocation
208,808	50%	0	0%	208,808	50%	0	0%

The M&I allocation is calculated to be 270,148 acre-feet. However, because there are no Irrigation CVP water service contract allocations to provide to the M&I CVP Contractors, there is no increase in M&I CVP allocations

52 PERCENT ALLOCATION YEARS

Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions (1988)

CVP Allocations in No Action Alternative				CVP Allocation in Alternative 1B			
M&I	% Allocation	Irrigation	% Allocation	M&I	% Allocation	Irrigation	% Allocation
217,160	52%	44,100	2%	261,260	63%	0	0%

The M&I allocation is calculated to be 274,951 acre-feet. However, because there are only 44,100 acre-feet of Irrigation CVP water service contract allocations to provide to the M&I CVP Contractors, there is no increase in M&I CVP allocations

53 PERCENT ALLOCATION YEARS

Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions (1929)

CVP Allocations in No Action Alternative				CVP Allocation in Alternative 1B			
M&I	% Allocation	Irrigation	% Allocation	M&I	% Allocation	Irrigation	% Allocation
221,336	53%	66,200	3%	277,388	66%	10,149	less than 1%

54 PERCENT ALLOCATION YEARS

Occurs for 2 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions (1926, 1977)

CVP Allocations in No Action Alternative				CVP Allocation in Alternative 1B			
M&I	% Allocation	Irrigation	% Allocation	M&I	% Allocation	Irrigation	% Allocation
225,513	54%	81,350	4%	279,828	67%	27,036	1%

57 PERCENT ALLOCATION YEARS

Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions (1931)

CVP Allocations in No Action Alternative				CVP Allocation in Alternative 1B			
M&I	% Allocation	Irrigation	% Allocation	M&I	% Allocation	Irrigation	% Allocation
238,041	57%	154,500	7%	287,152	69%	105,389	5%

63 PERCENT ALLOCATION YEARS

Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions (1991)

CVP Allocations in No Action Alternative				CVP Allocation in Alternative 1B			
M&I	% Allocation	Irrigation	% Allocation	M&I	% Allocation	Irrigation	% Allocation
263,098	63%	287,100	13%	301,734	72	248,464	11%

TABLE 5-4

SUMMARY OF CHANGES IN CENTRAL VALLEY PROJECT ALLOCATIONS FOR M&I AND IRRIGATION WATER SERVICE CONTRACTORS UNDER ALTERNATIVE 1B

66% PERCENT ALLOCATION YEARS **Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions (1976)**							
CVP Allocations in No Action Alternative				**CVP Allocation in Alternative 1B**			
M&I	% Allocation	Irrigation	% Allocation	M&I	% Allocation	Irrigation	% Allocation
275,627	66%	363,100	16%	309,128	74%	329,599	15%
70% PERCENT ALLOCATION YEARS **Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions (1932)**							
CVP Allocations in No Action Alternative				**CVP Allocation in Alternative 1B**			
M&I	% Allocation	Irrigation	% Allocation	M&I	% Allocation	Irrigation	% Allocation
292,331	70%	440,500	20%	318,907	76	413,924	19%
74% PERCENT ALLOCATION YEARS **Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions (1960)**							
CVP Allocations in No Action Alternative				**CVP Allocation in Alternative 1B**			
M&I	% Allocation	Irrigation	% Allocation	M&I	% Allocation	Irrigation	% Allocation
309,036	74%	504,900	23%	328,140	79	485,796	22%

NOTES:

All values as acre-feet/year

% Allocation for M&I is equal to the M&I allocation value as compared to 417,616 acre-feet, or 100 percent allocation for M&I as defined in the No Action Alternative.

% Allocation for Irrigation is equal to the Irrigation allocation value as compared to 2,164,000 acre-feet, or 100 percent allocation for Irrigation in the OCAP 2004 CALSIM II model run.

No Action Alternative and Alternative 1B values for M&I Allocations are values presented in Table 5-3

No Action Alternative values for Irrigation Allocations are values of Irrigation CVP water service contract allocations in the OCAP 2004 model run for the years with the specific M&I Allocation characteristics. These values take into account that allocation of Irrigation CVP water service contract water could be less in areas located south of the Delta than north of the Delta. Alternative 1B values for Irrigation Allocations are based upon the subtraction of additional water to be provided to M&I CVP water service contractors from the No Action Alternative value.

American River Division values are not included in this table because there are no physical facilities to convey alternative water supplies to most of the American River Division. It is assumed that the American River Division would receive water under the Water Forum Proposal, as included in the OCAP 2004 model runs.

Alternative 2A. Under Alternative 2A, the allocations identified in Alternative 1B would be considered for a second tier of allocations. The second tier would provide up to 100 percent of the industrial water demand. The total allocations per contractor were limited to 75 percent of the CVP water service Contract Total. The results were compared to the No Action Alternative to determine the extent of additional water supplies that would be needed to meet the M&I water shortage policy goals under Alternative 2A, as shown in Table 5-5. As described in the discussion under Alternative 1A, additional water supplies would be provided by reductions in water supplies to Irrigation CVP water service contractors.

As shown in Table 5-6, additional water supplies would be required under Alternative 2A in all 13 years. However, in 4 of the 13 years, the allocations to Irrigation CVP water service contractors are zero, and , the M&I CVP water service contract allocations remain at 50 percent. During the 4 years that M&I CVP water service contract allocations are 52, 53, and 54 percent, Irrigation CVP water service contract allocations are 2, 3, and 4 percent, respectively, and are not adequate to fully meet the M&I CVP water service contract demand under Alternative 2A. The additional water for M&I CVP water service contractors is available in the remaining 5 of the 13 years. Allocations of 5 percent or less to Irrigation CVP water service contractors would occur in 9 of 13 years as compared to 8 of 13 years in the No Action Alternative. The reduction in allocation percentages to Irrigation CVP water service contractors in the remaining 4 years would be no more than 3 percent.

Because Delta exports are not limited due to capacity limitations during the water years with M&I CVP water service contract allocations less than 75 percent, there would be no adverse impacts to availability of Delta export capacity for other users.

Because the water is re-allocated between CVP M&I and irrigation water users in the same water year, there is no change to storage in CVP reservoirs or to allocation of water to refuge water supplies, instream flows, or senior water rights holders.

Alternative 2B. Under Alternative 2B, the allocations were determined to be 75 percent of the water amounts identified in the Water Needs Assessment. If the resultant amounts were less than the public health and safety water quantities for each of the contractors, the deliveries were increased to meet the public health and safety water quantities as limited to 75 percent of the CVP water service Contract Total. The total demands per contractor were limited to 75 percent of the CVP water service Contract Total for that contract. The results were compared to the No Action Alternative to determine the extent of additional water supplies that would be needed to meet the M&I water shortage policy goals under Alternative 2B, as shown in Table 5-7. As described in the discussion under Alternative 1A, additional water supplies would be provided by reductions in water supplies to Irrigation CVP water service contractors.

As shown in Table 5-8, additional water supplies would be required under Alternative 2B in all 13 years. However, in 4 of the 13 years, the allocations to Irrigation CVP water service contractors are zero, and , the M&I CVP water service contract allocations remain at 50 percent. During the 4 years that M&I CVP water service contract allocations are 52, 53, and 54 percent, Irrigation CVP water service contract allocations are 2, 3, and 4 percent, respectively, and are not adequate to fully meet the M&I CVP water service contract demand under Alternative 2B. The additional water for M&I CVP water service contractors is available in the remaining 5 of the 13 years. Allocations of 5 percent or less to Irrigation CVP water service contractors would occur in 9 of 13 years as compared to 8 of 13 years in the No Action Alternative. The reduction in allocation percentages to Irrigation CVP water service contractors in the remaining 4 years would be no more than 3 percent.

TABLE 5-5

CENTRAL VALLEY PROJECT WATER SERVICE CONTRACT DELIVERIES UNDER ALTERNATIVE 2A THAT WOULD PROVIDE PUBLIC HEALTH AND SAFETY WATER QUANTITIES FOR M&I CONTRACTORS UP TO 75 PERCENT OF CONTRACT TOTAL

	Divisions						
	Shasta and Trinity	**Sacramento River**	**Eastside**	**Delta**	**West San Joaquin**	**San Felipe**	**Total**
50 PERCENT ALLOCATION YEARS - Not Feasible, Water not available to increase deliveries **Occurs for 4 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions**							
No Action Alternative CVP M&I Deliveries	16,341	138	4,500	103,735	10,956	73,138	208,808
Alternative 2A M&I CVP Deliveries	20,241	215	6,750	135,254	14,169	123,013	299,642
Difference in M&I CVP deliveries	3,900	77	2,250	31,519	3,213	49,875	90,834
52 PERCENT ALLOCATION YEARS - Not Completely Feasible, Water not available to totally meet needs **Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions**							
No Action Alternative Deliveries	16,995	143	4,680	107,884	11,394	76,064	217,160
Alternative 2A M&I CVP Deliveries	20,566	215	6,750	138,038	14,393	123,319	308,281
Difference in M&I CVP deliveries	3,571	72	2,070	30,154	2,999	47,255	86,121
53 PERCENT ALLOCATION YEARS **Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions**							
No Action Alternative Deliveries	17,322	146	4,770	109,959	11,613	77,526	221,336
Alternative 2A M&I CVP Deliveries	20,764	215	6,750	139,430	14,505	123,471	305,135
Difference in M&I CVP deliveries	3,442	69	1,980	29,471	2,892	45,945	83,799
54 PERCENT ALLOCATION YEARS **Occurs for 2 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions**							
No Action Alternative Deliveries	17,649	149	4,860	112,034	11,832	78,989	225,513
Alternative 2A M&I CVP Deliveries	20,965	215	6,750	140,822	14,617	123,624	306,993
Difference in M&I CVP deliveries	3,316	66	1,890	28,788	2,785	44,635	81,480

TABLE 5-5

CENTRAL VALLEY PROJECT WATER SERVICE CONTRACT DELIVERIES UNDER ALTERNATIVE 2A THAT WOULD PROVIDE PUBLIC HEALTH AND SAFETY WATER QUANTITIES FOR M&I CONTRACTORS UP TO 75 PERCENT OF CONTRACT TOTAL

	Divisions						
	Shasta and Trinity	**Sacramento River**	**Eastside**	**Delta**	**West San Joaquin**	**San Felipe**	**Total**
57 PERCENT ALLOCATION YEARS							
Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions							
No Action Alternative Deliveries	18,629	157	5,130	118,258	12,490	83,377	238,041
Alternative 2A M&I CVP Deliveries	21,730	215	6,750	144,998	14,953	124,082	312,728
Difference in M&I CVP deliveries	3,101	58	1,620	26,740	2,463	40,705	74,687
63 PERCENT ALLOCATION YEARS							
Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions							
No Action Alternative Deliveries	20,590	173	5,670	130,706	13,805	92,154	263,098
Alternative 2A M&I CVP Deliveries	22,674	215	6,750	153,350	15,625	124,999	323,613
Difference in M&I CVP deliveries	2,084	42	1,080	22,644	1,820	32,845	60,515
66 PERCENT ALLOCATION YEARS							
Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions							
No Action Alternative Deliveries	21,571	182	5,940	136,930	14,462	96,542	275,627
Alternative 2A M&I CVP Deliveries	23,122	215	6,750	155,697	15,691	125,457	327,202
Difference in M&I CVP deliveries	1,551	33	810	18,767	1,499	28,915	51,575
70 PERCENT ALLOCATION YEARS							
Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions							
No Action Alternative Deliveries	22,878	193	6,300	145,229	15,338	102,393	292,331
Alternative 2A M&I CVP Deliveries	23,720	215	6,750	155,745	16,432	126,068	328,930
Difference in M&I CVP deliveries	842	22	450	10,516	1,094	23,675	36,599

TABLE 5-5

CENTRAL VALLEY PROJECT WATER SERVICE CONTRACT DELIVERIES UNDER ALTERNATIVE 2A THAT WOULD PROVIDE PUBLIC HEALTH AND SAFETY WATER QUANTITIES FOR M&I CONTRACTORS UP TO 75 PERCENT OF CONTRACT TOTAL

	Divisions						
	Shasta and Trinity	**Sacramento River**	**Eastside**	**Delta**	**West San Joaquin**	**San Felipe**	**Total**
74 PERCENT ALLOCATION YEARS							
Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions							
No Action Alternative Deliveries	24,185	204	6,600	153,528	16,215	108,244	309,036
Alternative 2A M&I CVP Deliveries	24,342	215	6,750	155,793	17,018	126,679	330,797
Difference in M&I CVP deliveries	157	11	90	2,265	803	18,435	21,761

NOTES:

All values as acre-feet/year

No Action Alternative Values are based on values presented in Chapter 4 and aggregated into summary values for CVP divisions or units

Alternative 2A Values are based on calculations described in Figure 3-3

Difference values are based on the subtraction of the Alternative 2A value from the No Action Alternative value

American River Division values are not included in this table because there are no physical facilities to convey alternative water supplies to most of the American River Division. It is assumed that the American River Division would receive water under the Water Forum Proposal, as included in the OCAP 2004 model runs.

TABLE 5-6

SUMMARY OF CHANGES IN CENTRAL VALLEY PROJECT ALLOCATIONS FOR M&I AND IRRIGATION WATER SERVICE CONTRACTORS UNDER ALTERNATIVE 2A

50 PERCENT ALLOCATION YEARS

Occurs for 4 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions (1924, 1933, 1934, 1990)

CVP Allocations in No Action Alternative				CVP Allocation in Alternative 2A			
M&I	% Allocation	Irrigation	% Allocation	M&I	% Allocation	Irrigation	% Allocation
208,808	50%	0	0%	208,808	50%	0	0%

The M&I allocation is calculated to be 299,642. However, because there are no Irrigation CVP water service contract allocations to provide to the M&I CVP Contractors, there is no increase in M&I CVP allocations

52 PERCENT ALLOCATION YEARS

Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions (1988)

CVP Allocations in No Action Alternative				CVP Allocation in Alternative 2A			
M&I	% Allocation	Irrigation	% Allocation	M&I	% Allocation	Irrigation	% Allocation
217,160	52%	44,100	2%	261,260	63%	0	0%

The M&I allocation is calculated to be 308,281-feet. However, because there are only 44,100 acre-feet of Irrigation CVP water service contract allocations to provide to the M&I CVP Contractors, there is no increase in M&I CVP allocations

53 PERCENT ALLOCATION YEARS

Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions (1929)

CVP Allocations in No Action Alternative				CVP Allocation in Alternative 2A			
M&I	% Allocation	Irrigation	% Allocation	M&I	% Allocation	Irrigation	% Allocation
221,336	53%	66,200	3%	287,536	69%	0	0%

The M&I allocation is calculated to be 305,135 acre-feet. However, because there are only 66,200 acre-feet of Irrigation CVP water service contract allocations to provide to the M&I CVP Contractors, there is no increase in M&I CVP allocations

54 PERCENT ALLOCATION YEARS

Occurs for 2 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions (1926, 1977)

CVP Allocations in No Action Alternative				CVP Allocation in Alternative 2A			
M&I	% Allocation	Irrigation	% Allocation	M&I	% Allocation	Irrigation	% Allocation
225,513	54%	81,350	4%	306,863	73%	0	0%

The M&I allocation is calculated to be 306,993 feet. However, because there are only 81,350 acre-feet of Irrigation CVP water service contract allocations to provide to the M&I CVP Contractors, there is no increase in M&I CVP allocations

57 PERCENT ALLOCATION YEARS

Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions (1931)

CVP Allocations in No Action Alternative				CVP Allocation in Alternative 2A			
M&I	% Allocation	Irrigation	% Allocation	M&I	% Allocation	Irrigation	% Allocation
238,041	57%	154,500	7%	312,728	75%	79,813	4%

TABLE 5-6

SUMMARY OF CHANGES IN CENTRAL VALLEY PROJECT ALLOCATIONS FOR M&I AND IRRIGATION WATER SERVICE CONTRACTORS UNDER ALTERNATIVE 2A

63 PERCENT ALLOCATION YEARS **Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions (1991)**							
CVP Allocations in No Action Alternative				**CVP Allocation in Alternative 2A**			
M&I	% Allocation	Irrigation	% Allocation	M&I	% Allocation	Irrigation	% Allocation
263,098	63%	287,100	13%	323,613	77%	226,585	10%
66% PERCENT ALLOCATION YEARS **Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions (1976)**							
CVP Allocations in No Action Alternative				**CVP Allocation in Alternative 2A**			
M&I	% Allocation	Irrigation	% Allocation	M&I	% Allocation	Irrigation	% Allocation
275,627	66%	363,100	16%	327,202	78%	311,525	14%
70% PERCENT ALLOCATION YEARS **Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions (1932)**							
CVP Allocations in No Action Alternative				**CVP Allocation in Alternative 2A**			
M&I	% Allocation	Irrigation	% Allocation	M&I	% Allocation	Irrigation	% Allocation
292,331	70%	440,500	20%	328,930	79%	403,902	19%
74% PERCENT ALLOCATION YEARS **Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions (1960)**							
CVP Allocations in No Action Alternative				**CVP Allocation in Alternative 2A**			
M&I	% Allocation	Irrigation	% Allocation	M&I	% Allocation	Irrigation	% Allocation
309,036	74%	504,900	23%	330,797	79%	483,139	22%

NOTES:

All values as acre-feet/year

% Allocation for M&I is equal to the M&I allocation value as compared to 417,616 acre-feet, or 100 percent allocation for M&I as defined in the No Action Alternative.

% Allocation for Irrigation is equal to the Irrigation allocation value as compared to 2,164,000 acre-feet, or 100 percent allocation for Irrigation in the OCAP 2004 CALSIM II model run.

No Action Alternative and Alternative 2A values for M&I Allocations are values presented in Table 5-5

No Action Alternative values for Irrigation Allocations are values of Irrigation CVP water service contract allocations in the OCAP 2004 model run for the years with the specific M&I Allocation characteristics. These values take into account that allocation of Irrigation CVP water service contract water could be less in areas located south of the Delta than north of the Delta. Alternative 2A values for Irrigation Allocations are based upon the subtraction of additional water to be provided to M&I CVP water service contractors from the No Action Alternative value.

American River Division values are not included in this table because there are no physical facilities to convey alternative water supplies to most of the American River Division. It is assumed that the American River Division would receive water under the Water Forum Proposal, as included in the OCAP 2004 model runs.

TABLE 5-7

CENTRAL VALLEY PROJECT WATER SERVICE CONTRACT DELIVERIES UNDER ALTERNATIVE 2B THAT WOULD PROVIDE PUBLIC HEALTH AND SAFETY WATER QUANTITIES FOR M&I CONTRACTORS UP TO 75 PERCENT OF CONTRACT TOTAL

	Divisions						
	Shasta and Trinity	**Sacramento River**	**Eastside**	**Delta**	**West San Joaquin**	**San Felipe**	**Total**
50 PERCENT ALLOCATION YEARS - Not Feasible, Water not available to increase deliveries **Occurs for 4 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions**							
No Action Alternative CVP M&I Deliveries	16,341	138	4,500	103,735	10,956	73,138	208,808
Alternative 2B M&I CVP Deliveries	28,333	248	6,750	156,108	19,501	130,651	341,591
Difference in M&I CVP deliveries	11,992	110	2,250	52,373	8,545	57,513	132,783
52 PERCENT ALLOCATION YEARS - Not Completely Feasible, Water not available to totally meet needs **Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions**							
No Action Alternative Deliveries	16,995	143	4,680	107,884	11,394	76,064	217,160
Alternative 2B M&I CVP Deliveries	28,333	248	6,750	156,108	19,501	130,651	341,591
Difference in M&I CVP deliveries	11,338	105	2,070	48,224	8,107	54,587	124,431
53 PERCENT ALLOCATION YEARS **Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions**							
No Action Alternative Deliveries	17,322	146	4,770	109,959	11,613	77,526	221,336
Alternative 2B M&I CVP Deliveries	28,333	248	6,750	156,108	19,501	130,651	341,591
Difference in M&I CVP deliveries	11,011	102	1,980	46,149	7,888	53,125	120,255
54 PERCENT ALLOCATION YEARS **Occurs for 2 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions**							
No Action Alternative Deliveries	17,649	149	4,860	112,034	11,832	78,989	225,513
Alternative 2B M&I CVP Deliveries	28,333	248	6,750	156,108	19,501	130,651	341,591
Difference in M&I CVP deliveries	10,684	99	1,890	44,074	7,669	51,662	116,078

TABLE 5-7

CENTRAL VALLEY PROJECT WATER SERVICE CONTRACT DELIVERIES UNDER ALTERNATIVE 2B THAT WOULD PROVIDE PUBLIC HEALTH AND SAFETY WATER QUANTITIES FOR M&I CONTRACTORS UP TO 75 PERCENT OF CONTRACT TOTAL

	Divisions						
	Shasta and Trinity	**Sacramento River**	**Eastside**	**Delta**	**West San Joaquin**	**San Felipe**	**Total**
57 PERCENT ALLOCATION YEARS							
Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions							
No Action Alternative Deliveries	18,629	157	5,130	118,258	12,490	83,377	238,041
Alternative 2B M&I CVP Deliveries	28,333	248	6,750	156,108	19,501	130,651	341,591
Difference in M&I CVP deliveries	9,704	91	1,620	37,850	7,011	47,274	103,550
63 PERCENT ALLOCATION YEARS							
Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions							
No Action Alternative Deliveries	20,590	173	5,670	130,706	13,805	92,154	263,098
Alternative 2B M&I CVP Deliveries	28,333	248	6,750	156,108	19,501	130,651	341,591
Difference in M&I CVP deliveries	7,743	75	1,080	25,402	5,696	38,497	78,493
66 PERCENT ALLOCATION YEARS							
Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions							
No Action Alternative Deliveries	21,571	182	5,940	136,930	14,462	96,542	275,627
Alternative 2B M&I CVP Deliveries	28,333	248	6,750	156,108	19,501	130,651	341,591
Difference in M&I CVP deliveries	6,762	66	810	19,178	5,039	34,109	65,964
70 PERCENT ALLOCATION YEARS							
Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions							
No Action Alternative Deliveries	22,878	193	6,300	145,229	15,338	102,393	292,331
Alternative 2B M&I CVP Deliveries	28,333	248	6,750	156,108	19,501	130,651	341,591
Difference in M&I CVP deliveries	5,455	55	450	10,879	4,163	28,258	49,260

TABLE 5-7

CENTRAL VALLEY PROJECT WATER SERVICE CONTRACT DELIVERIES UNDER ALTERNATIVE 2B THAT WOULD PROVIDE PUBLIC HEALTH AND SAFETY WATER QUANTITIES FOR M&I CONTRACTORS UP TO 75 PERCENT OF CONTRACT TOTAL

	Divisions						
	Shasta and Trinity	**Sacramento River**	**Eastside**	**Delta**	**West San Joaquin**	**San Felipe**	**Total**
74 PERCENT ALLOCATION YEARS							
Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions							
No Action Alternative Deliveries	24,185	204	6,600	153,528	16,215	108,244	309,036
Alternative 2B M&I CVP Deliveries	28,333	248	6,750	156,108	19,501	130,651	341,591
Difference in M&I CVP deliveries	4,148	44	90	2,580	3,286	22,407	32,555

NOTES:

All values as acre-feet/year

No Action Alternative Values are based on values presented in Chapter 4 and aggregated into summary values for CVP divisions or units

Alternative 2B Values are based on calculations described in Figure 3-4

Difference values are based on the subtraction of the Alternative 2B value from the No Action Alternative value

American River Division values are not included in this table because there are no physical facilities to convey alternative water supplies to most of the American River Division. It is assumed that the American River Division would receive water under the Water Forum Proposal, as included in the OCAP 2004 model runs.

TABLE 5-8

SUMMARY OF CHANGES IN CENTRAL VALLEY PROJECT ALLOCATIONS FOR M&I AND IRRIGATION WATER SERVICE CONTRACTORS UNDER ALTERNATIVE 2B

50 PERCENT ALLOCATION YEARS

Occurs for 4 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions (1924, 1933, 1934, 1990)

CVP Allocations in No Action Alternative				CVP Allocation in Alternative 2B			
M&I	% Allocation	Irrigation	% Allocation	M&I	% Allocation	Irrigation	% Allocation
208,808	50%	0	0%	208,808	50%	0	0%

The M&I allocation is calculated to be 341,591 acre-feet. However, because there are no Irrigation CVP water service contract allocations to provide to the M&I CVP Contractors, there is no increase in M&I CVP allocations

52 PERCENT ALLOCATION YEARS

Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions (1988)

CVP Allocations in No Action Alternative				CVP Allocation in Alternative 2B			
M&I	% Allocation	Irrigation	% Allocation	M&I	% Allocation	Irrigation	% Allocation
217,160	52%	44,100	2%	261,260	63%	0	0%

The M&I allocation is calculated to be 341,591 acre-feet. However, because there are only 44,100 acre-feet of Irrigation CVP water service contract allocations to provide to the M&I CVP Contractors, there is no increase in M&I CVP allocations

53 PERCENT ALLOCATION YEARS

Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions (1929)

CVP Allocations in No Action Alternative				CVP Allocation in Alternative 2B			
M&I	% Allocation	Irrigation	% Allocation	M&I	% Allocation	Irrigation	% Allocation
221,336	53%	66,200	3%	287,536	69%	0	0%

The M&I allocation is calculated to be 341,591 acre-feet. However, because there are only 66,200 acre-feet of Irrigation CVP water service contract allocations to provide to the M&I CVP Contractors, there is no increase in M&I CVP allocations

54 PERCENT ALLOCATION YEARS

Occurs for 2 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions (1926, 1977)

CVP Allocations in No Action Alternative				CVP Allocation in Alternative 2B			
M&I	% Allocation	Irrigation	% Allocation	M&I	% Allocation	Irrigation	% Allocation
225,513	54%	81,350	4%	306,863	73%	0	0%

The M&I allocation is calculated to be 341,591 acre-feet. However, because there are only 81,350 acre-feet of Irrigation CVP water service contract allocations to provide to the M&I CVP Contractors, there is no increase in M&I CVP allocations

57 PERCENT ALLOCATION YEARS

Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions (1931)

CVP Allocations in No Action Alternative				CVP Allocation in Alternative 2B			
M&I	% Allocation	Irrigation	% Allocation	M&I	% Allocation	Irrigation	% Allocation
238,041	57%	154,500	7%	341,591	82%	50,952	2%

TABLE 5-8

SUMMARY OF CHANGES IN CENTRAL VALLEY PROJECT ALLOCATIONS FOR M&I AND IRRIGATION WATER SERVICE CONTRACTORS UNDER ALTERNATIVE 2B

63 PERCENT ALLOCATION YEARS **Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions (1991)**							
CVP Allocations in No Action Alternative				**CVP Allocation in Alternative 2B**			
M&I	% Allocation	Irrigation	% Allocation	M&I	% Allocation	Irrigation	% Allocation
263,098	63%	287,100	13%	341,591	82%	208,609	10%
66% PERCENT ALLOCATION YEARS **Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions (1976)**							
CVP Allocations in No Action Alternative				**CVP Allocation in Alternative 2B**			
M&I	% Allocation	Irrigation	% Allocation	M&I	% Allocation	Irrigation	% Allocation
275,627	66%	363,100	16%	341,591	82%	297,137	14%
70% PERCENT ALLOCATION YEARS **Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions (1932)**							
CVP Allocations in No Action Alternative				**CVP Allocation in Alternative 2B**			
M&I	% Allocation	Irrigation	% Allocation	M&I	% Allocation	Irrigation	% Allocation
292,331	70%	440,500	20%	341,591	82%	391,242	18%
74% PERCENT ALLOCATION YEARS **Occurs for 1 of the 72 years in OCAP 2004 CALSIM II model simulation for 2020 Conditions (1960)**							
CVP Allocations in No Action Alternative				**CVP Allocation in Alternative 2B**			
M&I	% Allocation	Irrigation	% Allocation	M&I	% Allocation	Irrigation	% Allocation
309,036	74%	504,900	23%	341,591	82%	472,346	22%

NOTES:

All values as acre-feet/year

% Allocation for M&I is equal to the M&I allocation value as compared to 417,616 acre-feet, or 100 percent allocation for M&I as defined in the No Action Alternative.

% Allocation for Irrigation is equal to the Irrigation allocation value as compared to 2,164,000 acre-feet, or 100 percent allocation for Irrigation in the OCAP 2004 CALSIM II model run.

No Action Alternative and Alternative 2B values for M&I Allocations are values presented in Table 5-7

No Action Alternative values for Irrigation Allocations are values of Irrigation CVP water service contract allocations in the OCAP 2004 model run for the years with the specific M&I Allocation characteristics. These values take into account that allocation of Irrigation CVP water service contract water could be less in areas located south of the Delta than north of the Delta. Alternative 2B values for Irrigation Allocations are based upon the subtraction of additional water to be provided to M&I CVP water service contractors from the No Action Alternative value.

American River Division values are not included in this table because there are no physical facilities to convey alternative water supplies to most of the American River Division. It is assumed that the American River Division would receive water under the Water Forum Proposal, as included in the OCAP 2004 model runs.

Because Delta exports are not limited due to capacity limitations during the water years with M&I CVP water service contract allocations less than 75 percent, there would be no adverse impacts to availability of Delta export capacity for other users.

Because the water is re-allocated between CVP M&I and irrigation water users in the same water year, there is no change to storage in CVP reservoirs or to allocation of water to refuge water supplies, instream flows, or senior water rights holders.

Summary. A comparison of changes in allocations to M&I and Irrigation CVP water service contractors is presented in Table 5-9 for the future conditions considered in this EA. Alternatives 2A and 2B would result in more impacts to Irrigation CVP water service contractors than Alternatives 1A and 1B. Alternative 1A would result in the least impacts to the Irrigation CVP water service contractors. None of the alternatives would cause adverse impacts to other CVP operations or surface waters as compared to the No Action Alternative.

Cumulative Effects

Implementation of M&I Water Shortage Policy would not result in cumulative adverse impacts to surface water resources, water quality, or CVP operations when considered in combination with future projects such as water transfer projects or development of other water supplies. Alternatives considered in this EA may reduce the demand for water transfers by the amount of additional water supplied to the M&I CVP water service contractors. The alternatives considered in this EA would not affect the ability to implement those projects or increase the overall impacts from all of the projects. The alternatives in this EA would reduce availability of potential water that could have been transferred from Irrigation CVP water service contractors in the 9 of the 72 years considered in the CALSIM modeling analyses.

None of the alternatives considered in this EA would modify CVP Contract Totals or deliveries from within the historical ranges under the No Action Alternative. None of the alternatives considered in this EA would support additional residential, commercial, or industrial growth within the M&I water service contractors service area. However, the improved water supply allocations in drought years may encourage the existing and projected water users to continue to be located within the M&I water service contractors' service areas.

GROUNDWATER

This section describes groundwater resources and specific issues associated with delivery of water to M&I users in each division considered in this EA. The description of the Affected Environment has been developed from information presented in the CVPIA PEIS.

Affected Environment

The Central Valley regional aquifer system of California is a 400-mile long, northwest-trending asymmetric trough averaging 50 miles in width. The significant water-producing geologic units are the unconsolidated to semi-consolidated nonmarine sediments that range from the Oligocene and Miocene ages (13 million to 25 million years old) to recent, and are located in the valley trough. The west side of the trough is bounded by pre-Tertiary and Tertiary semi-consolidated to consolidated marine sedimentary rocks of the Coast Ranges. These faulted and folded sediments extend eastward beneath most of the Central Valley; any water contained in the sediments is usually saline. The east side of the valley is underlain by pre-Tertiary igneous and metamorphic rocks of the Sierra Nevada. Only small quantities of water are extracted from the joints and cracks of these basement rocks.

TABLE 5-9

PERCENT ALLOCATIONS TO CENTRAL VALLEY PROJECT WATER SERVICE CONTRACT DELIVERIES FOR M&I AND IRRIGATION WATER SERVICE CONTRACTORS

No. of Years	No Action Alternative		Alternative 1A		Alternative 1B		Alternative 2A		Alternative 2B	
	M&I	Irrig.	M&I	Irrig.	M&I	Irrig.	M&I	Irrig.	M&I	Irrig.
4 years (1924, 1933, 1934, 1990)	50%	0%	50%	0 [a]	50%	0 [a]	50%	0 [a]	50%	0 [a]
1 year (1988)	52%	2%	63%	0 [b]	63%	0 [b]	63%	0 [b]	63%	0 [b]
1 year (1929)	53%	3%	65%	1%	66%	<1%	69%	0 [b]	69%	0 [b]
2 years (1926, 1977)	54%	4%	65%	2%	67%	1%	73%	0 [b]	73%	0 [b]
1 year (1931)	57%	7%	67%	5%	69%	5%	75%	4%	82%	2%
1 year (1991)	63%	13%	70%	12%	72%	11%	77%	10%	82%	10%
1 year (1976)	66%	16%	72%	16%	74%	15%	78%	14%	82%	14%
1 year (1932)	70%	20%	74%	20%	76%	19%	79%	19%	82%	18%
1 year (1960)	74%	23%	76%	23%	79%	22%	79%	22%	82%	22%

"Irrig." = Irrigation
All percentages calculated as compared to total M&I or Irrigation CVP water service contracts

Number of Years refers to the years in the OCAP 2004 CALSIM II model run that was used to define the No Action Alternative

% Allocation for M&I is equal to the M&I allocation value as compared to 417,616 acre-feet, or 100 percent allocation for M&I as defined in the No Action Alternative.

% Allocation for Irrigation is equal to the Irrigation allocation value as compared to 2,164,000 acre-feet, or 100 percent allocation for Irrigation in the OCAP 2004 CALSIM II model run.

[a] Under the No-Action Alternative for 50 percent M&I Allocation years, deliveries to Irrigation CVP water service contractors are equal to zero. Therefore, there are no changes in deliveries to M&I or Irrigation water users.

[b] Re-allocation of water to increase M&I CVP water service contract water in these alternatives will result in zero deliveries to Irrigation CVP water service contractors

Many faults and folds exist in the Central Valley. Available information suggests that most faults and folds do not obstruct groundwater flow. Major groundwater barriers occur west of the Sacramento River between Redding and Red Bluff, near the Sutter Buttes northeast of Sacramento, and in the southeastern portion of the San Joaquin Valley. Groundwater characteristics in the Sacramento and San Joaquin valleys and the San Felipe Division are described below.

Sacramento Valley (Shasta, Trinity, Sacramento River, and American River Divisions). During the geologic period of deposition, as much as 10 vertical miles of unconsolidated continental and marine sediment accumulated in the structural trough of the Sacramento Valley basin. Alluvium deposits can be found throughout the region in the form of alluvial fans, stream channel deposits, and flood plain deposits. These vast deposits are the source of most of the groundwater pumped in the Sacramento Valley. Although the Sacramento Valley Aquifer System is considered unconfined, areas of confinement are present. Depth to the base of freshwater ranges from 1,000 feet north of Red Bluff to nearly 3,000 feet near Sacramento. Aquifer recharge of the basin has historically occurred from deep percolation of rainfall, the infiltration from stream beds, and subsurface inflow along basin boundaries. Most of the recharge for the Central Valley occurs in the north and east sides of the valley where the precipitation is the greatest. With the introduction of agriculture to the region, recharge occurs from deep percolation of applied irrigation water and seepage from canals.

The rate of change in groundwater withdrawals is generally proportional to changes in irrigated agricultural acreage and availability of surface water supplies. Groundwater use also increased in recent years as non-irrigated pasture lands were converted to urban land uses that rely upon groundwater. The increased use of groundwater in the western Sacramento Valley near Zamora and Davis have caused land subsidence.

Groundwater quality in the Sacramento Valley is generally good. However, there are areas with high levels of Total Dissolved Solids (TDS) and boron. TDS concentrations in the Sacramento Valley groundwater are generally considered to be low with most values being less than 500 mg/l. The low TDS concentrations are primarily due to the groundwater recharge from the Cascade Range and Sierra Nevada. Higher concentrations of up to 1,500 mg/l occur southwest of the Sutter Buttes and near the Delta.

Boron is not a regulated substance in drinking water, but it is a critical element in irrigation water. In small quantities, boron is essential for plant growth. However, concentrations as low as 0.75 mg/l may be toxic to boron-sensitive plants, and it is toxic to most crops at concentrations above 4 mg/l. Low levels of boron (below 0.75 mg/l) have been observed southwest of Sacramento. Boron concentrations greater than 0.75 mg/l have been reported in an area east of Red Bluff and north of Davis.

San Joaquin Valley (Eastside, Delta, and West San Joaquin Divisions). The San Joaquin Valley basin has accumulated up to six vertical miles of unconsolidated continental and marine sediment in the structural trough. The top 2,000 feet of these sediments consist of continental deposits that generally contain freshwater. As these sediments accumulated over the last 24 million years, large lakes periodically filled and drained, resulting in deposition of laterally extensive clay layers, forming significant barriers to the vertical movement of groundwater in the basin. The most extensive of these is the Corcoran Clay (a member of the Tulare Formation deposited about 600,000 years ago), consisting of a clay layer zero to 160 feet thick, found at depths of 100 to 400 feet below the land surface in the San Joaquin Valley. Other clay layers are present above and below the Corcoran Clay and may have local impacts on groundwater conditions. The Corcoran Clay divides the groundwater system into two major aquifers: a confined aquifer below the clay layer and a semi-confined aquifer above the layer.

The semi-confined aquifer can be divided into three geohydrologic units based on the source of the sediment: Coast Range alluvium, Sierra Nevada sediments, and flood basin deposit. The Coast Range

alluvial deposits are derived largely from the erosion of marine rocks from the Coast Range. These 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 contain a large proportion of silt and clay, are high in salts, and contain elevated concentrations of selenium and other trace elements. The Sierra Nevada sediments on the eastern side of the region are derived primarily from granitic rock. These deposits make up most of the total thickness of sediments along the valley axis and gradually thin to the west until pinching out near the western boundary. These sediments are relatively permeable, with hydraulic conductivities three times that of the Coast Range deposits. The flood basin deposits are relatively thin and, in geologic terms, have been created in recent time. These deposits occur along the center of the valley floor and are generally only 5 to 35 feet thick.

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 expanded in the region, recharge was 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 consists of subsurface inflow from the valley floor and foothill areas to the east of the eastern boundary of the Corcoran Clay Member. Present information indicates that the clay layers, including the Corcoran Clay, are not continuous in some areas, and some seepage from the semi-confined aquifer above does occur through the confining layer.

Historically, the interaction of groundwater and surface water resulted in net gains to the streams. This condition existed on a regional basis through about the mid 1950s. Since that time groundwater level declines have resulted in some stream reaches losing 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 streamflows have fluctuated. Along the San Joaquin River, flood control operations in conjunction with spring pulse flow requirements have caused high groundwater adjacent to the streams. The raised groundwater levels can impact the root zones of crops adjacent to the river.

Large-scale groundwater development during the 1960s and 1970s, combined with the introduction of imported surface water supplies, have modified the natural groundwater flow pattern towards the Delta. Flow largely occurs from areas of recharge towards areas of lower groundwater levels due to groundwater pumping. The vertical movement of water in the aquifer has been altered as a result of thousands of wells constructed with perforation above and below the confining unit (Corcoran Clay Member), where present, providing a direct hydraulic connection. This may have been partially offset by a decrease in vertical flow resulting from the inelastic compaction of fine-grained materials within the aquifer system.

Expansion of agricultural practices between 1920 and 1950 caused declines in groundwater levels in many areas of the San Joaquin Valley. Along the east side of the valley groundwater declined between 40 and 80 feet since the mid 1800s. Declines began occurring in the 1940s along the west side of the valley to more than 30 feet by 1960. In the confined aquifer of northwestern San Joaquin Valley, groundwater levels were recorded as ranging from 200 feet below sea level to sea level in spring 1960. By spring 1970, groundwater levels in this same area were recorded as ranging from 200 feet to 100 feet below sea level, a decline of about 100 feet. Groundwater levels near Stockton declined to about 50 feet below sea level by spring 1970, causing saline groundwater intrusion. Groundwater levels in the semiconfined aquifer between spring 1970 and spring 1980 declined in response to 1976-1977 drought conditions and recovered to near pre-drought levels by 1980 when surface water was available from the CVP system. During the 1987-1992 drought water levels declined by 20 to 30 feet throughout most of the central and eastern parts of the San Joaquin Valley.

As a result of declining groundwater, land subsidence has occurred throughout the valley. From 1920 to 1970, almost 5,200 square miles of irrigated land in the San Joaquin valley were characterized by at least

one foot of land subsidence. By the mid 1970s, the use of imported surface water in lieu of groundwater pumping in the western and southern portions of San Joaquin Valley essentially eliminated new land subsidence. During the 1976-1977 and 1987-1992 droughts, land subsidence was observed in areas previously affected due to renewed high groundwater pumping rates, including areas near the Delta Mendota Canal.

Groundwater quality conditions vary throughout the San Joaquin Valley. Constituents of concern in the San Joaquin Valley groundwater include TDS, boron, nitrate, arsenic, and selenium. TDS concentrations vary considerably throughout the valley. Along the eastern side of the valley, TDS concentrations are generally less than 500 mg/l in this area because this area is recharged with water from the Sierra Nevada. On the west side of the valley, TDS concentrations are generally greater than 500 mg/l and can be in excess of 2,000 mg/l. The concentrations in excess of 2,000 mg/l generally occur above the Corcoran Clay and are related to local soil conditions and accumulation of salts from irrigation with water from the Delta. Boron concentrations are high in the northeastern sections of the San Joaquin valley. High nitrate concentrations occur north of Stockton and near Fresno. Municipal uses of groundwater for drinking water are impaired due to elevated arsenic concentrations along the eastern edges of valley.

Selenium is leached from soils into groundwater along the west side of the valley during the infiltration of irrigation water. The selenium-impacted groundwater then discharges into receiving surface waters. Recently, the State of California has established maximum selenium objectives for the San Joaquin River. Reclamation has worked with local water agencies and stakeholders in the area to reduce discharge of selenium into the San Joaquin River and reduce the accumulation of selenium in local wetlands.

San Felipe Division. Groundwater resources vary throughout the San Felipe Division. In Zone 6 of the San Benito County Flood Control and Water Conservation District, groundwater consist of numerous subbasins partially separated by barriers or fault zones. Irrigation of agricultural lands in this area has relied on groundwater as the primary supply. As agricultural development expanded, groundwater withdrawals exceeded recharge rates and caused severe declines in groundwater levels. In the 1980s, CVP water was imported into this area to reduce the overdraft conditions. Recently, the groundwater levels have increased to pre-irrigation levels. Groundwater quality is generally good. However, areas with high levels of TDS occur sporadically. Organic constituents are also detected in the vicinity of wastewater percolation ponds near the communities of Hollister and San Juan Bautista.

In Santa Clara County, extensive groundwater pumping for agricultural purposes produced overdraft conditions and resulted in land subsidence of up to 13 feet, increased pumping costs, and seawater intrusion from the San Francisco Bay. Local surface water facilities constructed in the 1940s eliminated most overdraft conditions by the 1950s, but subsequent increased development re-initiated the overdraft. To reverse these conditions, surface water was initially imported to the area in the late 1960s through the SWP South Bay Aqueduct. Continued growth during the late 1960s and 1970s threatened to return the area to overdraft conditions until CVP water was introduced through the San Felipe Division. Groundwater resources in Santa Clara County are generally of good quality. Seawater intrusion is presumably responsible for high chloride concentrations in the northern Santa Clara Valley. High boron concentrations occur in the foothills on the east side of the county and high nitrate concentrations occur in areas that rely upon septic systems for wastewater treatment and disposal.

Contra Costa and Alameda Counties (American River and Delta Divisions). Groundwater basins in Alameda and Contra Costa counties are structural depressions formed by folding and faulting. The basins are filled with marine and alluvial sediments and drained by surface streams. Seawater intrusion is common near San Francisco Bay.

Groundwater resources are limited and/or of poor water quality in many portions of these counties. Limited groundwater supplies have resulted in overdraft conditions, land subsidence, and degradation of water quality. In eastern Contra Costa County, high nitrates due to agricultural activities through the 1960s have made available groundwater supplies unacceptable for municipal drinking water uses. Groundwater is used for agricultural and industrial users.

Major municipal water suppliers in Contra Costa and Alameda counties rely upon local and imported surface water from the Delta or water imported by East Bay Municipal Utility District from the Mokelumne River.

Environmental Consequences

The effects of Alternatives 1A, 1B, 2A, and 2B on groundwater resources are compared to conditions under the No Action Alternative.

No Action Alternative. The No Action Alternative represents the future conditions without implementation of an M&I water shortage policy under the alternatives. Under the No Action Alternative, it is anticipated that groundwater use by both M&I and Irrigation CVP water service contractors would remain the same as under existing conditions except in the American River Division. In the American River Division, conjunctive use programs will be implemented as part of the Water Forum Agreement.

Alternative 1A. Under Alternative 1A, groundwater use by M&I and Irrigation CVP water service contractors would not change from the No Action Alternative conditions in 63 of the 72 years considered in this EA when the M&I CVP water service contract water allocations are equal to or greater than 75 percent or equal to 50 percent.

In the remaining 9 years of the 72 years considered in the CALSIM II model runs for this EA, it is unclear how the M&I CVP water service contractors will react with the increased water allocations. In some communities, this may result in a decreased use of groundwater or reduction of stringent conservation measures. It also is unclear how the Irrigation CVP water service contractors will respond to the reduction in water allocations. Some contractors may fallow lands more frequently. Other contractors may increase use of groundwater, or use a combination of fallowing and increased groundwater withdrawals. Therefore, it is difficult to quantify the changes in groundwater conditions. However, if increased groundwater withdrawals are used for the irrigated areas in the 9 years, groundwater overdraft and groundwater quality will probably adversely affected on a temporary basis.

Alternative 1B. The changes in groundwater use under Alternative 1B would be similar to that described under Alternative 1A because the changes in M&I and Irrigation CVP water service contractor allocations would be similar under both alternatives.

Alternative 2A. The changes in groundwater use under Alternative 2A would be similar to that described under Alternative 1A because the changes in M&I and Irrigation CVP water service contractor allocations would be similar under both alternatives.

Alternative 2B. The changes in groundwater use under Alternative 2B would be similar to that described under Alternative 1A because the changes in M&I and Irrigation CVP water service contractor allocations would be similar under both alternatives.

Cumulative Effects

Implementation of M&I Water Shortage Policy would not result in cumulative adverse impacts to groundwater resources when considered in combination with future projects such as water transfer projects or development of other water supplies. Alternatives considered in this EA may reduce the demand for water transfers by the amount of additional water supplied to the M&I CVP water service contractors. The alternatives considered in this EA would not affect the ability to implement those projects or increase the overall impacts from all of the projects. The alternatives in this EA would reduce availability of potential water that could have been transferred from Irrigation CVP water service contractors in the 9 of the 72 years considered in the CALSIM modeling analyses. If the irrigation users decide to increase groundwater pumping in the 9 years, that could reduce the feasibility of increasing groundwater pumping under future water transfer programs.

None of the alternatives considered in this EA would modify CVP Contract Totals or deliveries from within the historical ranges under the No Action Alternative. None of the alternatives considered in this EA would support additional residential, commercial, or industrial growth within the M&I water service contractors. However, the improved water supply allocations in drought years may encourage the existing and projected water users to continue to be located within the M&I water service contractors' service areas.

MUNICIPAL AND INDUSTRIAL LAND USE AND CENTRAL VALLEY PROJECT WATER COSTS

This section describes land use and water supply costs for M&I users in each division considered in this EA. The description of the Affected Environment has been developed from information presented in the CVPIA PEIS and draft environmental documents prepared by and for Reclamation to support the Long-Term Contract Renewal process.

Affected Environment

Municipal and Industrial Land Use. M&I land is defined as land used for residential, industrial, commercial, construction, institutional, railroad yards, cemeteries, airports, golf courses, sanitary landfills, sewage treatment plants, water control structures, and other development purposes. Highways, railroads, and other transportation facilities are also included as M&I land use if they are part of a surrounding M&I area.

Existing and projected land uses within each of the M&I CVP water service contractor service areas are described in detail in Chapter 3. Regional land use for the Sacramento and San Joaquin valleys and the San Francisco Bay Area are summarized below.

M&I land use in the Sacramento Valley increased after 1950, in part as a result of the post-World War II “baby boom” and strong economic conditions. Between 1950 and 1980, M&I corridors developed along Interstate 80 and Highway 50 in the American River Division. During this time, development in the region included growth in Sacramento, which expanded the area from a regional transportation center for agriculture and the state capital; to an area that also supported aerospace, electronics, computer and other high technology industries. Between 1980 and 1990, M&I land acreage within the Sacramento River Region increased from approximately 316,000 acres to 444,000 acres. During the 1980s, areas within the American River Division were among the fastest growing areas in California. Recently, M&I land use has increased in the Trinity and Shasta Division as the cities of Redding, Shasta Lake, and Red Bluff and surrounding areas have increased residential units.

Increases in M&I land use in the San Joaquin Valley occurred primarily in Fresno, Merced, Stanislaus, and San Joaquin Counties. Between 1980 and 1990, M&I land acreage within the San Joaquin River Region increased from approximately 71,000 acres to 110,000 acres. Major M&I centers in the portions of the Eastside, Delta, and West San Joaquin divisions in the San Joaquin Valley include the cities of Stockton, Tracy, and Manteca. These cities are growing due to industrial growth and as suburban areas for the San Francisco Bay Area.

Between 1955 and 1970, M&I land use in the San Francisco Bay Area (including areas in the American River, Delta, and San Felipe divisions) increased from approximately 225,000 to 485,000 acres. M&I land use for 1990 was 655,000 acres. By the late 1990s, few areas remained in this region that could support new development. Extensive development occurred on the Interstates 680 and 580 corridors.

Municipal and Industrial Water Supply Costs for CVP Water. Water use and average water costs vary greatly among water suppliers, as described in the CVPIA PEIS. Summer seasonal M&I water use is higher in the Central Valley than in coastal communities due to higher landscape irrigation requirements. Winter seasonal residential M&I water use is higher in suburban areas than in high-density urban areas. Overall water use varies by M&I CVP water service contractor and is affected by types of land use, seasons, and availability of additional water sources. Most of the M&I CVP water service contractors have implemented extensive conservation and recycled water programs, and larger communities rely upon several water supplies, as described in Chapter 3.

Due to the use of several water supplies, it is difficult to determine or compare the actual cost of water to the retail customers. For the purpose of this EA, the analysis of M&I CVP water supplies is limited to a comparison of the 2004 cost of service rates for each M&I CVP water service contractor in this EA, as summarized in Table 5-10.

Environmental Consequences

The effects of Alternatives 1A, 1B, 2A, and 2B on M&I Land Use and Water Supply Costs are compared to conditions under the No Action Alternative.

No Action Alternative. The No Action Alternative represents the future conditions without implementation of an M&I water shortage policy under the alternatives. Under the No Action Alternative, it is anticipated that projected land uses would be consistent with general plans, water supply integrated resources plans, and other documents prepared by local agencies, as summarized in Chapter 3 of this EA. These plans have been prepared assuming the water supply conditions under the No Action Alternative which are consistent with projected conditions in the CVPIA PEIS proposed action. In areas with identified water supply deficiencies in 2029, plans have been or are being prepared by the local water supply agencies to implement extensive water use efficiency programs. Some agencies are developing conjunctive use programs. Many agencies have been evaluating opportunities to participate in water transfer programs that would provide additional water during dry periods. Under all of these programs, it is anticipated that water conservation will be extensively used when M&I CVP water service contract allocations are less than 75 percent.

CVP cost of service rates under the No Action Alternative would be consistent with values presented in Table 5-10. The cost of water transfers during droughts is difficult to project. Recent costs of water transfers have exceeded $100/acre-foot without the cost of conveyance from the transferor to the M&I water agency.

Alternative 1A. Under Alternative 1A, M&I land use is not anticipated to change because this alternative would not provide additional water to M&I CVP water service contractors except to meet

public health and safety needs in drought periods. There would be no increase in CVP water service Contract Totals that could be used to support growth not identified in the Water Needs Assessment used in the No Action Alternative.

TABLE 5-10

2004 RATES FOR COST OF SERVICE FOR M&I CENTRAL VALLEY PROJECT WATER SERVICE CONTRACT WATER

CVP Division	M&I Water Service Contractor	2004 Cost of Service Rate for M&I CVP Water ($/acre-feet)
Trinity River	Shasta Community Services District	24.25
	Shasta County Service Area - Keswick #25	28.01
	Bella Vista Water District (not Shasta County Water Agency service area)	64.77
	Clear Creek Community Services District	48.33
	Centerville Community Services District	26.36
Shasta	Shasta County Water Agency	31.40
	Mountain Gate Community Services District (not Shasta County Water Agency service area)	20.08
	City of Shasta Lake	23.97
	City of Redding	15.00 to 25.14 [a]
	U.S. Forest Service - Centimundi Boat Ramp	15.92
Sacramento River	Colusa County Water District	29.83
	County of Colusa	22.88
	Whitney Construction	21.36
	Elk Creek Community Services District	15.00
	U.S. Forest Service - Conservation Camp	18.07
American River	El Dorado Irrigation District (El Dorado Hills, only)	25.83
	City of Roseville	20.09
	San Juan Water District	22.64
	East Bay Municipal Utility District	110.55
	Sacramento Municipal Utility District	70.27
	Sacramento County Water Agency	19.02
	Placer County Water Agency	No M&I CVP water in 2004
Eastside	Tuolumne Utility District	No M&I CVP water in 2004

TABLE 5-10

2004 RATES FOR COST OF SERVICE FOR M&I CENTRAL VALLEY PROJECT WATER SERVICE CONTRACT WATER

CVP Division	M&I Water Service Contractor	2004 Cost of Service Rate for M&I CVP Water ($/acre-feet)
Delta	Broadview Water District	42.58
	Del Puerto Water District	29.86
	Plainview Water District	27.30
Delta - continued	City of Tracy	35.10
	Patterson Irrigation District	No M&I CVP water in 2004
	Contra Costa Water District	36.33
	U.S. Department of Veterans Affairs - Cemetery	36.47
West San Joaquin	Westlands Water District	49.51
	San Luis Water District	15.00 to 59.45
	Pacheco Water District	72.02
	Panoche Water District	39.87 to 44.78 [b]
	City of Avenal	94.39
	City of Coalinga	80.75
	City of Huron	91.71
	California Department of Fish & Game	39.58
San Felipe	Zone 6 of San Benito County Water Conservation & Flood Control District	40.01
	Santa Clara Valley Water District	53.59

All rates based on 2004 U.S. Bureau of Reclamation M&I Ratebook for the cost of capital repayment plus operation and maintenance.

[a] Range of costs depend upon whether water is delivered from Spring Creek Conduit or Sacramento River.

[b] Range of costs depend upon whether water is delivered from Delta Mendota Canal or San Luis Unit.

With the potential of additional years of no CVP irrigation water deliveries , farmers would need to find alternative water sources. Surface water could be available through agreements already held by the farmer or through short term transfers. These water sources are likely to be more expensive than CVP water service contracts, particularly transfers made during drier water years.

At the expected frequency of no or very little CVP irrigation water deliveries associated with this alternative, it is likely that farmers without affordable and accessible alternative water supplies will be subject to significant financial burdens. Farmers may fallow crops, resulting in lost farm revenue and related jobs. Farmers with permanent crops would be most vulnerable to losing high valued investments. Loss of agricultural employment would affect lower income population and minority populations more than other populations in the state. There could be an improved allocations of industrial employment associated with industries that rely upon M&I CVP water service contract water and that were concerned about reductions in water supplies during droughts.

CVP cost of service rates under Alternative 1A would be equal to those used in the No Action Alternative. The total cost of M&I CVP water service contract water would be different than under the No Action Alternative depending upon the total volume delivered, although the unit cost would not change. The overall cost of supplying M&I water could also change as the need for water transfers changes in Alternative 1A as compared to the No Action Alternative.

Conditions in the American River Division under Alternative 1A would be identical as the conditions under the No Action Alternative.

Alternative 1B. Under Alternative 1B, M&I land use is not anticipated to change because this alternative would not provide additional water to M&I CVP water service contractors except to meet public health and safety needs in drought periods. There would be no increase in CVP water service Contract Totals that could be used to support growth not identified in the Water Needs Assessment used in the No Action Alternative.

With the potential of additional years of no CVP irrigation water deliveries, farmers would need to find alternative water sources. Surface water could be available through agreements already held by the farmer or through short term transfers. These water sources are likely to be more expensive than CVP water service contracts, particularly transfers made during drier water years.

At the expected frequency of no or very little CVP irrigation water deliveries associated with this alternative, it is likely that farmers without affordable and accessible alternative water supplies will be subject to significant financial burdens. Farmers may fallow crops, resulting in lost farm revenue and related jobs. Farmers with permanent crops would be most vulnerable to losing high valued investments. Loss of agricultural employment would affect lower income population and minority populations more than other populations in the state. There could be an improved allocations of industrial employment associated with industries that rely upon M&I CVP water service contract water and that were concerned about reductions in water supplies during droughts.

CVP cost of service rates under Alternative 1B would be equal to those used in the No Action Alternative. The total cost of M&I CVP water service contract water would be different than under the No Action Alternative depending upon the total volume delivered, although the unit cost would not change. The overall cost of supplying M&I water could also change as the need for water transfers changes in Alternative 1B as compared to the No Action Alternative.

Conditions in the American River Division under Alternative 1B would be identical as the conditions under the No Action Alternative.

Alternative 2A. Under Alternative 2A, M&I land use is not anticipated to change because this alternative would not provide additional water to M&I CVP water service contractors except to meet public health and safety needs in drought periods to provide adequate water to maintain industrial users. There would be no increase in CVP water service Contract Totals that could be used to support growth not identified in the Water Needs Assessment used in the No Action Alternative.

With the potential of additional years of no CVP irrigation water deliveries, farmers would need to find alternative water sources. Surface water could be available through agreements already held by the farmer or through short term transfers. These water sources are likely to be more expensive than CVP water service contracts, particularly transfers made during drier water years.

At the expected frequency of no or very little CVP irrigation water deliveries associated with this alternative, it is likely that farmers without affordable and accessible alternative water supplies will be subject to significant financial burdens. Farmers may fallow crops, resulting in lost farm revenue and related jobs. Farmers with permanent crops would be most vulnerable to losing high valued investments. Loss of agricultural employment would affect lower income population and minority populations more than other populations in the state. There could be an improved allocations of industrial employment associated with industries that rely upon M&I CVP water service contract water and that were concerned about reductions in water supplies during droughts.

CVP cost of service rates under Alternative 2A would be equal to those used in the No Action Alternative for the first tier. However, even under the first tier, the total cost of M&I CVP water service contract water would be higher than under the No Action Alternative due to the increased total volume delivered, although the unit cost would not change.

Cost of CVP water under the second tier would be higher than the CVP cost of service rates in all years - not just the years with M&I CVP water service contract allocations less than 75 percent. Therefore, with respect to the CALSIM II model simulation, the higher rates for the second tier increment would occur in all 72 years for the increased allocations in 9 of the 72 years. Alternative 2A would increase the cost of the second tier by three to 10 times the cost of service rate. However, this increase would be blended with the existing cost of service rate for the first tier, as described in the following example assuming a multiplier of 10.

Assumptions:
CVP Water Service Contract Cost of Service = $20/acre-foot (First Tier or Base Rate)
Second Tier Cost - assume multiplier of 10 = $200/acre-foot (Second Tier or Incremental Rate)

Allocation based upon methods described for Alternative 1B = 10,000 acre-feet
Additional amount of water to provide 100 percent of industrial water demand, up to a maximum of 75 percent of Contract Total = 1,000 acre-feet (Second-Tier)

Example of Blended Rate:
[(10,000 acre-feet * $20/acre-foot) + (1,000 acre-feet*$200/acre-foot)]/(11,000 acre-feet) = $36.4/acre-foot

The overall cost of water supply would also change as the need for water transfers would decrease in Alternative 2A as compared to the No Action Alternative. Conditions in the American River Division under Alternative 2A would be identical as conditions under the No Action Alternative.

Alternative 2B. Under Alternative 2B, M&I land use is not anticipated to change because this alternative would not provide additional water to M&I CVP water service contractors except to meet public health and safety needs in drought periods to provide adequate water to maintain industrial users. There would be no increase in CVP water service Contract Totals that could be used to support growth not identified in the Water Needs Assessment used in the No Action Alternative.

With the potential of additional years of no CVP irrigation water deliveries, farmers would need to find alternative water sources. Surface water could be available through agreements already held by the farmer or through short term transfers. These water sources are likely to be more expensive than CVP water service contracts, particularly transfers made during drier water years.

At the expected frequency of no or very little CVP irrigation water deliveries associated with this alternative, it is likely that farmers without affordable and accessible alternative water supplies will be subject to significant financial burdens. Farmers may fallow crops, resulting in lost farm revenue and related jobs. Farmers with permanent crops would be most vulnerable to losing high valued investments. Loss of agricultural employment would affect lower income population and minority populations more than other populations in the state. There could be an improved allocations of industrial employment associated with industries that rely upon M&I CVP water service contract water and that were concerned about reductions in water supplies during droughts.

CVP cost of service rates under Alternative 2B would be equal to those used in the No Action Alternative for the first tier. However, even under the first tier, the total cost of M&I CVP water service contract water would be higher than under the No Action Alternative due to the increased total volume delivered, although the unit cost would not change.

The cost of CVP water under the second tier would be higher than the CVP cost of service rates in all years, not just the years with M&I CVP water service contract allocations less than 75 percent. Therefore, with respect to the CALSIM II model simulation, the higher rates for the second tier increment would occur in all 72 years for the increased allocations in 9 of the 72 years. Alternative 2B would increase the cost of the second tier by three to 10 times the cost of service rate, as described under Alternative 2B. However, this increase would be blended with the existing cost of service rate for the first tier, as described in the following example assuming a multiplier of 10.

> **Assumptions:**
> CVP Water Service Contract Cost of Service = $20/acre-foot (First Tier or Base Rate)
> Second Tier Cost - assume multiplier of 10 = $200/acre-foot (Second Tier or Incremental Rate)
>
> Allocation based upon methods described for Alternative 1B = 10,000 acre-feet
> Additional amount of water to provide 100 percent of M&I water demand, up to a maximum of 75 percent of Contract Total = 5,000 acre-feet (Second-Tier)
>
> **Example of Blended Rate:**
> [(10,000 acre-feet * $20/acre-foot) + (5,000 acre-feet*$200/acre-foot)]/(15,000 acre-feet) = $80/acre-foot

The overall cost of water supply would also change as the need for water transfers changes in Alternative 2B as compared to the No Action Alternative.

Conditions in the American River Division under Alternative 2B would be identical as conditions under the No Action Alternative.

Cumulative Effects

Implementation of M&I Water Shortage Policy would not result in cumulative adverse impacts to land use or CVP water supply costs when considered in combination with future projects such as water transfer projects or development of other water supplies. Alternatives considered in this EA may reduce the demand for water transfers by the amount of additional water supplied to the M&I CVP water service contractors. The alternatives considered in this EA would not affect the ability to implement those projects or increase the overall impacts from all of the projects. The alternatives in this EA would reduce availability of potential water that could have been transferred from Irrigation CVP water service contractors to any type of M&I users in the 9 of the 72 years considered in the CALSIM modeling analyses.

None of the alternatives considered in this EA would modify CVP Contract Totals or deliveries from within the historical ranges under the No Action Alternative. None of the alternatives considered in this EA would support additional residential, commercial, or industrial growth within the M&I water service contractors. However, the improved water supply allocations in drought years may encourage the existing and projected water users to continue to be located within the M&I water service contractors' service areas.

AGRICULTURAL LAND USE AND ECONOMICS

This section describes land use and economics for agricultural users in each division considered in this EA. The description of the Affected Environment has been developed from information presented in the CVPIA PEIS and draft environmental documents prepared by and for Reclamation to support the Long-Term Contract Renewal process.

Affected Environment

The Irrigation CVP water service contractors that may be affected by the alternatives for the M&I Water Shortage Policy are located in several divisions in the Central Valley and in the San Felipe Division in San Benito and Santa Clara counties. The Central Valley is an important agricultural region for California and the United States. In 2002, the 18 Central Valley counties that include Irrigation CVP water service contractors contributed 52 percent, by value, of California's agricultural production and included six of the top 10 agricultural counties in the state (Fresno, Tulare, Kern, Merced, Stanislaus, and San Joaquin counties). Agriculture in the Central Valley is an important employer and affects the regional economy through farm expenditures, as well as production of many crops that require processing or transportation after harvest.

Within the past few years, growth trends have shown that more municipal and industrial development is moving into the Central Valley from the coastal areas of California. This growth is caused by the availability of affordable land and homes, and less crowded living conditions available in the Central Valley. As a result of the growth, sectors such as construction, wholesale and retail trade, entertainment and leisure services, professional and business services, manufacturing, and technology are increasingly important in the Central Valley economy.

Despite these emerging trends, land use and economic productivity in the Central Valley counties are still primarily based in agricultural production. The production values and primary crops within California in 2002 for counties with Irrigation CVP water service contractors that could be affected by alternatives considered in this EA are summarized in Table 5-11.

The Sacramento Valley climate and soils allow cultivation of a wide variety of crops, and the fine-textured soils adjacent to the Sacramento River are especially suited to rice production. Sacramento Valley's leading crops by acreage include rice; grains and field crops; and hay, pasture, and alfalfa. More urbanized counties, such as Placer and Santa Clara counties, specialize in truck crops and nursery and horticultural products. Production from irrigated acreage within the San Joaquin Valley is planted with grains, hay, pasture, orchards, grapes, cotton, and vegetable crops. The region is the leading California area for production of grapes, almonds, walnuts, tomatoes, and melons.

Farm characteristics, including harvested acres and irrigated acreage, and agricultural economics of the counties described in this EA are summarized in Tables 5-12 and 5-13. Agricultural production in the Central Valley is sensitive to the cost and availability of water. The 2004 cost of service rates for agricultural water in areas located North of the Delta ranges from $16.35 to $32.90/acre-feet. For water service contractors located South of the Delta, 2004 irrigation cost of service rates range from $21.59 to $62.27/acre-foot.

Groundwater and other surface water are important alternative water supplies for Irrigation CVP water service contractors. However, availability and cost of these alternative sources vary. When CVP water service Contract Totals are not available due to supply constraints, agricultural producers would rely upon groundwater or other surface water, often at a higher cost than CVP water service contracts.

Environmental Consequences

The effects of Alternatives 1A, 1B, 2A, and 2B on Agricultural Land Use and Water Supply Costs are compared to conditions under the No Action Alternative.

Long term contract renewals will not directly affect the cost of service for agricultural contractors, but they could affect the irrigation allocations. Reductions in irrigation allocations could negatively affect profits, cause changes in cropping patterns and irrigation technologies, and affect which lands a farmer can cultivate. Agricultural production decisions, once made, are fairly inflexible, especially if capital has been invested and after a crop has been planted. For instance, when a farmer chooses to produce a particular crop, the farmer needs to apply a certain level of irrigation and the farmer has made a financial commitment through the harvest and marketing of the commodity. If water supply is decreased and irrigation cannot occur as needed, the quantity and quality of the crop likely suffers and profits are reduced. Farmers could make several kinds of responses to increased frequencies of shortage.

- If water supply is reduced over several seasons, the farmer may change to a different cropping pattern that requires less water. This can lead to decreased revenues and profits. In certain regions of the Central Valley, water is needed to move salts from the root zones of the soils. Without a sufficient amount of water to manage salinity, yields can be reduced, and some lands or some crops may not be profitable to irrigate.

- The farmer may have access to alternate sources of water such as groundwater or non-CVP surface water. Typically, these alternative sources are substantially more expensive. In some areas, especially in the western and southern San Joaquin Valley, groundwater pumping requires pumping for several hundreds of feet to the soil surface. The quality of the groundwater may be characterized by high TDS, which could reduce yields or the quality of the harvested commodity. Supplemental surface water is generally much more expensive than CVP water service contract supplies, especially during drought conditions.

TABLE 5-11

AGRICULTURAL PRODUCTION AND LEADING CROPS BY COUNTY
(2002 Values)

CVP Division	County	Agricultural Production ($1,000)	Percent of Agricultural Production in California by Value	Leading Crops by Value
Shasta and Trinity	Shasta	52,198	0.2%	Cattle, Nursery Products, Alfalfa and Other Hay
Sacramento River	Colusa	290,266	0.9%	Rice, Processing Tomatoes, Almonds
	Glenn	303,892	1.0%	Rice, Almonds, Dairy Products
	Tehama	126,372	0.4%	English Walnuts, Dried Plums, Dairy Products
American River	Placer	66,556	0.2%	Rice, Nursery Products, Cattle and Calves
Delta	Contra Costa	100,154	0.3%	Nursery Products, Cattle and Calves, Sweet Corn
	Fresno	3,415,591	11.1%	Grapes, Cotton, Poultry
	Merced	1,730,720	5.6%	Dairy Products, Poultry, Almonds
	San Joaquin	1,343,808	4.4%	Dairy Products, Grapes, Tomatoes
	Stanislaus	1,367,971	4.5%	Dairy Products, Almonds, Poultry
West San Joaquin	Fresno	3,415,591	11.1%	Grapes, Cotton, Poultry
	Kings	1,023,807	3.3%	Dairy Products, Cotton, Cattle and Calves
	Merced	1,730,720	5.6%	Dairy Products, Poultry, Almonds
San Felipe	San Benito	214,841	0.7%	Nursery Products, Lettuce, Vegetable Crops
	Santa Clara	255,374	0.8%	Nursery Products, Mushrooms, Bell Peppers
Cross Valley	Fresno	3,415,591	11.1%	Grapes, Cotton, Poultry
	Kern	2,586,247	8.4%	Grapes, Citrus, Carrots
	Kings	1,023,807	3.3%	Dairy Products, Cotton, Cattle and Calves
	Tulare	3,200,552	10.4%	Dairy Products, Citrus, Grapes

All values are from 2002 California Agricultural Statistics Service, U.S. Department of Agriculture

TABLE 5-12

AGRICULTURAL LAND USE AND IRRIGATED ACREAGE BY COUNTY
(2002 Values)

Division	County	Land Area (acres)	Percent of Land Area in Farms	Number of Farms	Irrigated Acres (acres)
Shasta and Trinity	Shasta	2,422,525	14%	1,126	46,021
Sacramento River	Colusa	736,432	66%	821	290,861
	Glenn	841,468	60%	1,283	223,127
	Tehama	1,888,632	46%	1,573	98,840
American River	Placer	898,795	15%	1,438	36,305
Delta	Contra Costa	460,765	27%	592	32,921
	Fresno	3,816,144	51%	6,281	1,098,941
	Merced	1,234,364	82%	2,964	518,538
	San Joaquin	895,540	91%	4,026	520,172
	Stanislaus	956,026	83%	4,267	401,439
West San Joaquin	Fresno	3,816,144	51%	6,281	1,098,941
	Kings	890,236	73%	1,154	407,031
	Merced	1,234,364	82%	2,964	518,538
San Felipe	San Benito	888,997	65%	677	33,200
	Santa Clara	826,040	39%	1,026	24,659
Cross Valley	Fresno	3,816,144	51%	6,281	1,098,941
	Kern	5,210,217	52%	2,147	811,672
	Kings	890,236	73%	1,154	407,031
	Tulare	3,087,340	45%	5,738	652,385

All values are from 2002 National Agricultural Statistics Service, U.S. Department of Agriculture

TABLE 5-13

ANNUAL AVERAGE PER FARM VALUES AND EXPENSES BY COUNTY (2002 Values)

Division	County	Market Value of Production ($1,000)	Market Value of Land and Buildings ($1,000)	Market Value of Machinery and Equipment ($1,000)	Farm Production Expenses ($1,000)
Shasta and Trinity	Shasta	19,496	519,775	22,962	25,593
Sacramento River	Colusa	293,966	1,885,392	175,235	282,249
	Glenn	179,392	846,235	98,679	153,182
	Tehama	70,018	843,119	42,217	66,165
American River	Placer	25,847	587,380	25,720	28,145
Delta	Contra Costa	152,383	1,089,622	47,274	119,609
	Fresno	439,328	1,101,948	99,231	344,033
	Merced	475,457	1,363,034	114,594	419,663
	San Joaquin	303,640	1,203,010	91,721	244,010
	Stanislaus	287,932	1,062,751	77,381	235,640
West San Joaquin	Fresno	439,328	1,101,948	99,231	344,033
	Kings	687,228	2,012,543	167,431	571,194
	Merced	475,457	1,363,034	114,594	419,663
San Felipe	San Benito	292,311	1,479,433	63,852	240,765
	Santa Clara	203,214	1,185,166	44,545	134,580
Cross Valley	Fresno	439,328	1,101,948	99,231	344,033
	Kern	958,875	2,213,516	195,721	750,347
	Kings	687,228	2,012,543	167,431	571,194
	Tulare	407,560	948,550	90,642	335,754

All values are from 2002 National Agricultural Statistics Service, U.S. Department of Agriculture

- The farmer may choose to change irrigation technologies to conserve water, but this is an expensive capital investment that would reduce profits and increase debt for the farmer. Therefore this response would occur only under severe long term circumstances.

- The farmer could choose to fallow land, which would decrease not only revenues, but also possibly decrease on-farm jobs and production-related expenditures that support agribusiness.

- Changes in agricultural production, cropping patterns, and irrigation can have direct economic impacts on the industry through changes in revenues, costs, and jobs. These direct impacts can affect local and regional economies.

No Action Alternative. The No Action Alternative represents the future conditions without implementation of the M&I Water Shortage Policy under the action alternatives. Non-agricultural land uses will increase as development continues in the Central Valley, especially for those areas near population centers. Irrigated acreage will continue to be retired and used for dryland farming or wildlife habitat, or converted to urban land uses.

Alternative 1A. Under Alternative 1A, water would be re-allocated from Irrigation CVP water service contractors to provide public health and safety water quantities to M&I CVP water service contractors. This alternative would lead to changes in contract deliveries for Irrigation CVP water service contractors in 9 of the 72 years considered in the CALSIM II model simulation, as summarized in Tables 5-9 and 5-14.

While the overall level of CVP water deliveries to irrigation users are low in the13 years, ranging from zero deliveries to 24 percent of Contract Total, the impacts to agricultural land use and agricultural economics is difficult to estimate without additional information on each contractor's alternative sources of water. A delivery of 20 percent of the Irrigation CVP water service contract amount can be a serious production constraint if that is the only water source. If it is supplemental to other water supplies, then the shortage is less of a limitation.

TABLE 5-14

FREQUENCY OF IRRIGATION CENTRAL VALLEY PROJECT WATER SERVICE CONTRACT DELIVERIES AS PERCENT OF TOTAL IRRIGATION WATER SERVICE CONTRACT DELIVERIES

Percent Deliveries of Irrigation CVP Water Service Contract Amount	No Action Alternative	Alternative 1A	Alternative 1B	Alternative 2A	Alternative 2B
No Deliveries	4 years	5 years	6 years	8 years	8 years
1 to 10 percent	5 years	4 years	3 years	2 year	2 years
11 to 20 percent	3 years	3 years	3 years	2 years	2 years
21 to 24 percent	1 year	1 year	1 year	1 year	1 year
25 to 100 percent	59 years	59 years	59 years	59 years	59 years

The CALSIM II model is used to simulate operations under 72 years of varying hydrologic conditions. Of the 72 years, 13 years have M&I water service contract allocations less than 75 percent, and therefore; are subject to specific M&I Water Shortage Policy allocations under this alternative.

With the potential of one additional year of no CVP irrigation water deliveries, farmers would need to find alternative water sources. Surface water could be available through agreements already held by the farmer or through short term transfers. These water sources are likely to be more expensive than CVP water service contracts, particularly transfers made during drier water years.

At the expected frequency of no or very little CVP irrigation water deliveries associated with this alternative, it is likely that farmers without affordable and accessible alternative water supplies will be subject to significant financial burdens. Farmers may fallow crops, resulting in lost farm revenue and related jobs. Farmers with permanent crops would be most vulnerable to losing high valued investments. Loss of agricultural employment would affect lower income population and minority populations more than other populations in the state. There could be an improved allocations of industrial employment associated with industries that rely upon M&I CVP water service contract water and that were concerned about reductions in water supplies during droughts.

Alternative 1B. Under Alternative 1B, water would be re-allocated from Irrigation CVP water service contractors to provide public health and safety water quantities to M&I CVP water service contractors. This alternative would lead to changes for Irrigation CVP water service contractors in the 9 of the 72 years considered in the CALSIM II model simulation, as summarized in Tables 5-9 and 5-14.

With the potential of two additional years of no CVP irrigation water deliveries, farmers would need to find alternative water sources. Surface water could be available through agreements already held by the farmer or through short term transfers. These water sources are likely to be more expensive than CVP water service contracts, particularly transfers made during drier water years.

At the expected frequency of no or very little CVP irrigation water deliveries associated with this alternative, it is likely that farmers without affordable and accessible alternative water supplies will be subject to significant financial burdens. Farmers may fallow crops, resulting in lost farm revenue and related jobs. Farmers with permanent crops would be most vulnerable to losing high valued investments. Loss of agricultural employment would affect lower income population and minority populations more than other populations in the state. There could be an improved allocations of industrial employment associated with industries that rely upon M&I CVP water service contract water and that were concerned about reductions in water supplies during droughts.

Alternative 2A. Under Alternative 2A, water would be re-allocated from Irrigation CVP water service contractors to provide public health and safety water quantities to M&I CVP water service contractors. This alternative would lead to changes for Irrigation CVP water service contractors in the 9 of the 72 years considered in the CALSIM II model simulation, as summarized in Tables 5-9 and 5-14.

These results assume that all of the M&I CVP water service contractors would be willing to purchase the second tier water. If alternative water supplies are available at a lower cost, the M&I users may not acquire the second tier water. If that occurred, the impact on CVP irrigation deliveries would be less.

With the potential of four additional years of no CVP irrigation water deliveries, farmers would need to find alternative water sources. Surface water could be available through agreements already held by the farmer or through short term transfers. These water sources are likely to be more expensive than CVP water service contracts, particularly transfers made during drier water years.

At the expected frequency of no or very little CVP irrigation water deliveries associated with this alternative, it is likely that farmers without affordable and accessible alternative water supplies will be subject to significant financial burdens. Farmers may fallow crops, resulting in lost farm revenue and related jobs. Farmers with permanent crops would be most vulnerable to losing high valued investments.

Loss of agricultural employment would affect lower income population and minority populations more than other populations in the state. There could be an improved allocations of industrial employment associated with industries that rely upon M&I CVP water service contract water and that were concerned about reductions in water supplies during droughts.

Alternative 2B. Under Alternative 2B, water would be re-allocated from Irrigation CVP water service contractors to provide public health and safety water quantities to M&I CVP water service contractors. This alternative would lead to changes for Irrigation CVP water service contractors in 9 of the 72 years considered in the CALSIM II model simulation, as summarized in Tables 5-9 and 5-14.

These results assume that all of the M&I CVP water service contractors would be willing to purchase the second tier water. If alternative water supplies are available at a lower cost, the M&I users may not acquire the second tier water. If that occurred, the impact on CVP irrigation deliveries would be less.

With the potential of four additional years of no CVP irrigation water deliveries, farmers would need to find alternative water sources. Surface water could be available through agreements already held by the farmer or through short term transfers. These water sources are likely to be more expensive than CVP water service contracts, particularly transfers made during drier water years.

At the expected frequency of no or very little CVP irrigation water deliveries associated with this alternative, it is likely that farmers without affordable and accessible alternative water supplies will be subject to significant financial burdens. Farmers may fallow crops, resulting in lost farm revenue and related jobs. Farmers with permanent crops would be most vulnerable to losing high valued investments. Loss of agricultural employment would affect lower income population and minority populations more than other populations in the state. There could be an improved allocations of industrial employment associated with industries that rely upon M&I CVP water service contract water and that were concerned about reductions in water supplies during droughts.

Cumulative Effects

These alternatives would not result in cumulative adverse impacts to agricultural land use and economics when considered in combination with future projects in Alternatives 1A and 1B. Issues of reduced CVP irrigation deliveries, alternative water supplies, and water transfers were evaluated as part of the CVPIA PEIS and environmental evaluations prepared to support the Long-term Contract Renewal process. The CVPIA PEIS indicated that future projects may alter CVP water supply allocations, but not change long term CVP Contract Totals or deliveries from within historical ranges. However, Alternatives 2A and 2B, with full implementation of the second tier water supply by M&I CVP water service contractors, could add an additional four years where agricultural contractors would receive zero CVP irrigation deliveries. This could result in more frequent fallowing and/or new cropping patterns. Farm revenue and employment changes associated with Alternatives 2A or 2B could affect the regional economy in years when CVP irrigation deliveries would be zero.

FISHERY AND WILDLIFE RESOURCES

This section describes biological resources for the study area considered in this EA. The description of the Affected Environment has been developed from information presented in the CVPIA PEIS and draft environmental documents prepared by and for Reclamation to support the Long-Term Contract Renewal process.

Affected Environment

This section describes the various types and characteristics of aquatic and terrestrial habitats in the project area, and the fish and wildlife species inhabiting the project area. Special-status fish, wildlife and plant species with the potential to occur in the project area are identified and their general habitat associations summarized.

Aquatic Habitats and Species Assemblages in the Study area. Aquatic habitats in the study area fall into several broad types: riverine, lacustrine, and estuarine.

Riverine Habitat. Riverine habitat is aquatic habitat characterized by moving water. The nature and characteristics of riverine habitat can vary considerably. Depending on the size of the drainage basin and topography, riverine habitats can consist of large, slow-moving water to small, fast-moving water found in higher elevation drainages.

Historically in the Central Valley, smaller streams and rivers typically were dry in the late summer. Only the largest rivers were consistently perennial. With construction of reservoirs on most of the larger streams and rivers in the Central Valley, flows have been regulated resulting in more consistent availability of aquatic habitat within and among years. Aquatic and emergent vegetation is typically sparse in riverine habitats and limited to the margins and backwaters of the river in areas of shallow, slow-moving water.

In addition to the natural watercourses, the study area contains an extensive network of canals and ditches. These canals and ditches were created and are maintained to convey water to agricultural and urban users, collect and carry drainwater from the agricultural fields after application, and pass flood waters. Canals and drains provide aquatic habitat of widely varying characteristics within and among years. Depending on the frequency and intensity of maintenance activities as well as the consistency of water availability, some canals and drains can support emergent vegetation or bank vegetation. Water depth, velocity and water quality also vary dramatically depending on the channel's size and use.

Fish assemblages in the riverine habitats of the study area include native and non-native species. More than 30 species of fish are known to use riverine habitats in the study area. Anadromous species include native species of chinook salmon (*Oncorhynchus tshawytscha*), steelhead (*Oncorhynchus mykiss*), green sturgeon (*Acipenser medirostris*), white sturgeon (*Acipenser transmontanus*), and non-native species such as American shad (*Alosa sapidissima*) and striped bass, (*Morone saxatilis*). Resident species include rainbow trout (*Oncorhynchus mykiss*), brown trout (*Salmo trutta*), largemouth (*Micropterus punctulatus*) and smallmouth bass (*Micropterus dolomieu*), channel catfish (*Ictalurus punctatus*), sculpin (*Cottus* sp.), carp (*Cyprinus carpio*), Sacramento pikeminnow (*Ptychocheilus grandis*), Sacramento sucker (*Catostomus occidentalis*), and hardhead (*Mylopharodon conocephalus*). The distribution and abundance of these species in riverine habitat of the study area varies depending on the specific conditions of the riverine habitat such as water temperature, gradient, substrate composition, among others.

In addition to fish, riverine habitat provides important habitat for a variety of wildlife species. Some mammals such as river otter (*Lutra canadensis*) and beaver (*Castor canadensis*) are closely tied to riverine habitats where they forage and travel. Various species of amphibians and some reptiles (e.g., pond turtles [*Clemmys marmorata*], giant garter snakes [*Thamnophis gigas*]) live near riverine systems during some or all of their lives. Waterbirds including ducks, geese, herons and egrets forage in riverine habitats. Osprey (*Pandion haliaetus*) and bald eagles (*Haliaeetus leucocephalus*) prey on fish in rivers in some locations and roost and nest in trees adjacent to rivers. Many other birds and mammals forage in or near rivers although not aquatic or semi-aquatic species.

Lacustrine Habitat. Lacustrine habitats are inland depressions containing standing water. They vary in size and characteristics and include natural lakes, reservoirs, dammed river channels, and ponds. This aquatic habitat type can be associated with rivers and freshwater emergent wetlands. Shallow, temporary habitats may support rooted plants, whereas deep permanent water bodies are primarily open water. Permanent open waters can support emergent and aquatic plants in shallow areas along the margins of the waterbody.

Fish and wildlife assemblages associated with lacustrine habitat vary substantially depending on the size and characteristics of the habitat and in primarily in the case of fish, whether species have been intentionally or unintentionally introduced. Larger reservoirs in the study area thermally stratified in the summer and can support warm and coolwater fish assemblages. Warmwater fish assemblages consist of sportfish such as largemouth bass, smallmouth bass, spotted bass (*Micropterus punctulatus*), bluegill (*Lepomis machrochirus*), crappie (*Pomoxis* spp.), and catfish (*Ictalurus* spp.). Native warmwater fish that inhabit lacustrine habitats include hardhead and pikeminnow. Coldwater sport species include brown trout, rainbow trout, and kokanee salmon (*Oncorhynchus nerka*) where these species have been introduced.

The open water zones of lakes and large rivers provide resting and escape cover for many species of waterfowl. Gulls, terns, kingfishers, osprey, and bald eagle hunt over open water. Insectivorous birds and bats often forage over open water. Common mammals associated with lacustrine habitats include muskrat (*Ondatra zibethica*), beaver, and river otter (Mayer and Laudenslayer 1988). Wetland associated species such as egrets, herons, and dabbling ducks may forage along the shallow margins of a lake.

Estuarine Habitat. Estuarine communities occur in periodically flooded substrates and open water portions of semi-enclosed coastal waters where tidal seawater is diluted by flowing freshwater. This mix of fresh and ocean waters usually forms a horizontal salinity gradient that varies by area and location, with seasonal variations in freshwater inflow and tidal action. Aquatic plants include phytoplankton and green and red algae. Eelgrass (*Zostera marina*) also grows in denser stands in many sub-tidal estuarine communities. Salinity determines plant species distribution in estuarine communities.

Fish species that use estuarine habitats are primarily marine in origin but anadromous species also use this habitat. Many marine species breed in estuarine habitats, and juvenile fish rear in this habitat until moving into marine environments as adults. Anadromous fish pass through estuarine areas during their upstream migrations to breeding areas. Juveniles of anadromous species may rear in estuarine habitats before moving to the ocean (e.g., salmon) or may continue to use estuarine habitats for much of their life (e.g., striped bass, splittail (*Pogonichthys macrolepidotus*). A few species such as delta smelt (*Hypomesus transpacificus*) are found almost exclusively in estuarine habitats. Mollusks, including gastropods and bivalves also occur in estuarine habitats.

Estuarine communities provide for reproduction, feeding, resting, and cover for many species of mammals and birds. Many of the wildlife species that use freshwater habitats also will use estuarine habitats. Examples include many species of ducks and geese, otters, muskrats, bald eagles, and osprey. However, for some species, resources found exclusively in estuarine habitats are essential. For example, the eelgrass beds supported by estuarine sub-tidal communities are critical to the black brant (*Branta bernicula*) which feeds almost exclusively on eelgrass.

Essential Fish Habitat. The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) mandates federal action agencies which fund, permit, or carry out activities that may adversely impact the essential fish habitat (EFH) of federally managed fish species to consult with NOAA Fisheries regarding the potential adverse effects of their actions on EFH (Section 305 (b)(2)). Section 600.920(a)(1) of the EFH regulations state that consultations are required of Federal action

agencies for renewals, reviews, or substantial revisions of actions if the renewal, review, or revision may adversely affect EFH. The EFH regulations require that federal action agencies obligated to consult on EFH provide NOAA Fisheries with a written assessment of the effects of their action on EFH (50 CFR 600.920). The statute also requires federal action agencies receiving EFH Conservation Recommendations from NOAA Fisheries to provide a detailed written response to NOAA Fisheries within 30 days upon receipt detailing how they intend to avoid, mitigate or offset the impact of the activity on EFH (Section 305(b)(4)(B)).

EFH is the aquatic habitat (water and substrate) necessary to fish for spawning, breeding, feeding, or growth to maturity that will allow a level of production needed to support a long-term, sustainable commercial fishery and contribute to a healthy ecosystem. "Waters" include aquatic areas and their associated physical, chemical, and biological properties that are used by fish, and can include areas historically used by fish in addition to areas currently used. "Substrate" includes sediment, hard bottom, structures underlying the waters, and associated biological communities. "Necessary" means habitat required to support a sustainable fishery and a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species full life cycle.

Because of their commercial value, consultation is required with NOAA Fisheries on all runs of chinook salmon, including Sacramento River winter-run chinook salmon, Central Valley spring-run chinook salmon, and Central Valley fall-/late fall–run chinook salmon. Effects of the project on EFH are incorporated into the analysis for the listed and candidate species and incorporated by reference into this EA.

Aquatic Habitats in the Study Area. This section provides and overview of the aquatic habitats and fish resources found in the upper Sacramento Valley, in the American River watershed, western and central San Joaquin Valley, and central and southern San Francisco Bay Area.

Sacramento River. The Sacramento River valley from Shasta Lake to the Delta includes the study area for the Shasta, Trinity, and Sacramento divisions. In the service areas of the CVP water service contractors, riverine habitat occurs as large, perennial rivers; small, perennial streams and small, intermittent streams. The Sacramento River is the dominant riverine habitat in the study area. Other perennial rivers and streams in or near the study area include Clear Creek, Cottonwood Creek, Butte Creek, Battle Creek, Bear Creek and the Feather River. Intermittent streams include Stony and Thomes creeks. These intermittent and perennial streams are tributaries to the Sacramento River. In addition to the natural watercourses, the study area contains an extensive network of canals and ditches that are inhabited by various warmwater mostly non-native fish species.

The Sacramento River serves as an important migration corridor for anadromous fish moving between the ocean and/or Delta and upper river/tributary spawning and rearing habitats. Aquatic habitat in the lower Sacramento River is characterized primarily by slow-water glides and pools, is depositional in nature, and has reduced water clarity and habitat diversity, relative to the upper portion of the river. More than 30 species of fish are known to use the Sacramento River. Of these, a number of native and introduced species are anadromous. Anadromous species include chinook salmon, steelhead, green and white sturgeon, striped bass, and American shad.

The Sacramento River joins with several other rivers that drain the western slopes of the Sierra Nevada and numerous sloughs to form the Delta and ultimately empties into the San Francisco Bay. The Delta and San Francisco Bay make up the largest estuary on the west coast. Its importance to fisheries is illustrated by the more than 120 fish species that rely on its unique habitat characteristics for one or more of their lifestages. Fish species found in the Delta include

anadromous species, as well as freshwater, brackish water, and saltwater species. Delta inflow and outflow are important for species residing primarily in the Delta (e.g., delta smelt and longfin smelt [*Spirinchus thaleichthys*]) as well as juveniles of anadromous species (e.g., chinook salmon) that rear in the Delta prior to ocean entry.

The Sacramento River supports native and non-native resident and anadromous fish. The Upper Sacramento River is of primary importance to native anadromous fishes and currently is used for spawning and early lifestage rearing, to some degree, by all four runs of chinook salmon (fall, late-fall, winter, and spring) and steelhead. Tributary rivers and streams also provide habitat for one or more runs of chinook salmon and steelhead.

Lacustrine habitat is uncommon in the study area. Diversion dams on the Sacramento River and several tributaries create lacustrine habitat. The large CVP and SWP reservoirs also provide lacustrine habitat.

American River. The American River watershed supports all three types of aquatic habitat. Lacustrine habitat is supported in several storage reservoirs in the upper American River basin upstream of Folsom Lake, as well as in Folsom Lake and Lake Natoma. Riverine habitat is represented by the North, Middle and South Forks of the American River, the lower American River, the Sacramento River, Dry Creek and other smaller permanent and intermittent streams that are tributary to these larger waterbodies. Cooler water temperatures exist in the Middle and South Fork American River during the summer and fall such that warmwater and coldwater fish species are supported. The North Fork American River supports only warmwater fish. The lower 23 miles of the American River (below Nimbus Dam), including backwaters and dredge ponds, supports more than 40 fish species, half of which are game fish. Common species include chinook salmon, steelhead, American shad, rainbow trout, striped bass (*Morone saxatilis*), bass, carp, Sacramento pikeminnow, Sacramento sucker, and hardhead (*Mylopharodon conocephalus*).

Folsom Lake is characterized by strong thermal stratification. In terms of aquatic habitat, the warm upper layer of Folsom Lake provides habitat for warmwater fishes, whereas the reservoir's lower layers form a "coldwater pool" that provides habitat for coldwater fish species throughout the summer and fall portions of the year. Native species that occur in the reservoir include hardhead (*Mylopharodon conocephalus*) and Sacramento pikeminnow (*Ptychocheilus grandis*). However, introduced largemouth bass (*Micropterus salmoides*), smallmouth bass (*Micropterus dolomieu*), spotted bass (*Micropterus punctulatus*), bluegill (*Lepomis machrochirus*), crappie (*Pomoxis* spp.), and catfish (*Ictalurus* spp.) constitute the primary warmwater sport fisheries of Folsom Lake. The reservoir's coldwater sport species include brown trout (*Salmo trutta*), rainbow trout (*Oncorhynchus mykiss*), kokanee salmon (*Oncorhynchus nerka*), and chinook salmon (*Oncorhynchus tshawytscha*). Lake Natoma supports many of the same species as Folsom Lake.

Northern and Central San Joaquin Valley. The Northern San Joaquin Valley includes the Delta Division and the Central San Joaquin Valley includes the Western San Joaquin River Division. The riverine habitat in the northern San Joaquin Valley range from small intermittent streams that drain the Coast Ranges and rarely reach the San Joaquin River to large, perennial rivers. On the east side of the valley, three major tributaries of the San Joaquin River (Stanislaus, Tuolumne, and Merced rivers) drain the western Sierra Nevada and provide flow to the San Joaquin River. These tributaries are located east of the study area and provide habitat, spawning, and rearing for salmonids. Impoundments on each of these rivers provide flood control, irrigation, and power generation.

Historically, the upper reaches of the San Joaquin River and its tributaries provided habitat for federal-listed Chinook salmon and steelhead trout. Spring-run Chinook salmon historically used the upper San Joaquin River watershed, but the habitat became limited as dams were constructed on the major rivers. Both fall-run Chinook salmon and steelhead trout continue to use these rivers; their returns have been low for a number of years. The Merced River Fish Hatchery, which is operated by the California Department of Fish and Game, produces fall-run Chinook salmon.

The Lower San Joaquin River downstream of Mendota Pool is characterized as a warm-water, 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 fish (chinook salmon) in the San Joaquin River.

Little information exists about fishery resources in water bodies located within the Delta Division. The intermittent streams located within the water service contractors' service areas are not known to support anadromous fish and are unlikely to support populations of resident fish because of the hydrologic conditions. The numerous water conveyance facilities and water supply and drainage canals could support warm water fish, such as bass, crappie, sunfish, bullhead (*Ameiurus spp.*), Sacramento sucker, catfish, shad, and various minnow species, such as Sacramento pikeminnow.

Contra Costa and Alameda Counties. Contra Costa and Alameda counties includes the service areas of M&I water service contractors in the Delta and American River divisions. Contra Costa County is bordered by Suisun Bay and the channels of the Sacramento and San Joaquin Rivers on its northern edge. Suisun Bay provides shallow water, estuarine habitat that is important for many fish species. Western Contra Costa and Alameda counties are bordered by San Francisco Bay. As described above, more than 120 fish species rely on the Delta and San Francisco Bay as important areas for species to complete one or more lifestages. Channels and sloughs of the Delta and Suisun Bay provide critical migration and rearing habitats for anadromous salmonids, delta smelt, splittail, among others.

Estuarine areas occur seasonally within and adjacent to the Delta and San Francisco Bay. These areas forming along the interface of freshwater and saltwater are highly productive and highly dynamic biotic zones. Juvenile fishes are attracted to these areas because of the abundance of small prey-sized fishes feeding on plankton. This mixing area is also important as a staging ground for anadromous fishes as they pass between, and acclimatize to the freshwater and saltwater environments.

Freshwater lacustrine habitat is provided in local reservoirs in Contra Costa and Alameda Counties. Riverine habitat is found in numerous permanent and intermittent streams that flow into the reservoirs or directly into Suisun Bay or San Francisco Bay.

Santa Clara and San Benito Counties. Santa Clara and San Benito counties include the San Felipe Division. Santa Clara County is bordered on its northern edge by the southern tip of the San Francisco Bay. The Bay and estuarine areas formed at freshwater inputs provide aquatic habitat for marine and estuarine species. Only a small portion of Santa Clara County encompasses estuarine habitats. Large areas of lacustrine communities are supported at San Justo Reservoir, Lexington Reservoir, Guadalupe Reservoir, Calero Reservoir, Uvas Reservoir, Chesbro Reservoirs, Coyote Lake, and Anderson Lake.

The major watercourses within the CVP water service contractors' service areas that provide riverine habitat are Coyote Creek, Guadalupe River and Pajaro River, which has very little flow during summer months. In addition, the area encompasses many smaller streams that are tributary to the major watercourses or discharge directly to San Francisco Bay. Fish species in these rivers and streams consist of the typical warm and coldwater fishes described previously. Many streams in this area historically supported steelhead, but temperature and substrate conditions are currently marginal or unsuitable. Suitable habitat is still available in Little Arthur, Llagas, and Uvas creeks in most years and these creeks are accessible to steelhead. This area is at the extreme southern edge of Coho salmon range and this species is not believed to have ever been abundant. Coho salmon do not currently occur within the San Felipe Division.

Special-Status Fish Species. Fish resources of the study area include native and non-native anadromous and resident species. Several native anadromous and resident species have been listed as threatened or endangered under the federal Endangered Species Act (ESA) or the California Endangered Species Act (CESA) or are candidates for listing.

Seven fish species or Evolutionarily Significant Units (ESU) listed under the ESA have the potential to occur in the watercourses in the study area, as shown in Tables 5-15 and 5-16. In addition to these listed species, two species that are candidates for federal listing have the potential to occur in the study area. These species are green sturgeon and Central Valley fall-run/late fall-run chinook salmon.

Terrestrial Habitats and Wildlife Communities in the Study area. Historically, the Central Valley contained a mosaic of riverine, wetland, and riparian habitat along rivers and streams with surrounding terrestrial habitats consisting of perennial grassland and oak woodland. With settlement of the Central Valley, agricultural and urban development converted land from native habitats to cultivated fields, pastures, residences, water impoundments, flood control structures, and other developments. As a result, native habitats generally are restricted in their distribution and size and are highly fragmented. Agricultural land comprises most of the study area and includes row and field crops, rice, pasture, and orchards. The following discussion describes the various terrestrial habitats that are present in or near the study area.

The types, amounts, and distribution of habitats in the service areas were derived primarily from the California Gap Analysis Project developed by the California Department of Fish and Game in 1998. In the California Gap Analysis, habitats were typed based on the California Wildlife Habitats Relationship System (CWHR) (Mayer and Laudenslayer, 1988). This project focused on mapping habitats at a landscape scale and has a resolution of 274 acres for upland habitats and 98.8 acres for wetland habitat. The database identifies general habitat types throughout the service areas but does not distinguish small habitat patches, such as stringers of riparian habitat or small wetlands, that can have high wildlife value. Where available, additional information is provided on the occurrence of important habitat types not distinguished in the California Gap Analysis.

TABLE 5-15

FEDERALLY LISTED, PROPOSED, AND CANDIDATE FISH SPECIES POTENTIALLY OCCURRING IN THE STUDY AREA

Species (Common Name)	Species (Scientific Name)	Federal Status[a]
Coho salmon – Central California Coast ESU[b]	*Oncorhynchus kisutch*	T
Coho salmon – Southern Oregon/Northern California ESU	*Oncorhynchus kisutch*	T
Delta smelt	*Hypomesus transpacificus*	T
Fall-run/late fall-run chinook salmon – Central Valley ESU	*Oncorhynchus tshawytscha*	C
Green sturgeon	*Acipenser medirostris*	C
Spring-run chinook salmon – Central Valley ESU	*Oncorhynchus tshawytscha*	T
Steelhead – Central California Coast ESU	*Oncorhynchus mykiss*	T
Steelhead – Central Valley ESU	*Oncorhynchus mykiss*	T
Winter-run chinook salmon	*Oncorhynchus tshawytscha*	E

[a] E: Listed as endangered under the Federal Endangered Species Act
T: Listed as threatened under the Federal Endangered Species Act
C: Classified as a candidate for listing as threatened or endangered under the Federal Endangered Species Act

[b] ESU = Evolutionary Significant Unit

TABLE 5-16

POTENTIAL OCCURRENCE OF LISTED, PROPOSED, AND CANDIDATE FISH SPECIES IN THE STUDY AREA

Species	DIVISION					
	Shasta, Trinity, and Sacramento	**American River (Sacramento Valley)**	**Delta (San Joaquin Valley)**	**West San Joaquin**	**American River and Delta (Alameda and Contra Costa Counties)**	**San Felipe**
Coho salmon – Central California Coast ESU[a]						X
Delta smelt	X	X	X	X	X	
Fall-run/Late fall-run Chinook salmon – Central Valley ESU	X	X	X		X	
Green Sturgeon	X	X	X	X	X	
Spring-run chinook salmon – Central Valley ESU	X	X	X		X	
Steelhead – Central California Coast ESU		X			X	X
Steelhead – Central Valley ESU	X	X	X	X	X	
Steelhead – South Central Valley ESU						X
Winter-run chinook salmon	X	X			X	

[a] ESU = Evolutionary Significant Unit

Wetland Habitats. Three types of wetland habitats occur in the study area, as listed below.

- Freshwater emergent wetland
- Vernal pool
- Saline emergent wetland (including coastal brackish marsh and northern coastal marsh).

The vegetation composition and characteristics and the associated wildlife communities are described below for each type of wetland.

Freshwater Emergent Wetland. Freshwater emergent wetlands occur in areas that are seasonally or perennially inundated. They form a transitional habitat between open water and upland habitats and occur in backwater areas of rivers, streams and lakes, and flood plains of rivers and streams. Wetlands are characterized by erect rooted, herbaceous vegetation that emerges above the water surface. Water depths are shallow, up to about one to two feet. Common plant species include cattails (*Typha* sp.), bulrushes (*Scirpus* sp.), and rushes (*Juncus* sp.).

Urban and agricultural development as well as hydrologic changes from flood control and water supply development, the amount of wetland habitat in the Central Valley has decreased substantially. Because much of the wetland habitat in California has been developed into other land uses, several species associated with wetlands have been listed as threatened or endangered by the Service. In the 1940s, freshwater emergent wetlands occupied about 554,000 acres of the Central Valley (Frayer et al. 1989; Central Valley Habitat Joint Venture 1990). By 1990, only 86,704 acres remained. Regional reductions in freshwater emergent wetlands have been estimated at 88.7 percent in the Sacramento Basin, 96.2 percent in the San Joaquin Basin, 99.2 percent in the Tulare Basin, 98.3 percent in the Delta, and 97.2 percent in the San Francisco Bay area.

Wetlands provide important habitat for waterfowl and a variety of other wildlife species, including grebes, herons, egrets, bitterns, coots, shorebirds, rails, hawks, owls, muskrat, raccoon, opossum, and beaver. Many upland species such as ring-necked pheasant, California quail, and black-tailed hare use the ecotone at the edge of the wetland for cover and forage. Reptiles and amphibians such as the common garter snake, aquatic garter snake, Pacific treefrog, and bullfrog also breed and feed in freshwater habitats of the region.

The hydrology of many of the remaining wetlands has been altered from seasonal to permanent inundation. This change has altered plant communities and facilitated the invasion of introduced aquatic predators such as bullfrogs, bass, and sunfish. These species compete with or prey upon native listed species, including federally listed species such as California red-legged frogs and giant garter snakes.

Vernal Pool. Vernal pools are typically found in association with annual grassland communities but constitute a unique habitat type. Vernal pools form in shallow depressions that are underlain by hardpan or volcanic rock. The hardpan or volcanic rock impedes drainage such that, in winter, the depressions fill with water and retain moist soil into late spring. The pools are then dry during the summer and fall until rains commence the following winter. The soils and moist microhabitat of these pools provides a unique habitat within a general matrix of annual grassland communities. Plant species of vernal pools differ from those of the surrounding annual grassland and many animals associated with annual grasslands depend on the occurrence of vernal pools to persist in the annual grassland landscape. Common plant species found in vernal pools include popcorn flower (*Plagiobothrys stipitata*), navarretia (*Navarretia leucocephala*), toad rush (*Juncus bufonius*), goldfields (*Lathenia chrysostoma*), yellow carpet (*Blennosperma nanum*), coyote thistle (*Eryngium vaseyi*), tidy tips (*Layia* sp.), water buttercup (*Ranunculus* sp.), and hairgrass

(*Deschampsia danthonioides*). The number and distribution of vernal pools have been greatly reduced as a result of agricultural practices and conversion to urban land uses. Holland (1978) estimated that five to 30 percent of California's vernal pools are intact today.

Although vernal pools are an ephemeral aquatic habitat, they are utilized by invertebrates and amphibians adapted to seasonal wetting and drying. When standing water is available, the California tiger salamander, western spadefoot toad, and Pacific treefrog may use the pools for egg laying and for the development of young. Aquatic invertebrates such as cladocerans, copepods, branchipods, and crawling water beetles may also inhabit vernal pools. In winter and spring, waterbirds such as mallard, cinnamon teal, killdeer, California gull, green-backed heron, great blue heron, and great egret may use vernal pools for resting and foraging grounds. Western kingbird, black phoebe, and Say's phoebe feed on flying insects above vernal pools. Several federally listed branchipods, including longhorn fairy shrimp, vernal pool fairy shrimp, and vernal pool tadpole shrimp are found in vernal pools.

Saline Emergent Wetland. Saline emergent wetlands encompass salt and brackish water marshes. They occur along the margins of bays, lagoons and estuaries. These wetlands form above intertidal sand and mud flats and below upland communities not subject to tidal action. Plant species composition and structure varies with the salinity, substrate and wave action. Characteristic plant species of more saline marshes are cordgrass (*Spartina foliosa*) and pickleweed (*Salicornia virginica*) while bulrushes and cattails occur in lower salinity marshes.

Only a small portion of the saline emergent wetlands that existed in the San Francisco Bay area in the mid-1800s remains. Many of the wetlands were dredged or filled in association with urban development. Runoff and discharges from urban and industrial development also has reduced and degraded wetlands. The suitability of the remaining wetlands for many species has been further limited, and in some cases precluded, by their small size, fragmentation, and lack of other habitat features.

The remaining saline emergent wetlands of the San Francisco Bay area provide important habitat for a variety of birds and mammals. Several species of lizards and snakes uses edges of the marshes and a few amphibians can occur in brackish portions these wetlands. Saline emergent wetlands provide important wintering and migratory stopover habitat for many birds. Common birds species include a waterfowl, herons, egrets, rails, and shorebirds. Several endemic subspecies birds inhabit saline emergent wetlands of the San Francisco Bay area including California clapper rails, California black rails, salt marsh yellowthroat, and Belding's savannah sparrow. Common mammals include shrews, bats, mice, and raccoons. Special-status species that use this habitat include California clapper rail, California black rail, and salt marsh harvest mouse.

Grassland Habitats. Within the study area, the only type of grassland habitat that occurs is annual grasslands. Grasslands in the Central Valley were originally dominated by native perennial grasses such as needlegrass. Currently, most grasslands in the area are dominated by introduced annual grasses of Mediterranean origin and a mixture of native and introduced forbs. The designation of "Annual grasslands" is a common habitat type in the study area. Introduced annual grasses are the dominant plant species and include wild oats, soft chess (*Bromus hordeaceus*), ripgut brome (*Bromus rigidus*), red brome (*Bromus rubens*), barley, and foxtail. Annual native forbs also occur in annual grassland habitat and include filaree, California poppy (*Eschscholtzia californica*), owls clover (*Gilia* spp.), tarweed (*Holocarpha virgata*) and various lupines (*Lupinus* spp.). Yellow star-thistle (*Centaurea solstitialis*), a noxious weed, has invaded many annual grassland habitats and degraded their quality for wildlife and livestock pasture. Much of the annual grassland in the study area is used as pasture. Annual grassland

habitat merges with valley oak and blue oak woodlands, occurring where soil moisture is insufficient to support tree growth or is suppressed due to grazing.

Many species of birds, mammals, reptiles and amphibians use annual grasslands. Raptors, such as ferruginous hawks (*Buteo regalis*), red-tailed hawks (*Buteo jamaicensis*), white-tailed kites (*Elanus leucurus*), American kestrel (*Falco sparverius*) and northern harriers (*Circus cyaneus*) commonly forage in annual grasslands. Short-eared owls (*Asio flammeus*) and burrowing owls (*Athene cunicularia*) forage and breed in this habitat. Horned larks (*Eremophila alpestris*), western meadowlarks (*Sturnella neglecta*), and savannah sparrows (*Passerculus sandwichensis*) are other common bird species. Characteristic reptiles and amphibians include western fence lizard (*Sceloporus occidentalis*), common garter snake (*Thamnophis sirtalis*), and western rattlesnake (*Rotalus viridis*). Common mammals include black-tailed jackrabbits (*Lepus californicus*), California ground squirrels (*Spermophilus beecheyi*), California voles (*Microtus californicus*), badgers (*Taxidea taxus*), coyotes (*Canis latrans*), and Botta's pocket gophers (*Thomomys bottae*). A number of special-status species use annual grassland habitat, including white-tailed kite, burrowing owl, and prairie falcon (*Falco mexicanus*).

Scrub/Shrub Habitats. Coastal scrub/chaparral communities consist of structurally homogenous brushland dominated by shrubs. Shrub height and crown cover vary considerably with fire frequency, precipitation, aspect, and soil type. Scrub/shrub habitats in the study area include the following types of communities as distinguished by CWHR.

- Chemise-Redshank Chaparral and Mixed Chaparral
- Coastal Scrub.

Chamise Redshank Chaparral and Mixed Chaparral. Chemise-Redshank Chaparral and Mixed Chaparral are very similar and their differentiation is somewhat subjective. In general, Chemise-Redshank Chaparral consists of at least 60 percent coverage by chemise (*Adenostoma fasciculatum*) and redshank (*Adenostoma sparsifolium*) combined. Mixed chaparral supports a greater diversity of plant species, including scrub oak (*Quercus berberidifolia*), ceanothus, manzanita, toyon, and yerba-santa (*Eriodictyon californicum*), in addition to chemise and redshank. The upper and lower elevational limits of chaparral land cover varies considerably with precipitation, aspect and soil type, but typically occurs below 5,000 feet.

No wildlife species are restricted to chaparral habitats of the study area. Common species include western fence lizard, racer (*Coluber constrictor*), common garter snake (*Thamnophis sirtalis*), turkey vultures, red-tailed hawk, golden eagle (*Aquila chrysaetos*), mountain quail (*Oreortyx pictus*), ash-throated flycatcher (*Myiarchus cinerascens*), sage sparrow (*Amphispiza belli*), opossum (*Didelphis virginiana*), coyote (*Canis latrans*), California ground squirrel, and black-tailed jackrabbit (*Lepus californicus*). No special-status species are dependent on this habitat type although several use chaparral habitats in addition to other habitats.

Coastal Scrub. Coastal scrub is typified by low to moderate-sized shrubs. Its growth form varies from patchy oceanside cover of nearly prostrate shrubs to dense, continuous areas of shrubs up to seven feet tall (Mayer and Laudenslayer 1988). Coyotebush is the predominant overstory shrub, but other common species are ceanothus, and coffeeberry. Understory species can include bracken fern (*Pteridium aquilinum*), swordfern (*Polystichum munitum*), yerba buena (*Satureja douglasii*) and Indian paintbrush (*Castilleja* sp.).

No wildlife species are restricted to coastal scrub habitats in the study area. Common species are the same as described for the chaparral habitats.

Woodland Habitats. Types of woodland habitats occur in the study area, as listed below.

- Blue Oak Woodland and Blue Oak-Foothill Pine Woodland
- Coastal Oak Woodland
- Valley Oak Woodland
- Montane Hardwood
- Montane Hardwood-Conifer
- Conifer Forest
- Valley Foothill Riparian

The vegetation composition and characteristics and the associated wildlife communities are described below for each type of woodland habitats.

Blue Oak Woodland and Blue Oak-Foothill Pine Woodland. Blue oak (*Quercus douglasii*) is the dominant overstory species of blue oak woodland and blue oak/foothill pine woodland. Foothill pine (*Pinus sabiniana*) becomes an important overstory species at higher elevations. Where foothill pine or other conifers comprise 25 to 49 percent of the overstory with blue oak comprising at least 50 percent of the overstory canopy, the CWHR classifies this community as Blue oak/Foothill Pine woodland. Frequent fire favors blue oak (a long-lived stump sprouter) over foothill pine. Stands vary from open savannas with grassy understories (usually at lower elevations) to fairly dense woodlands with shrubby understories. Typical shrub species in blue oak woodland are poison-oak (*Toxicodendron diversilobum*), coffeeberry (*Rhamnus californica*), redbud (*Cercis occidentalis*), ceanothus (*Ceanothus* sp.), and manzanita (*Arctostaphylos* sp.) with ground cover consisting of annuals such as bromegrass, wild oats, foxtail, and filaree (Mayer and Laudenslayer, 1988).

Blue oak woodlands provide habitat for a diversity of wildlife species, although no species appear to be completely dependent on this habitat type. Verner and Boss (1980) state that 29 species of amphibians and reptiles, 57 species of birds, and 10 species of mammals find optimal breeding habitat conditions in mature stages of blue oak woodlands. Acorns produced by blue oaks are an important food resource for a diversity of bird and mammal species. Typical species inhabiting blue oak woodlands in the study area include scrub jays, yellow-billed magpies (*Pica nuttalli*), gray squirrels, and California ground squirrels (*Spermophilus beecheyi*). Special-status species associated with oak woodland habitats include oak titmouse, Lawrence's goldfish, and Nuttall's woodpecker.

Coastal Oak Woodland. Coastal oak woodland occurs in the Coast Range in the western portion of the action area. In this woodland, coastal live oak (*Quercus agrifolia*) is the dominant overstory species and can be the only overstory species in some locations. In mesic areas, California bay (*Umbellularia californica*), Pacific madrone (*Arbutus menziesii*), tanoak (*Lithocarpus densiflorus*), and canyon live oak (*Quercus chrysolepis*) contribute to the overstory. The understory typically consists of shade-tolerant shrubs such as California blackberry (*Rubus ursinus*), creeping snowberry (*Gaultheria hispidula*) and toyon (*Heteromeles arbutifolia*).

A diversity of wildlife species use coastal oak woodlands in fulfilling one or more life requisites. At least 60 species of mammals use oaks in some manner and over 100 species of birds have been reported in oak-dominated habitats in California (Mayer and Laudenslayer 1988). Species composition is generally similar to that of other oak woodland types.

Valley Oak Woodland. Valley oak woodland can occur throughout much of the Central Valley and into the Sierra Nevada foothills up to an elevation of about 2,000 feet. The overstory canopy of this habitat type is almost exclusively valley oak (*Quercus lobata*). California sycamore (*Platanus racemosa*), black walnut (*Juglans californica*), interior live oak (*Quercus wislizenii*), boxelder (*Acer negundo*) and blue oak occur sporadically. Shrubs such as poison-oak, toyon (*Heteromeles arbutifolia*), and coffeeberry can occur in the understory although typically, the understory is comprised of annuals such as wild oats, bromegrass, barley (*Hordeum* sp.), and ryegrass (*Lolium* sp.) (Mayer and Laudenslayer, 1988). Valley oak woodland merges with annual grasslands and often borders agricultural fields. Valley oak woodlands also often occur adjacent to riparian habitats along larger rivers and in small drainages. As distance from the watercourse increases, tree density declines, thus transitioning from a forest-like structure, to savanna-like to grassland.

Like other habitats containing oaks, valley oak woodland is used by a variety of wildlife species that exploit the acorn food resource. Cavities formed in oaks also are an important habitat feature for cavity-nesting birds and mammals. Common species inhabiting valley oak woodland include California quail (*Callipepla californica*), red-shouldered hawk (*Buteo lineatus*), acorn woodpecker (*Melanerpes formicivorus*), scrub jay (*Aphelocoma californica*), bushtit (*Psaltriparus minimus*), gray squirrel (*Sciurus griseus*), mule deer (*Odocoileus hemionus*), red-tailed hawk, and white-tailed kite. Special-status species associated with oak woodland habitats include oak titmouse (*Baeolophus inornatus*), Lawrence's goldfish (*Carduelis lawrenci*), and Nuttall's woodpecker (*Picoides nuttallii*).

Montane Hardwood. Montane hardwood forest occurs in eastern portions of the study area at lower elevations than conifer forest communities, although it can be interspersed with ponderosa pine (*Pinus pondersosa*). This forest type is dominated by hardwood tree species including coastal live oak, California black oak (*Quercus kelloggii*), tanoak, and Pacific madrone, but often includes some conifers, such as gray pine and ponderosa pine. Typical understory shrub species include manzanita, poison-oak, coffeeberry, currant (*Ribes* sp.), and ceanothus (Mayer and Laudenslayer 1988).

The oaks comprising montane hardwood forest habitat attract and support a diversity of bird and mammal species that exploit and depend on acorns. Typical species include scrub jays (*Aphelocoma californica*), acorn woodpeckers (*Melanerpes formicivorus*), gray squirrels (*Sciurus griseus*), wild turkey (*Meleagris gallopavo*), dusky-footed woodrats (*Neotoma fuscipes*), black bear (*Ursus americanus*), and mule deer (*Odocoileus hemionus*). Reptiles are found in the litter on the forest floor and include western fence lizard (*Sceloporus occidentalis*), gopher snake (*Pituophis melanoleucus*), and western rattlesnake (*Rotalus viridis*).

Montane Hardwood-Conifer. Montane hardwood-conifer communities are similar to montane hardwood but include conifers and hardwoods, often as a closed forest. Hardwood species are the same as in montane hardwood communities. Typical conifer species are Douglas-fir (*Pseudotsuga menziesii*), ponderosa pine, and redwood (*Sequoia sempervirens*). The specific plant composition of this habitat type varies in response to soil type, exposure and moisture among other factors. Wildlife communities consist of a mix of the species found in montane hardwood and conifer forest types.

Conifer Forest. Within the study area, the Gap Analysis identified five CWHR habitat types dominated by conifers: Ponderosa pine (*Pinus ponderosa*), Sierran mixed conifer, Douglas-fir (*Pseudotsuga menziesii*), Jeffrey pine (*Pinus jeffreyi*), and redwood (*Sequoia sempervierns*). For this EA, these five CWHR habitat types are grouped as conifer forest habitat. Conifer forest

habitats occur primarily in eastern portions of the study area, in foothill and higher elevation areas of the Sierra Nevada Mountains. A small amount of conifer forest habitat also is present in the Coast Range in the western portion of the study area. The species composition of the conifer forest habitat varies with elevation, soil composition, and rainfall. Conifer forest habitats occur at elevations as low as 2,500 feet in elevation. Ponderosa pine occurs at the lowest elevation where it can be interspersed with montane hardwood (described above). At higher elevations, ponderosa pine is replaced by Sierran mixed conifer and Douglas-fir. Sierran mixed conifer habitat consists of a mix of five conifer species and one hardwood species - white fir (*Abies concolor*), Douglas-fir, ponderosa pine, sugar pine (*Pinus lamertiana*), incense-cedar (*Calocedrus decurrens*), and California black oak (*Quercus kelloggii*).

The Sierran mixed conifer habitat type occurs from about 4,000 to 10,000 ft in elevation in the study area (California Department of Forestry and Fire Protection, 1988) and grades with ponderosa pine and Douglas-fir habitats. In the Sierra Nevada, the Douglas-fir habitat is largely a subset of the Sierran mixed conifer type, where Douglas-fir occurs as a pure stand. Jeffery pine typically occurs at high elevations (above Sierran mixed conifer), but because it is tolerant of serpentine soils it occurs as pure stands in some areas of serpentine soils. A small amount of redwood forest occurs in the Coast Range in the western portion of the study area. Redwood communities are dominated by redwoods. Understory vegetation is usually dense, consisting of tall shrubs. Douglas-fir is a common associate.

Conifer forest habitat of the Sierra Nevada Mountains has been estimated to support about 355 species of vertebrates (Verner and Boss 1980). Mixed conifer forest typically supports greater species diversity than single-species conifer stands because of the greater plant species diversity. The variety in plant species composition of mixed conifer forest provides a diversity of food and cover types. Nonetheless, many wildlife species will exploit all of the conifer forest types to varying degrees. Special-status species potentially inhabiting conifer forest habitat in the study area include California spotted owl (*Strix occidentalis occidentalis*), northern goshawk (*Accipiter gentilis*), Pacific fisher (*Martes pennanti*), and bald eagle (*Haliaeetus leucocephalus*).

Valley Foothill Riparian. Valley foothill riparian land cover develops in the flood plains of low-gradient rivers and streams. This land cover occurs adjacent to freshwater reaches of permanent and seasonal watercourses. Typically, riparian land cover occurs as narrow bands of vegetation immediately adjacent to watercourses. Dominant tree species of valley foothill riparian land cover are cottonwood (*Populus fremontii*), California sycamore (*Plantanus racemosa*), and valley oaks (*Quercus lobata*). Typical shrub species include willows (*Salix* sp.), elderberry (*Sambucus* sp.), and wild grape (*Vitis californica*).

Riparian land cover forms a transitional community between the aquatic, riverine environment and dry upland areas. The composition of riparian plant communities is shaped by the timing, intensity, and duration of flooding. Willows predominate in areas subject to regular inundation and quickly colonize newly deposited gravel bars or recently scoured areas. Cottonwoods occur farther from the river channel in areas subject to less frequent and intense flooding. Still, the persistence of cottonwoods is linked to the natural seasonal pattern of flows. Cottonwoods evolved to release seeds at the same time as high spring flows would deposit nutrient rich sediments where germination and seedling survival would be enhanced.

Thus, the timing and intensity of flows is critical to the persistence of riparian vegetation. Flood control and water supply projects have resulted in hydrologic alterations that have changed the species composition, structure and extent of riparian habitats. In addition, most rivers have been channelized and are confined by levees which limit the area available to support riparian

communities. As a result of these changes the extent of riparian land cover has been substantially reduced.

The structural and compositional diversity, abundant food resources, and availability of water in valley foothill riparian habitat make this habitat particularly valuable to wildlife. Wildlife species diversity is often higher in riparian habitats than in adjacent habitats. Many resident bird, amphibians, reptiles, and mammals breed in riparian habitats, while other species frequent this habitat in winter or during migration (Sanders et al. 1985.). Special-status species associated with riparian habitats in the study area include the valley elderberry longhorn beetle (*Desmocercus californicus dimorphus*), Swainson's hawk (*Buteo swainsoni),* and western yellow-billed cuckoo (*Coccyzus americanus occidentalis*).

Agricultural Habitats. Native habitats in the Central Valley have been largely replaced by agricultural habitats. Agricultural land use is common in the study area and consists of a variety of row crops and field crops. Crop types vary from year-to-year depending on market conditions and other factors. However, there are three primary agricultural types are used to characterize agricultural habitat in the study area, as listed below.

- Croplands
- Rice
- Orchards and Vineyards.

Croplands. Cropland in the study area consists of row crops, and grain crops. Diverse row crops are grown in the study area including tomatoes, sugar beets, and melons. Grain crops include barley, wheat, corn, and oats. Many of these crops are planted in fall and harvested in spring. Row and grain crops are intensively managed, and chemicals are often used to control pests and diseases.

The habitat value in cropland is fluctuates with 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. The value of agricultural fields to value varies seasonally with changes in crop type as well as with the different stages of crop maturity.

The young green shoots of grain crops are used for foraging by such species as greater white-fronted geese, tundra swans, and tule elk. Other species, including red-winged blackbirds, Brewer’s blackbirds, ring-necked pheasants, waterfowl, and western harvest mice, feed on the seeds produced by these crops. Many species of rodents and birds are able to exploit 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 white-tailed kites.

Rice. Cultivated rice in the Central Valley has some of the attributes found in seasonal wetlands. However, the intensive management of this habitat reduces many of the benefits found in natural wetlands. Flooded rice fields provide nesting and foraging habitat for waterfowl and shorebirds. Rice provides important forage for many wildlife species. After harvest, waterfowl (e.g., mallards and Canada geese), sandhill cranes, California voles, and deer mice feed upon the waste grain. Raptors, including northern harrier, white-tailed kite, and ferruginous hawk, feed upon rodents in this habitat. Irrigation ditches used to flood rice fields often contain dense cattail vegetation and

provide habitat for wildlife species, such as the Virginia rail, American bittern, snowy egret, marsh wren, common yellowthroat, and song sparrow.

Orchard and Vineyard. Orchard habitat consists of cultivated fruit or nut-bearing trees. Typically, they are open, tree-dominated habitats consisting of a single tree species. This habitat is planted in a uniform pattern and intensively managed. Understory vegetation is usually sparse; however, in some areas, grasses or forbs are allowed to grow between orchard rows to reduce erosion. Walnuts and olives are the primary orchard crops in the study area.

Wildlife use of orchards is typically limited. Ground squirrels and other small mammals can inhabit understory areas and birds such as scrub jays may be seasonally attracted to fruit orchards. No special-status species rely on orchards or regularly use this habitat type.

Other Habitat Types. Other types of habitats occur in the study area, as listed below.

- Barren (throughout study area)
- Stabilized Interior Dunes (Delta Division - Contra Costa County)
- Serpentine (American and San Felipe divisions)

The vegetation composition and characteristics and the associated wildlife communities are described below for each type of habitats.

Barren. Barren areas are devoid of vegetation or support very sparse vegetation. Barren areas can be natural or human-created. Natural barren areas include sand bars, rock outcrops, beaches and mudflats. Human-created barren areas include quarries, roads and buildings.

Wildlife use of barren areas is strongly determined by the location and characteristics of the species area. Beaches and mudflats are used by numerous species of shorebirds that forage on invertebrates inhabiting the sand or brought in by wave action. Some shorebirds also nest on barren, sandy habitats. Rock outcrops, also classified as “barren,” are used by a completely different suite of species. This habitat type may be used by bats are roosting locations, or mice, chipmunks and ground squirrels as shelter. Foxes and weasels forage for small mammals in these areas.

Stabilized Interior Dunes. Stabilized interior dunes are sand dunes that have been stabilized or partially stabilized by shrubs, scattered low annuals, and perennial grasses in areas with less wind or higher water availability. These dunes typically occupy sites that are lower and more sheltered than active dunes, with soil moisture retained just below the sand surface, allowing perennial vegetation to survive long drought periods. The Antioch Dunes in Contra Costa County are the only stabilized interior dunes in the study area.

Development has eliminated about 90 percent of the original 500 acres of the Antioch Dunes. The Antioch Dunes National Wildlife Refuge and a few acres of surrounding lands are all that remain of sand dunes that formed during glaciation periods. The refuge contains 67 acres and includes two separate tracts of land west of Antioch, California. These dunes were declared critical habitat for the Contra Costa wallflower and Antioch Dunes evening-primrose in the late 1970s. The refuge supports designated critical habitat for these two species and Lange’s metalmark butterfly.

Serpentine. The serpentine habitat type is distinguished by soil type rather than by dominant plant species. Serpentine soils are formed from weathered volcanic (ultramafic) rocks such as serpentinite, dunite, and peridotite. These soils provide a harsh environment for plant growth.

Several factors contribute to the inhospitability of serpentine soils to plant growth including: (1) a low calcium-magnesium ratio; (2) lack of essential nutrients such as nitrogen, potassium, and phosphorous; and (3) high concentrations of heavy metals (mineral toxicity). As a result of these harsh conditions, serpentine soils support unique grassland communities consisting of fountain thistle (*Cirsium fontinale* ssp. *fontinale*), Santa Clara Valley dudleya (*Dudleya setchellii)*, Marin dwarf-flax (*Hesperolinon congestum*), Metcalf Canyon jewelflower (*Streptanthus albidus* ssp. *albidus*), uncommon jewelflower (*S. albidus* ssp. *peramoenus*), and coyote ceanothus (*Ceanothus ferrisae*).

Terrestrial Habitats in the Study Area. This section provides and overview of the terrestrial habitats and wildlife resources found in the upper Sacramento Valley, in the American River watershed, western and central San Joaquin Valley, and central and southern San Francisco Bay Area.

The CVP divisions share many of the same types of terrestrial habitats although some habitats are occur only in specific areas, as shown in Table 5-17. Agricultural habitat is found in all of the divisions, but is most prevalent in the Shasta, Trinity, Sacramento, Delta, and West San Joaquin divisions. The specific crop types differ among these divisions, such as rice being a substantial component of the Sacramento River Division. Freshwater emergent wetlands occur in all divisions but saline emergent wetlands are restricted to those areas that border the San Francisco Bay. Similarly, oak woodlands occur in most divisions but the type of oak woodland varies depending on the location with coastal oak woodland in moist coastal portions of the study area and blue oak woodland in the drier interior areas.

Special-Status Wildlife and Plant Species. The habitats of the study area support many species that are listed or proposed for listing as threatened or endangered under the ESA, as summarized in Tables 5-18 and 5-19. Critical habitat has been designated for some of the listed species that inhabit the study area. The occurrence of designated critical habitat in each division is summarized in Table 5-20. The habitat associations of special status wildlife and plant species are summarized in Table 5-21.

Environmental Consequences

The effects of Alternatives 1A, 1B, 2A, and 2B on biological resources are compared to conditions under the No Action Alternative. Environmental consequences to biological resources are related to changes in aquatic resources due to changes in CVP operations and changes in terrestrial resources due to changes in land use.

No Action Alternative. The No Action Alternative represents the future conditions without implementation of an M&I water shortage policy under the alternatives. There would be additional use of water rights water in the future. However, due to regulatory requirements for the CVP and SWP operations, minimum and maximum flows would be as described in the OCAP 2004. Projected land use changes as described in the CVPIA PEIS would result in additional agricultural lands either being converted to municipal uses or more frequently fallowed due to reduced water supply allocations. These changes and responses to the increased demand have been addressed in local general plans and associated environmental documentation.

TABLE 5-17

OCCURRENCE OF TERRESTRIAL HABITATS IN THE STUDY AREA

	DIVISION					
	Shasta, Trinity, and Sacramento	**American River (Sacramento Valley)**	**Delta (San Joaquin Valley)**	**West San Joaquin**	**American River and Delta (Alameda and Contra Costa Counties)**	**San Felipe**
WETLAND HABITATS						
Freshwater Emergent Wetland	X	X	X	X	X	X
Vernal Pools	X	X	X	X	X	X
Saline Emergent Wetland			X	X	X	X
GRASSLAND HABITATS						
Annual grassland	X	X	X	X	X	X
SCRUB/SHRUB HABITATS						
Chamise Redshank Chaparral	X	X	X		X	X
Mixed Chaparral	X	X			X	X
Coastal scrub					X	X
WOODLAND HABITATS						
Blue Oak-Foothill Pine	X	X	X		X	X
Blue Oak Woodland	X	X	X		X	X
Coastal Oak Woodland		X			X	X
Valley Oak Woodland	X	X	X			
Montane Hardwood		X				X
Montane Hardwood-Conifer		X				X
Conifer Forest[a]	X	X	X			X
Valley Foothill Riparian	X	X	X	X	X	X
AGRICULTURAL HABITATS						
Cropland	X	X	X	X	X	X
Rice	X		X	X		
Orchard and Vineyard	X	X	X	X	X	X
OTHER LAND COVER TYPES						
Barren	X	X	X	X	X	X
Stabilized Interior Dunes					X	
Serpentine		X				X

[a] Conifer forest habitat includes Ponderosa pine, Jeffrey pine, Redwood, Sierran mixed conifer, Douglas-fir

TABLE 5-18

FEDERALLY LISTED WILDLIFE AND PLANT SPECIES POTENTIALLY OCCURRING IN THE STUDY AREA

Species (Common Name)	Species (Scientific Name)	Status (Threatened or Endangered)
PLANTS		
Antioch Dunes evening-primrose	*Oenothera deltoides ssp. howelli*	E
Butte County Meadowfoam	*Limnanthes floccosa* ssp. *californica*	E
California jewelflower	*Caulanthus californicus*	E
California sea-blite	*Suaeda californica*	E
Colusa grass	*Neostapfia colusana*	T
Contra Costa wallflower	*Erysimum capitatum ssp. Angustatum*	E
Contra Costa goldfields	*Lasthenia conjugens*	E
Coyote ceanothus	*Ceanothus ferrisae*	E
El Dorado Bedstraw	*Galium californicum ssp. sierrae*	
Green's tuctoria	*Tuctoria greenei*	E
Hairy Orcutt grass	*Orcuttia pilosa*	E
Hoover's sprurge	*Chamaesyce hooveri*	T
Large-flowered fiddleneck	*Amsinckia grandiflora*	E
Layne's butterweed	*Senecio layneae*	T
Metcalf Canyon jewelflower	*Streptanthus albidus ssp. albidus*	E
Pallid manzanita	*Arctostaphylos pallida*	T
Palmate-bracted bird's beak	*Cordylanthus palmatus*	E
Pine Hill ceanothus	*Ceanothus roderickii*	E
Pine Hill flannelbush	*Fremontodendron californicum ssp. decumbens*	E
Sacramento Orcutt grass	*Orcuttia viscida*	E
San Joaquin woolly-threads	*Monolopia congdonii*	E
Santa Clara Valley dudleya	*Dudleya setchellii*	E
Santa Cruz tarplant	*Holocarpha macradenia*	T
Slender Orcutt grass	*Orcuttia tenuis*	T
Showy indian clover	*Trifolium amoenum*	E
Soft bird's beak	*Cordylanthus mollis ssp. mollis*	E
Solano grass	*Tuctoria mucronata*	E
Stebbins's morning glory	*Calystegia stebbinsii*	E
Succulent owl's clover	*Castilleja campestris ssp. succulenta*	T
Tiburon Indian paintbrush	*Castilleja campestris ssp. neglecta*	E
INVERTEBRATES		
Bay checkerspot butterfly	*Euphydryas editha bayensis*	T
California freshwater shrimp	*Syncaris pacifica*	E
Callipe silverspot butterfly	*Speyeria callippe callippe*	E
Conservancy fairy shrimp	*Branchinecta conservatio*	E

TABLE 5-18

FEDERALLY LISTED WILDLIFE AND PLANT SPECIES POTENTIALLY OCCURRING IN THE STUDY AREA

Species (Common Name)	Species (Scientific Name)	Status (Threatened or Endangered)
Delta green ground beetle	*Elaphrus viridis*	T
Lange's metalmark butterfly	*Apodemia mormo langei*	E
Longhorn fairy shrimp	*Branchinecta longiantenna*	E
Valley elderberry longhorn beetle	*Desmocerus californicus dimorphus*	T
Vernal pool fairy shrimp	*Branchinecta lynchi*	T
Vernal pool tadpole shrimp	*Lepidurus packardi*	E
AMPHIBIANS		
California red-legged frog	*Rana aurora draytonii*	T
California tiger salamander – Central California DPS	*Ambystoma californiense*	T
REPTILES		
Alameda whipsnake	*Masticophis lateralis euryxanthus*	T
Blunt-nosed leopard lizard	*Gambelia sila*	E
Giant garter snake	*Thamnophis gigas*	T
San Francisco garter snake	*Thamnophis sirtalis tetrataenia*	E
BIRDS		
Bald Eagle	*Haliaeetus leucocephalus*	T
California brown pelican	*Pelecanus occidentalis californicus*	E
California clapper rail	*Rallus longirostris obsoletus*	E
California condor	*Gymnogyps californianus*	E
California least tern	*Sterna antillarum browni*	E
Least Bell's vireo	*Virea bellii pusillus*	E
Marbled murrelet	*Brachyramphus marmoratus*	T
Northern spotted owl	*Strix occidentalis caurina*	T
Western snowy plover	*Charadrius alexandrinus nivosus*	T
MAMMALS		
Fresno kangaroo rat	*Dipodomys nitratoides exilis*	E
Giant kangaroo rat	*Dipodomys ingens*	E
Riparian woodrat	*Neotoma fuscipes riparia*	E
Riparian brush rabbit	*Sylvilagus backmani riparius*	E
Salt marsh harvest mouse	*Reithrodontomoys raviventris*	E
San Joaquin kit fox	*Vulpes macrotis mutica*	E
Tipton kangaroo rat	*Dipodomys nitratoides nitratoides*	E

TABLE 5-19

OCCURRENCE OF LISTED AND PROPOSED PLANT AND WILDLIFE SPECIES IN THE STUDY AREA

	DIVISION					
	Shasta, Trinity, and Sacramento	**American River (Sacramento Valley)**	**Delta (San Joaquin Valley)**	**West San Joaquin**	**American River and Delta (Alameda and Contra Costa Counties)**	**San Felipe**
PLANTS						
Antioch Dunes evening-primrose					X	
Butte County Meadowfoam	X					
California jewelflower			X	X		
California sea-blite					X	X
Colusa grass	X				X	
Contra Costa wallflower					X	
Contra Costa goldfields					X	X
Coyote ceanothus						X
El Dorado Bedstraw		X				
Green's tuctoria	X					
Hairy Orcutt grass	X					
Hoover's eriastrum			X			
Hoover's sprurge	X					
Large-flowered fiddleneck					X	
Layne's butterweed		X				
Metcalf Canyon jewelflower						X
Pallid manzanita					X	
Palmate-bracted bird's beak	X		X	X		
Pine Hill ceanothus		X				
Pine Hill flannelbush		X				
Sacramento Orcutt grass		X				
San Joaquin woolly-threads				X		
Santa Clara Valley dudleya						X
Santa Cruz tarplant					X	X
Slender Orcutt grass	X	X				

TABLE 5-19

OCCURRENCE OF LISTED AND PROPOSED PLANT AND WILDLIFE SPECIES IN THE STUDY AREA

	DIVISION					
	Shasta, Trinity, and Sacramento	**American River (Sacramento Valley)**	**Delta (San Joaquin Valley)**	**West San Joaquin**	**American River and Delta (Alameda and Contra Costa Counties)**	**San Felipe**
Showy Indian clover			X			
Soft bird's beak					X	
Solano grass						
Stebbin's morning glory		X				
Succulent owl's clover		X				
Tiburon Indian paintbrush						X
INVERTEBRATES						
Bay checkerspot butterfly						X
California freshwater shrimp					X	
Callipe silverspot butterfly					X	
Conservancy fairy shrimp	X		X			
Delta green ground beetle					X	
Lange's metalmark butterfly					X	
Longhorn fairy shrimp					X	
Valley elderberry longhorn beetle	X	X	X	X	X	
Vernal pool fairy shrimp	X	X	X	X	X	
Vernal pool tadpole shrimp	X	X	X	X	X	
AMPHIBIANS						
California red-legged frog	X	X	X	X	X	X
California tiger salamander –Central California DPS	X	X	X	X	X	X
REPTILES						
Alameda whipsnake			X		X	X

TABLE 5-19

OCCURRENCE OF LISTED AND PROPOSED PLANT AND WILDLIFE SPECIES IN THE STUDY AREA

	DIVISION					
	Shasta, Trinity, and Sacramento	**American River (Sacramento Valley)**	**Delta (San Joaquin Valley)**	**West San Joaquin**	**American River and Delta (Alameda and Contra Costa Counties)**	**San Felipe**
Blunt-nosed leopard lizard			X	X	X	
Giant garter snake	X	X	X	X		
San Francisco garter snake						X
BIRDS						
Bald Eagle	X	X	X	X	X	X
California brown pelican					X	
California clapper rail					X	X
California condor				X		
California least tern					X	X
Least Bell's vireo						X
Marbled murrelet						X
Northern spotted owl	X					
Western snowy plover					X	
MAMMALS						
Fresno kangaroo rat			X	X		
Giant kangaroo rat			X	X		
Riparian woodrat			X	X	X	
Riparian brush rabbit					X	
Salt marsh harvest mouse					X	X
San Joaquin kit fox				X	X	X
Tipton kangaroo rat			X	X		

TABLE 5-20

OCCURRENCE OF CRITICAL HABITAT FOR LISTED PLANT AND WILDLIFE SPECIES IN THE STUDY AREA

	DIVISION					
	Shasta, Trinity, and Sacramento	**American River (Sacramento Valley)**	**Delta (San Joaquin Valley)**	**West San Joaquin**	**American River and Delta (Alameda and Contra Costa Counties)**	**San Felipe**
PLANTS						
Antioch evening-dunes primrose					X	
Colusa grass	X					
Contra Costa wallflower					X	
Green's tuctoria	X					
Hairy Orcutt grass	X					
Hoover's sprurge	X					
Slender Orcutt grass	X					
INVERTEBRATES						
Bay checkerspot butterfly						X
Conservancy fairy shrimp	X					
Valley elderberry longhorn beetle					X	
Vernal pool fairy shrimp	X			X		
Vernal pool tadpole shrimp	X			X		
AMPHIBIANS						
California red-legged frog			X			
BIRDS						
Northern spotted owl	X					
MAMMALS						
Fresno kangaroo rat			X			
Giant kangaroo rat				X		

TABLE 5-21

HABITAT ASSOCIATIONS OF LISTED PLANT AND WILDLIFE SPECIES IN THE STUDY AREA

	HABITAT																				
	RIV	**LAC**	**EST**	**FEW**	**VP**	**SEW**	**AGS**	**CRC/MCH**	**CSC**	**BOP/BOW**	**COW**	**VOW**	**MHW**	**MHC**	**CF**	**VRI**	**CRP**	**RCE**	**OVN**	**BAR**	**SID**	**SERP**
PLANTS																						
Antioch Dunes evening-primrose																					X	
Butte County Meadowfoam					X																	
California jewelflower							X	X														
California sea-blite						X																
Colusa grass					X																	
Contra Costa wallflower																					X	
Contra Costa goldfields					X																	
Coyote ceanothus																						X
El Dorado Bedstraw										X												
Green's tuctoria					X																	
Hairy Orcutt grass					X																	
Hoover's spurge					X																	
Large-flowered fiddleneck							X			X	X	X										
Layne's butterweed								X														X
Metcalf Canyon jewelflower																						X
Pallid manzanita								X	X													
Palmate-bracted bird's beak							X	X														
Pine Hill ceanothus								X														
Pine Hill flannelbush								X														
Sacramento Orcutt grass					X																	
San Joaquin woolly-threads							X															
Santa Clara Valley dudleya																						X
Santa Cruz tarplant							X															
Slender Orcutt grass					X																	
Showy Indian clover							X															X
Soft bird's beak						X																
Solano grass					X																	
Stebbin's morning glory								X														X
Succulent owl's clover					X																	
Tiburon Indian paintbrush																						X
INVERTEBRATES																						
Bay checkerspot butterfly																						X
California freshwater shrimp	X																					
Callipe silverspot butterfly							X															
Conservancy fairy shrimp					X																	
Delta green ground beetle					X																	
Lange's metalmark butterfly																					X	

TABLE 5-21

HABITAT ASSOCIATIONS OF LISTED PLANT AND WILDLIFE SPECIES IN THE STUDY AREA

	HABITAT																				
	RIV	**LAC**	**EST**	**FEW**	**VP**	**SEW**	**AGS**	**CRC/MCH**	**CSC**	**BOP/BOW**	**COW**	**VOW**	**MHW**	**MHC**	**CF**	**VRI**	**CRP**	**RCE**	**OVN**	**BAR**	**SID**	**SERP**
Longhorn fairy shrimp					X																	
Valley elderberry longhorn beetle																X						
Vernal pool fairy shrimp					X																	
Vernal pool tadpole shrimp					X																	
AMPHIBIANS																						
California red-legged frog	X	X		X			X			X	X	X				X						
California tiger salamander – Central California DPS					X		X															
REPTILES																						
Alameda whipsnake							X	X	X		X											
Blunt-nosed leopard lizard							X															
Giant garter snake	X	X		X			X									X		X				
San Francisco garter snake				X			X															
BIRDS																						
Bald Eagle	X	X	X												X	X						
California brown pelican			X																	X		
California clapper rail						X														X		
California condor							X			X												
California least tern			X			X														X		
Least Bell's vireo																X						
Marbled murrelet															X							
Northern spotted owl														X	X							
Western snowy plover																				X		
MAMMALS																						
Fresno kangaroo rat							X															
Giant kangaroo rat							X															
Riparian woodrat																X						
Riparian brush rabbit																X						
Salt marsh harvest mouse						X																
San Joaquin kit fox							X										X		X			
Tipton kangaroo rat							X															

RIV: Riverine
LAC: Lacustrine
EST: Estuarine
FEW: Freshwater emergent wetland
BOP/BOW: Blue oak foothill pine/Blue oak woodland
VP: Vernal pool
SEW: Saline emergent wetland
AGS: Annual grassland
CRC/MCH: Chamise-Redshank chaparral/ mixed chaparral
CSC: Coastal scrub
COW: Coastal oak woodland
VOW: Valley oak woodland
MHW: Montane hardwood
MHC: Montane hardwood-conifer
CF-Conifer forest
VRI: Valley foothill riparian
CRP: Cropland
RCE: RIce
OVN: Orchard and Vineyard
BAR: Barren
SID: Stabilized interior dune
SERP: Serpentine

Alternative 1A. Under Alternative 1A, it is anticipated that minimum and maximum stream flows would be similar to the No Action Alternative conditions. Because the water is re-allocated between CVP M&I and irrigation water users in the same water year, there is no change to storage in CVP reservoirs or to allocation of water to refuge water supplies, instream flows, or senior water rights holders. Delta exports would be within normal CVP operational values and would be similar to conditions under the No Action Alternative.

Under Alternative 1A, land uses would be similar to those described under the No Action Alternative. Reduction in deliveries to Irrigation CVP water service contractors are relatively small in 13 of the 72 years considered based upon the CALSIM II modeling. It is anticipated that lands fallowed under the No Action Alternative may be fallowed more frequently. Due to the small incremental difference in deliveries under Alternative 1A as compared to the No Action Alternative, it is not anticipated that additional lands would be fallowed. Therefore, it is anticipated that biological resources, including special status species, under Alternative 1A would be similar to conditions under the No Action Alternative. In essence, Alternative 1A would result in no demonstrable change in conditions affecting listed species. Any effect that may result under Alternative 1A would be well within the scope of effects addressed in the contract specific and OCAP consultation. Thus, there would be no effects that have not already been addressed in related consultations.

Alternative 1B. The impacts to CVP reservoir facilities and to surface water resources under Alternative 1B would be similar to those described under Alternative 1A. In essence, Alternative 1B would result in no demonstrable change in conditions affecting listed species. Any effect that may result under Alternative 1B would be well within the scope of effects addressed in the contract specific and OCAP consultation. Thus, there would be no effects that have not already been addressed in related consultations.

Alternative 2A. The impacts to CVP reservoir facilities and to surface water resources under Alternative 2A would be similar to those described under Alternative 1A. However, the frequency of fallowing lands that would be fallowed under No Action Alternative would increase. Therefore, it is anticipated that biological resources, including special status species, under Alternative 2A would be similar to conditions under the No Action Alternative.

Alternative 2B. The impacts to CVP reservoir facilities and to surface water resources under Alternative 2B would be similar to those described under Alternative 1A. However, the frequency of fallowing lands that would be fallowed under No Action Alternative would increase. Therefore, it is anticipated that biological resources, including special status species, under Alternative 2B would be similar to conditions under the No Action Alternative.

Cumulative Effects

Alternatives 1A, 1B, 2A, and 2B would not result in cumulative adverse impacts to biological resources when considered in combination with future projects such as water transfer projects or development of other water supplies. The fallowed land may be located adjacent to other lands fallowed under separate programs or due to changing agricultural market conditions. Therefore, the cumulative loss of field crops may result in changes of associated habitat associated with fallowed lands. These changes in habitat are not expected to have an adverse impact on biological resources, including special status species as compared to the No Action Alternative conditions.

RECREATION

This section describes recreational opportunities for the study area considered in this EA. The description of the Affected Environment has been developed from information presented in the CVPIA PEIS and draft environmental documents prepared by and for Reclamation to support the Long-Term Contract Renewal process.

Affected Environment

Recreation can be an active or passive use of unimproved open space land or improved recreational facilities. Wildlife areas; areas of scenic, historic and cultural value; lake shores; beaches; and rivers and streams are examples of open space as a passive use that may have few or no improvements. Parks, golf courses, and sports clubs are examples of recreation areas that provide for more active uses and have more facility improvements.

Sacramento Valley (Shasta, Trinity, and Sacramento River Divisions). The Sacramento Valley includes opportunities that range from Shasta County to the Delta. Recreation opportunities within Shasta County are numerous. Federal and state agencies and the private sector are major providers of recreation facilities in Shasta County. Undeveloped open space, or natural areas contained within national recreation areas, national parks, wilderness areas, and state parks represent the major tourist recreation resources of Shasta County, and are important to the County's tourist industry. There are privately owned and operated recreational facilities, resorts, campgrounds, recreational vehicle parks, boat and boating equipment facilities.

In the Shasta Lake area and along the Upper Sacramento River, recreational opportunities are provided at many sites, including Shasta-Trinity National Forest, Whiskeytown-Shasta-Trinity National Recreation Area, Shasta Historic Park, Lake Redding - Caldwell Memorial Park, Turtle Bay Regional Park, and Balls Ferry Fishing Access.

The upper reach of the Sacramento River from Red Bluff to the Feather River confluence is a major aquatic recreation resource for the study area. This 160-mile segment of the river is characterized by slower moving water and a meandering river channel lined with riparian thickets and orchards. Although most land along this reach is privately owned, the California Department of Parks and Recreation and Tehama, Glenn, and Colusa counties provide public access along the middle reach. In addition, the Service and California Department of Fish and Game maintain several refuges along the Sacramento River. Water-dependent activities in this reach include boat and shore fishing, swimming, and beach use. Black Butte and Stony Gorge reservoirs also provide some recreation potential.

Recreation activities occur at national wildlife refuges (NWRs) including Sacramento, Delevan, and Colusa refuges that are managed as part of the Sacramento NWR Complex. Gray Lodge Wildlife Area is managed by the California Department of Fish and Game. Most recreation activities on the refuges are associated with the presence of waterfowl. These activities include nonconsumptive uses (such as wildlife observation and hiking) and consumptive uses (such as hunting). Hunting of ducks, geese, coots, snipes, and pheasants is permitted between October and January on portions of all refuges in the Sacramento NWR Complex. Fishing does not occur on any other refuge in the complex. Certain activities, such as hiking and driving tours, can be restricted when birds are present on the refuge. Most of the visitation to the wildlife refuges occurs in the late fall through the winter.

Lower American River (American River Division). Recreation in the Lower American River watershed occurs within many of the cities and at county facilities throughout the area. Regional recreational opportunities occur at Folsom Lake, Lake Natoma, and along the Lower American River

corridor. The Folsom State Recreation Area (SRA) consists of Folsom Lake and Lake Natoma. This area is heavily used due to its proximity to a rapidly growing metropolitan area. The SRA includes 176 campsites that accommodate tent, trailer, recreational vehicles, and group campers; 11 day use areas; and over 90 miles of existing trails. The highest use rates occur in the summer and decrease in the fall and winter. Use in 2000 at the Folsom Lake SRA was more than 1.5 million visitors. Water-enhanced land-based activities include picnicking, camping, and trail use such as walking, hiking, cycling, mountain biking, and horseback riding. Water-dependent activities include boating, personal watercraft use (jetskis), windsurfing, water skiing, rafting, swimming, and fishing. Major facilities at Folsom Lake include six developed boat launching areas, a marina, and two formal beach areas. Folsom Lake's elevation declines from Memorial Day through Labor Day. Lake levels in a normal year will generally decline through the summer season. In most years, the water surface elevation stays above about 405 feet mean sea level and the berthing slips are available for year-round mooring. In wetter years, lake levels can rise above 450 feet mean sea level and inundate nearshore boat ramps and parking spaces. The nearshore boat ramps are useable between 450 and 420 feet mean sea level.

Lake Natoma is located at the downstream end of the Folsom Lake SRA. Major facilities at Lake Natoma include three boat launching areas, two formal beaches, California State University, Sacramento Aquatic Center, several picnic areas, and an eight-mile segment of the American River paved trail that is used by equestrians, hikers, runners, mountain bikers, and in-line skaters. Bank fishing is common, and swimming and diving occur from the rock outcrops at the upper end of the lake. The predominant recreational activity is trail use for jogging, bicycling, hiking, and horseback riding. Lake Natoma supports an average of half-million visitor-days/year, primarily during the spring and summer.

The Lower American River from Nimbus Dam to the confluence with the Sacramento River includes the American River Parkway. The Parkway includes 14 interconnected parks along the publicly owned lands of the river. The most popular feature of the Parkway is the Jedediah Smith Memorial Trail - more commonly known as the American River Bike Trail. The trail extends 32 miles east from Discovery Park near the Sacramento River to Beals Point in the Folsom Lake SRA. This trail offers to hikers, cyclists, and horseback riders opportunities for outdoor recreation, nature viewing, and relaxation. The American River is popular with fishing enthusiasts, canoeists, kayakers, and rafters, and the Parkway offers several picnic areas, and opportunities for nearby golf, guided natural and historic tours, archery, and game fields. More than five million visitors use the Parkway each year; visitation is expected to increase to 9.6 million by 2020.

Recreational opportunities in the Lower American River Watershed include the 165-acre Rancho Seco Lake that is owned and operated by Sacramento Municipal Utility District. CVP water is used for part of the water supply for the lake. Park facilities include group campgrounds and individual camp sites, recreational vehicle sites, group and family picnic areas, two boat launches, a store/snack bar, restrooms, and a swimming area. The lake is a popular fishing spot for catfish, blue gill, bass, crappie, and trout. Most lake facilities are located on the south and west shores of the lake. The peak number of persons at Rancho Seco Lake on a summer weekend is approximately 5,000.

There are many local and regional parks in the Lower American River watershed that are maintained by the cities, counties, and local agencies. These parks are frequently irrigated with CVP water supplies.

Delta (Delta Division). The Sacramento-San Joaquin Delta is used for extensive recreational activities, including fishing, boating, picnicking, and camping. The Delta supports about 12 million user days of recreation a year for water-oriented recreation, as well as picnic sites and camping areas. Usage typically peaks in July. Boating and fishing are the most popular activities. There are many private marinas and public boat launching facilities in the Delta.

Eastside Division. Recreational opportunities in the Eastside Division are focused at New Melones Reservoir and along the Stanislaus River. New Melones Reservoir supports boating, fishing, swimming, wading, camping, and sightseeing. The Stanislaus River supports fishing, swimming, boating, camping, and picnicking. Many of these activities are directly supported by local businesses in the region.

Northern and Central San Joaquin Valley (Delta and West San Joaquin Divisions). Recreational opportunities in the San Joaquin Valley primarily occur along the lower San Joaquin River, near San Luis Reservoir, and at the wildlife refuges. Recreational use for the Lower San Joaquin River is similar to activities in the Delta. It is estimated that river, boating and fishing activities in the Lower San Joaquin River is 157,000 six-hour Recreational Visitor Days.

San Luis Reservoir, the adjacent O'Neill Forebay, and Los Banos and Little Panoche reservoirs provide reservoir-related recreational resources. 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 the three reservoirs. Hunting for deer and wild pig is allowed on the northwest shoreline of the San Luis Reservoir SRA. Relaxing and camping are the most popular of the water-related activities. Seventy-seven percent of annual use occurs between April and September. The majority of visitors are from the Bay-Delta and San Joaquin Valley areas.

O'Neill Forebay is located immediately east of San Luis Reservoir and serves as a regulating reservoir. Recreational facilities consist of two boat ramps, two picnic areas, a campground, and a swimming area. Other 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 widely used for windsurfing. The majority of visits occur between April and September.

Recreation facilities for picnicking, camping, hunting, swimming, fishing, and boating are also located at Los Banos and Little Panoche reservoirs and at fishing access locations along the San Luis and Delta Mendota Canals. The San Luis Canal includes 12 fishing access sites. The Delta Mendota Canal provides two fishing access sites. Only fishing is allowed at the access sites.

The San Luis and Merced NWR complexes are owned and operated by the Service. Volta, Los Banos, and Mendota Wildlife Management Areas are owned and operated by the California Department of Fish and Game. Fishing is by rod and reel only and the taking of frogs, crayfish, turtles, snakes, and all other wildlife is prohibited. Fishing also occurs near the refuges along streams and sloughs. The refuges also include selfguided driving tours. Camping is permitted at staging areas on the national wildlife refuges during hunting season only. Camping is not allowed at the wildlife areas. Most recreational activities are wildlife-dependent. They include non-consumptive uses such as wildlife observation or consumptive uses such as hunting. Management regulations designed to minimize wildlife disturbance at the refuges include limiting public access to certain time periods. There also are over 150 private waterfowl hunting clubs in the northern and central San Joaquin Valley.

San Felipe Division. Recreational opportunities in the Santa Clara County and in Zone 6 of San Benito County Flood Control and Water Conservation District includes local and regional parks, golf courses, and recreational opportunities at water supply reservoirs. Recreational opportunities at the water supply reservoirs that store CVP water include picnicking and hiking. The Bureau of Land Management owns and operates several wildlife refuges in this areas.

Contra Costa and Alameda Counties (Delta and American River Divisions). Recreation in this area ranges from water-oriented opportunities near the Delta and San Francisco Bay and at water supply reservoirs. Contra Costa Water District and East Bay Regional Park District manage facilities that are associated with CVP water at Contra Loma and Los Vaqueros reservoirs and along the Contra Costa Trail that parallels the Contra Costa Canal. The reservoir and canals provide opportunities for jogging, hiking, bicycling, and picnicking.

East Bay Municipal Utility District and East Bay Regional Park District manage facilities at Briones, Chabot, Lafayette, San Pablo, and Upper San Leandro reservoirs. These reservoirs offer a range of opportunities that include hiking, bicycling, jogging, fishing, non-contact water sports, boating, sailing, and picnicking. At San Pablo Reservoir and Lake Chabot, trout and catfish are planted to supplement the resident population of large- and smallmouth bass, white sturgeon, bluegill, and crappie. Public fishing and boating is not allowed at Briones Reservoir. Other opportunities include horseback riding at San Pablo Reservoir and crew by the U.C. Berkeley women's crew team at Lake Chabot.

Environmental Consequences

The effects of Alternatives 1A, 1B, 2A, and 2B on recreational resources are compared to conditions under the No Action Alternative. Environmental consequences to recreational resources are related to changes in water storage elevations at reservoirs that store CVP water and streams or canals that convey CVP water. Recreational use can also be affected by changes in land use.

No Action Alternative. The No Action Alternative represents the future conditions without implementation of an proposed September 2001 M&I Water Shortage Policy under the alternatives. There would be additional exercise of senior water rights water in the future. However, due to regulatory requirements for the CVP and SWP operations, minimum and maximum reservoir elevations and stream flows would be similar to those described in the OCAP 2004. Water supplies to refuges would be the same as under the No Action Alternative.

Alternative 1A. Under Alternative 1A, it is anticipated that minimum and maximum reservoir elevations and stream flows would be similar to the No Action Alternative conditions. Because the water is re-allocated between CVP M&I and irrigation water users in the same water year, there is no change to storage in CVP reservoirs or to allocation of water to refuge water supplies, instream flows, or the ability to exercise senior water rights. It is also anticipated that land use patterns would be identical to the No Action Alternative conditions. Therefore, it is anticipated that recreational resources under Alternative 1A would be similar to those described under the No Action Alternative, and there would be no impact.

Alternative 1B. Under Alternative 1B, it is anticipated that minimum and maximum reservoir elevations and stream flows would be similar to the No Action Alternative conditions. Because the water is re-allocated between CVP M&I and irrigation water users in the same water year, there is no change to storage in CVP reservoirs or to allocation of water to refuge water supplies, instream flows, or senior water rights holders. It is also anticipated that land use patterns would be identical to the No Action Alternative conditions. Therefore, it is anticipated that recreational resources under Alternative 1B would be similar to those described under the No Action Alternative, and there would be no impact.

Alternative 2A. Under Alternative 2A, it is anticipated that minimum and maximum reservoir elevations and stream flows would be similar to the No Action Alternative conditions. Because the water is re-allocated between CVP M&I and irrigation water users in the same water year, there is no change to storage in CVP reservoirs or to allocation of water to refuge water supplies, instream flows, or senior water rights holders. It is also anticipated that land use patterns would be identical to the No Action

Alternative conditions. Therefore, it is anticipated that recreational resources under Alternative 2A would be similar to those described under the No Action Alternative, and there would be no impact.

Alternative 2B. Under Alternative 2B, it is anticipated that minimum and maximum reservoir elevations and stream flows would be similar to the No Action Alternative conditions. Because the water is re-allocated between CVP M&I and irrigation water users in the same water year, there is no change to storage in CVP reservoirs or to allocation of water to refuge water supplies, instream flows, or senior water rights holders. It is also anticipated that land use patterns would be identical to the No Action Alternative conditions. Therefore, it is anticipated that recreational resources under Alternative 2A would be similar to those described under the No Action Alternative, and there would be no impact.

Cumulative Effects

These alternatives would not result in cumulative adverse impacts to recreational resources when considered in combination with future projects such as water transfer projects or development of other water supplies.

CULTURAL RESOURCES

This section describes cultural resources for the study area considered in this EA. The description of the Affected Environment has been developed from information presented in the CVPIA PEIS and draft environmental documents prepared by and for Reclamation to support the Long-Term Contract Renewal process.

Affected Environment

Cultural resources are those aspects of the physical environment that relate to human culture and society, and those cultural institutions that hold communities together and link them to their surroundings. Cultural resources include expressions of human culture and history in the physical environment such as prehistoric or historic archaeological sites, buildings, structures, objects, districts, and locations of important historic events, or sites of traditional/cultural importance.

The primary law governing cultural resources is the National Historic Preservation Act of 1966 (NHPA), as amended (16 USC Section 470) and implementing regulations (36 CFR 800). This act established the National Register of Historic Places (NRHP) and the Advisory Council on Historic Preservation (ACHP). Section 106 of the NHPA requires that federal agencies consult with the ACHP prior to any undertaking that would affect a property either on or eligible for the National Register. Because Section 106 compliance is usually in response to a proposed action that has the potential to affect historic properties, consultation with the California SHPO, interested parties, and where appropriate, the ACHP is required.

According to federal law, significant cultural resources are those that are either listed on the NRHP, nominated to the NRHP, eligible for listing on the NRHP, designated a National Historic Landmark, or valued by modern Native Americans for maintaining their traditional culture.

It is acknowledged that an unknown number of prehistoric sites and historic resources have been destroyed as a result of the early development of the area. In addition, it is acknowledged that there is the potential for the discovery of unknown sites in urban and rural contexts with some potential for deeply buried sites in the inland and delta areas of the study area.

Prehistory. This section provides a brief overview of the prehistoric contexts for the study area.

Sacramento Valley (Shasta, Trinity, Sacramento River, and American River Divisions). Human occupation of northern California may have begun shortly after 8,000 years ago, representing a subsistence pattern based largely on wild seeds and other plant foods. A dramatic intensification of land use began around 4,000-5,000 years ago. A cultural transition occurred about 2,500 years ago, marked by changes in burial practices, tool types, and ceremonial items. The transition may reflect the eastward spread of Miwok people from the Bay Area. Sites from about 1,500 years ago reflect dense populations with highly developed social organizations, trade networks, food storage and redistribution systems, ceremonial and funerary complexes, and a strong sense of territoriality. The settlement and subsistence patterns changed. The increased regional population may have intensified the use of land and fish and shellfish resources.

The earliest defensible dated cultural evidence from the Upper Sacramento Valley was from an archaeological site, CA-SHA-475, on the Squaw Creek drainage of Shasta Lake. Radiocarbon dates from the lowest stratum indicates human use dating between 6,530 and 7,580 years ago. This period lasting until about 5,000 years ago was likely typified by a foraging economy based on extensive hunting and the collection of native plants especially hard seeds, and is thought to be linked to Hokan speaking people, quite possibly the ancestors of the Yana.

During the period between approximately 5,000 and 3,000 years ago, there was an increased reliance on acorns and, perhaps, other softer foods. Evidence of this pattern, the Whiskeytown Pattern, is widespread and could be related to preservation or increasing human use.

During the last 1,500 years, the aboriginal inhabitants diversified and specialized in the exploitation of natural resources with large seasonal encampments along the major streams. This cultural pattern is related to the appearance of Penutian speaking people from the Columbia Plateau. These people are assumed to be the ancestors of the modern Wintu.

Glenn, Tehama, Colusa, and Yolo counties include evidence of prehistoric and historic use. Regional human use dates back to around 6,000 BC. The patterns relevant to Sacramento Valley prehistory are the Windmiller, Berkeley, and Augustinian Patterns. The Windmiller Pattern was primarily a hunting and fishing economy. The Berkeley Pattern focused on acorns as a dietary staple. Relatively more mortars are found, indicating a shift to a dependable, but labor intensive, food source. The Augustinian Pattern was distinguished by sites with evidence of intensive fishing, hunting, and acorn gathering. There is a shift toward densely populated villages, highly developed exchange systems, ceremonialism, social stratification, cremation, and preinternment burning of grave goods. This pattern is associated with the migration southward of Wintun peoples.

San Joaquin Valley (Eastside, Delta, and West San Joaquin Divisions). The Northern and Central San Joaquin Valley has a long and complex cultural history with district regional patterns that extend back more than 11,000 years. The first generally agreed-upon evidence for the presence of prehistoric peoples is represented by the distinctive fluted spear points (termed Clovis points) found on the margins of extinct lakes in the San Joaquin Valley. The ancient hunters who used these spear points existed during a narrow time range of 10,900 to 11,200 years ago. The next cultural period (8,000 to 10,000 years ago) is characterized by stemmed spear points. This 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.

About 8,000 years ago, many California cultures shifted the main focus of their subsistence strategies from hunting to seed gathering. Within the last 3,000 years, specialized adaptations to locally available

resources were developed and populations expanded. Many sites dated to this time contain mortars and pestles and/or are associated with bedrock mortars.

San Francisco Bay Area (Delta, American, and San Felipe Divisions). The San Francisco Bay Area was inhabited by at least three indigenous groups: the Ohlone Costanoan (or "coastal dwellers"), the Bay Miwok, and the Northern Valley Yokut. Early inhabitants lived in nomadic hunter-gatherer societies. Prior to 5,000 to 4,500 years ago, Native American use of the San Francisco Bay region appears to have been intermittent and sparse. Evidence of early occupation along the bayshore may have been hidden by rising sea levels from about 15,000 to 7,000 years ago or buried under sediments caused by bay marshland infilling along estuary margins from 7,000 years onward. Early groups probably focused on hunting and the gathering of various plan foods along with shellfish collection. By about 4,000 years ago, villages were located along the shorelines of bay shore marshlands, streams, and other water bodies.

San Benito County was settled by a group of Hokan-speaking Native Americans over 10,000 years ago. The Hokans were replaced by the Ohlone, which lived along the San Francisco and Monterey bay areas and foothills. The Ohlones were hunters and gatherers. The tribes included the Mutsun tribe in the San Juan Canyon area, Pagsin tribe near Hollister, the Ausaima tribe in San Juan Valley and near Hollister, the Tamarron in the Diablo Range, the Chalon tribe in the south central part of the county, and the Salinan tribe in the southern part of the county. Extensive archaeological sites including midden sites, burial sites, and sacred sites are attributed to the Ohlones.

Ethnography. This section provides a brief overview of the ethnographic contexts for the study area.

Upper Sacramento Valley (Shasta, Trinity, and Sacramento River Divisions). Prior to appearance of Euro-American explorers and settlers, the Upper Sacramento Valley was populated by the Wintu, Yana, and Patwin. The Wintu occupied all of this area except the Cow Creek drainage that was included in the northwestern edge of the Yana territory. The Wintu spoke a Penutian language. The Yana spoke a Hokan dialect. The Wintu controlled the Sacramento River corridor and many of its most productive tributaries. The Yana lived in the eastern foothills and stream corridors of the southern Cascade. The Patwin occupied areas adjacent to the river in Southern Colusa and northern Yolo counties. The Northwestern Maidu or Konkow also occupied a portion of the river in northern Colusa and southern Glenn counties.

The material culture and lifestyles of the groups were quite similar. They constructed semi-permanent or permanent villages on the terraces above main stream corridors and emphasized the use of fish (especially salmon), shellfish, acorns, small mammals, birds, and native plant foods. These staples were processed to provide food during the winter and other lean periods. Reliance on a variety of foods lessened the possibility of famine due to the failure of supply of one or more food sources. Hunting augmented the staples of the diet. Skins acquired through the hunting or snaring of animals were processed and used for a variety of items especially clothing. Housing was comprised of conical, semi-subterranean family residences, approximately 10 feet in diameter, that were often located near a larger communal structure, which was used variously as a residence and for ceremonies. The size of these communal structures appear to have increased through time.

Lower Sacramento Valley (American River Division and Northern Delta). The Valley Nisenan lived along the Sacramento River from downstream of the confluence with the American River, upstream to beyond Yuba City/Marysville, and eastward along the American River for about eight miles. The Nisenan villages may have had 500 to 1,000 occupants. Villages contained houses, and also granaries for storage of acorns and other winter supplies. Near Roseville, the Nisenan inhabited a major village named Pitchiku. Structures included brush shelters, sweat houses, acorn granaries, and dance houses

Between Freeport and the confluence of the Cosumnes River, the Sacramento River is the ethnographic territory of the Plains Miwok. The Plains Miwok were overtaken by diseases brought into the area by miners and other immigrants. By about 1880, the Plains Miwok were considered culturally extinct although members were still alive. The Plains Miwok lived in large, semi-sedentary villages along the major river courses of the delta system. They focused on plant collecting, with fishing and hunting being subsidiary activities.

Placer County is known to have been occupied by two groups of Native Americans: the Nisenan and the Washoe. Both the Nisenan and the Washoe were hunter-gatherers. The Washoe lived a much more mobile life in smaller groups than the Nisenan.

El Dorado County was once inhabited by the ancestors of the Nisenan, Northern Sierra Miwok, and the Washoe. The lifeways and material culture of the three groups were very similar. Permanent houses were typically conical in shape and covered with brush or earth. All groups subsisted on a varied assortment of fish, game, and plants. Acorns were a staple throughout most of the territory; other materials were used for food, medicinal, and manufacturing purposes. Commonly hunted game included deer, bear, mountain lions, and rabbits.

Northern and Central San Joaquin Valley (Delta and West San Joaquin Divisions). This area includes lands claimed by the Penutian-speaking Yokuts. 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 (for the Northern Valley Yokuts), and south to Buena Vista and Kern Lakes at the southernmost end of the Great Central Valley (for the Southern Valley Yokuts). The life of the North Valley Yokuts was centered along the San Joaquin River and its many tributaries, which is flanked by dry, treeless grasslands along its length. The principal food sources for this group were salmon and acorns; procuring avifauna, big game hunting, and seed collecting also played an important role in subsistence. Round, single-family dwellings built of reeds were the primary structure in North Valley Yokuts villages. Basketry and other fiber weaving work constituted the primary craft, accompanied by a lithics industry that manufactured tools from locally obtainable chert, jasper, and chalcedony. Trade with neighboring peoples such as the Costanoans and Miwok was common.

The basic social unit for the Yokuts was the family, although the village may also be considered a social and a political and economic unit. Villages were inhabited mainly in the winter because it was necessary to go to the higher elevations to establish temporary camps during food-gathering seasons (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.

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 primary and secondary tools and implements.

History. This section provides a brief overview of the historic contexts for the study area.

Upper Sacramento Valley (Shasta, Trinity, and Sacramento River Divisions). In the early 1800s, the missions established by the Spanish on the coast were losing populations due to disease and people leaving the area. Military expeditions were organized to the Sacramento Valley to recapture the natives that had left the missions. Active native resistance led to a major battle in 1813 between the

Spanish and Miwok tribelets near the Cosumnes River. In 1833, a great epidemic swept through the Sacramento Valley destroying entire villages.

Ewing Young was the first American known to actually enter the Sacramento Valley in 1832. In response to these explorations, the Mexican government provided land grants to Mexican citizens within the Sacramento Valley to fortify their sovereignty. The most significant of the new land claimants within the study area was Pierson B. Reading who was granted the Buena Ventura 26,633 acre land grant in 1844. Reading played a major role in the Bear Flag Revolt of 1846 that paved the way for American claims to California and the Mexican-American War of 1846-1847. Reading led parties to discover the second gold strike in California at Reading Bar on Clear Creek in the Upper Sacramento Valley, at Reading Bar on the Trinity River, and at Reading Springs near the town of Old Shasta. Mining flourished throughout the 1850s and 1860s with individual operations giving way to corporate undertakings. Mining activities caused widespread destruction of what was left of the native culture and resource base.

The agricultural potential of the Sacramento Valley was recognized in the second half of the 19th century. Unreliable precipitation and the need for protection from periodic flooding limited further growth of agriculture in the region until irrigation facilities started to be constructed in the 1890s. The railroad was constructed to Redding in 1872 and was extended past Redding in 1883.

In the latter part of the 19th and early part of the 20th centuries, mining returned with the extraction and smelting of copper from Keswick upstream along the Sacramento and Pit rivers. By the conclusion of World War I, this industry had dwindled. The study area headed into an economic decline during the 1920s and 1930s. With the construction of Shasta Dam in the late 1930s and early 1940s, the economy and population began an upward trend. Lumber mills were built in and near the City of Redding following World War II. The completion of State Highway 99 in the 1920s augmented the shipping and transportation services of the railroad. With the proliferation of the automobile, the area became a destination for tourism and recreation.

Lower Sacramento Valley (American River Division and Northern Delta). The first Anglo-American to travel to what is now Sacramento County was Jedediah Strong Smith. Later, New Helvetia, the first non-Indian settlement in the Central Valley, was established by Captain John A. Sutter in 1839. He established Sutter's Fort in the City of Sacramento as a trading post. Gold was discovered at Sutter's Mill on the American River in January 1848. By 1854, Sacramento had become the state capital. As the city grew, it became necessary to protect it from flooding of the American and Sacramento rivers.

The Sacramento Valley Railroad was the first railroad in the state and was constructed between Sacramento and Folsom by 1856. The first transcontinental railroad was completed in 1869 when the Central Pacific Railroad met the Union Pacific Railroad, linking Sacramento with Promontory, Utah. Southeastern Sacramento County was settled in the 1850s by hay and barley growers. The primary agricultural industry was stock raising. In addition, fruits and wine grapes were grown and timber mills were developed along the rivers.

In the foothills, mining became the basis of the economy. The earliest towns in Placer County were Auburn founded in 1849, Ophir in 1852, and Rattlesnake in 1853. The economic development of the county was originally based on mining of gold, then coal, granite, iron, copper, quartz, and clay. The Central Pacific Railroad was completed from Sacramento to Auburn in 1865 and led to growth of the timber and agriculture industries. During the 1920s, Placer County was considered the largest fruit-producing area in the state. In the late 1950s, a pear disease and the lower yield of foothill ranches contributed to the demise of Placer County's fruit industry. Dairy farming became locally important after the decline of the fruit industry until the 1960s. Other agricultural enterprises in the county include raising beef cattle, horses, rice, sheep, turkeys, and producing honey, wine, and brandy.

Reclamation of the Delta occurred to provide land for agriculture. Further development of the area was facilitated by the development of regional rail and road networks to service industry and agriculture. The introduction of the refrigerator railcar in the 1880s allowed the transport of agricultural produce to distant markets. Coal mining occurred from the 1850s to the 1880s.

Northern and Central San Joaquin Valley (Eastside, Delta, and West San Joaquin Divisions). Until the late 1850s, the San Joaquin Valley was sparsely settled by Europeans. Extensive areas of marsh were a hindrance to farming. By the mid-1860s, however, American settlers were beginning to reclaim and drain land for agriculture and ranching.

The Southern Pacific and Central Pacific railroads and many smaller interurban lines to the north and 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. By the 1870s, the San Joaquin Valley was the center of California's wheat production. The introduction of canning technology and transcontinental rail led to widespread diversification and development of specialty crops such as fruits and nuts. About the same time, development of the petroleum resources of the southern San Joaquin Valley was initiated and continues today. The need for a steady supply of water to irrigate the increasing acreage of farmed land led to the incorporation of water districts, and eventually to large-scale water supply projects.

San Francisco Bay Area (Delta, American, and San Felipe Divisions). The inland areas were explored by the Spanish between 1772 and 1811 prior to establishing presidios, missions, and secular towns along the California coast from 1769 to 1821. Mission San Jose in present-day Fremont, San Francisco de Asis in San Francisco, and Mission San Juan Bautista were established in this area.

Control of California passed from Spain to Mexico in 1822. Mexican policy stressed individual ownership of the land, with large ranchos being granted to individuals. Control of California passed to the United States in 1847. Throughout the late 19th century, ranchos and other lands were subdivided as the result of population growth.

Contra Costa and Alameda counties first developed as agricultural areas with urban areas located along the San Francisco Bay shoreline. The population of these areas grew significantly after the 1906 earthquake in San Francisco, and during World War II, when many industries moved to the East Bay. Large portions of Contra Costa County remained agricultural until 30 years ago, when residential communities were developed to support employment in other parts of the Bay Area.

The Central Railroad was completed between San Francisco and San Jose in 1864 which led to the growth of fruit orchards, vineyards, and other agricultural farms in Santa Clara County. Agricultural growth continued until after World War II when the electronic industry and other industries expanded in the area and associated residential areas grew.

In San Benito County, the City of Hollister was a center for sheep ranching in the mid-1800s. Hollister began to grow and become larger than San Juan Bautista when the railroad was constructed only near Hollister. In addition to the communities of Hollister and San Juan Bautista, several small agricultural communities were formed, including Tres Pinos which served as the southern terminus for Southern Pacific Railroad in the county; Paicines; Panoche which was a stagecoach and ore wagon stop; New Idria Quicksilver Mine (one of the largest quicksilver mines in the world); and Bear Valley.

Identified Cultural Resources. This section provides a brief overview of the identified cultural resources in the study area.

Upper Sacramento Valley (Shasta, Trinity, and Sacramento River Divisions). Approximately 17 cultural resources have been identified within or adjacent to the boundaries of the Shasta and Trinity Divisions. These resources include those listed in the NRHP, the California Historical landmark series, or the California Points of Interest Program. In addition, there are approximately 500 known sites or areas of archaeological significance.

In the Sacramento River Division, about 2,300 sites have been recorded. A total of 199 sites have been recorded in Colusa County. Of these, 84 are historic sites or have historic components. Prehistoric site densities are highest near the Sacramento River and tributary streams and in the vicinity of Grimes. The site of the Nowi Rancheria is the only archaeological resource that is formally listed on the NRHP. Many additional sites have been determined eligible for listing or are likely to meet the criteria for NRHP and/or California Register listing. Four buildings are formally listed on the NRHP. The Colusa County Courthouse is also listed as a California State Landmark along with two other properties. The California Inventory of Historical Resources lists six resources and includes three California Points of Historical Interest.

Over 475 sites have been recorded in Glenn County. Of these, 101 are historic sites or have historic components. Prehistoric site densities are highest near the Sacramento River and tributary streams. High site densities have also been recorded in higher elevation zones in the western part of the county, outside of the boundaries of the water districts. No prehistoric or historic archaeological resources are formally listed on the NRHP, but many additional sites have been determined eligible for listing or are likely to meet the criteria for the NRHP and/or the California Register of Historic Resources (CRHR). The Gianella Bridge and the Willows Post Office are the only historic buildings or structures formally listed on the NRHP. Two additional properties, the Swift Adobe and site of the first posted water notice, are listed as California State Landmarks. The California Inventory of Historical Resources lists 17 resources. Glenn County also includes 17 California Points of Historical Interest.

Recorded sites in Tehama County are located at over 1,615 recorded sites. Historic era sites or sites with historic components number over 200. Many habitation sites are located on ridges near the numerous streams and creeks which cross the county. Prehistoric site densities are highest near the Sacramento River and other watercourses. Only one archaeological resource is formally listed on the NRHP: the Sulfur Creek Archaeological District, located near Mill Creek. Many additional sites have been determined eligible for listing or are likely to meet the criteria for NRHP and/or California Register listing. Eight buildings are formally listed on the NRHP. Four additional properties are listed as a California State Landmark along with two other properties. The California Inventory of Historical Resources lists 13 resources, and the County also has a designated California Point of Historical Interest.

Lower Sacramento Valley (American River Division). Between the Sacramento/Sutter County boundary and Freeport along the Sacramento River, there are 24 prehistoric and 3 historic sites and at least 42 historic structures along this segment of the Sacramento River. Three of the prehistoric sites are considered eligible for the NRHP. The town of Freeport has the potential to be determined an important historical resource. Other eligible or potentially eligible historic resources along the lower Sacramento River include Reclamation District 1000, Washington Water Company Water Tower, Sacramento Weir and Yolo Bypass, St. Josephs Church and Rectory, Leonidis Taylor Monument, and 37 houses built between 1855 and 1900. One of the houses (John White House) was not recommended for the NRHP; the other 36 are listed as "appears eligible" or "may become eligible". There are 22 prehistoric, 13 historic, and 1 multi-component sites on the American River between Folsom Dam and the Sacramento River.

Folsom Boulevard right-of-way is eligible for listing in the NRHP. There are also three potentially significant historic structures in the right-of-way. Folsom has a Historic District that includes most of "Old Folsom", containing most of the remaining commercial and residential buildings dating back to the 1800s. The Sacramento Valley Railroad (the Union Pacific Railroad tracks between Sacramento and Folsom) is a historic resource that has been determined eligible for listing in the NRHP, and is designed as a California State Historic Landmark. A total of 185 prehistoric sites or components have been recorded at Folsom Lake, and 59 historic-period sites have been recorded there, mostly related to mining, transportation, and settlement.

There are three archaeological sites on the Rancho Seco site. At Site RS-1, about 30 prehistoric artifacts and numerous cultural items were noted on the surface, including flaked cobbles and pebbles. Site RS-2 appears to meet NRHP criteria, and consists of a main ditch, dams and reservoirs, and two areas of associated placer mining activity likely dating to the late 1800s. Site RS-3 contains the remains of the Skully Dairy, which operated in the 1950s, and does not appear to meet NRHP criteria.

Two large permanent Nisenan sites located within the Maidu Regional Park in Roseville are listed in the NRHP. Within Roseville, there are 11 sites of historic and cultural importance. Four historic isolated artifacts or features were recorded, including two buildings on the Diamond K Ranch property identified as eligible for the NRHP. Other identified historic sites consist of an old wooden stove pipeline and a barn that was constructed in about 1910.

Structures associated with the early lumber mills, buildings and other features associated with the fruit-growing industry. Depression-era concrete bridges, and other historic resources such as school houses, residences, commercial buildings, community halls, churches, and cemeteries exist throughout Placer County. El Dorado County contains approximately 850 prehistoric and historic sites. There are also 14 properties listed on the NRHP; 9 eligible for listing on the NRHP, 27 State Historic Landmarks, and 25 named gold mining districts.

Northern and Central San Joaquin Valley (Delta and West San Joaquin Divisions). A total of 89 archaeological and historic sites are currently documented within the contract service areas of the 20 districts in the Delta Division excluding Contra Costa Water District. Many of these prehistoric and historic sites have already been determined eligible or are considered potentially eligible for inclusion on the NRHP. Others remain unevaluated in relation to NRHP eligibility criteria. In addition to formally recorded sites, it is clear that a large number of prehistoric and historic sites remain undiscovered within the overall project area simply because for many areas, especially undeveloped ranch and farm lands, a formal archaeological inventory survey has never been undertaken. In addition to archaeological sites of prehistoric and historic-era affiliation, isolated artifacts have also been identified at numerous locations throughout the overall project area. *Isolates* are defined as single formed tools of prehistoric affiliation or portable historic artifacts and isolated historic features not associated with other cultural manifestations. By definition, such finds are not considered eligible for inclusion on the NRHP.

A total of 67 archaeological and historic sites are currently documented within the service areas of the West San Joaquin Division. 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 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 include buildings and structures dating to the 19th and early- through mid-20th 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;

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

San Francisco Bay Area (Delta, American, and San Felipe Divisions). The areas in Contra Costa and Alameda counties served by Contra Costa Water District and East Bay Municipal Utility District contain numerous prehistoric resources (including lithic scatters, quarries, habitations, shell mounds, bedrock mortars, petroglyphs, and burials), and historic resources, as well as standing historic structures, buildings, districts, and objects; and locations of important historic events or sites of traditional or cultural importance.

A total of 72 archaeological sites have been recorded in or adjacent to the Contra Costa Water District service area. These include 52 prehistoric sites, 19 historic sites, and 1 multi-component site with a prehistoric and historic component. Historic resources are likely to occur throughout the area although many are likely to have been destroyed by subsequent development or redevelopment. At least 44 NRHP listed or determined eligible individual properties or districts (buildings, building sites, landings, etc.) are located in this service area. These historic properties are also included in the CRHR. The Contra Costa Canal was evaluated and was determined not eligible for the NRHP by Reclamation and SHPO in 1992. No NRHP and/or CRHR historic properties, architecturally significant structures, landmarks, or points of interest are present either within or adjacent to the canal.

Archaeological districts in Santa Clara County include Isabel Valley, Santa Teresa, Circles within Circles near Morgan Hill, Uvas Creek-Little Arthur Creek, Upper and Lower Bodfish Creek, Leavesley Road-Alamias Creek, and Pacheco Pass Creek. Coyote Creek Archaeological District and Poverty Flat Site in Henry Coe State Park are listed on the National Register of Historic Places.

Historic sites are located near Los Gatos, Coyote area near Metcalf Road, the settlement of Old Gilroy, Madrone area, New Almaden historic district, Stanford University, Mt. Hamilton Road, and areas from Gilroy to San Martin. The sites include residences, windmills, tankhouse, and historic buildings. Historic districts have been established for Alviso (Embarcadero de Santa Clara), Downtown San Jose, St. James Square, Hensley, and New Almaden.

Environmental Consequences

The effects of Alternatives 1A, 1B, 2A, and 2B on cultural resources are compared to conditions under the No Action Alternative. Environmental consequences to cultural resources are primarily related to exposure of sensitive sites due to changes in water elevations at reservoirs that store CVP water and streams that convey CVP water.

No Action Alternative. The No Action Alternative represents the future conditions without implementation of an M&I water shortage policy under the alternatives. There would be additional exercising of senior water rights water in the future. However, due to regulatory requirements for the CVP and SWP operations, minimum and maximum reservoir elevations and stream flows would be similar to those described in the OCAP 2004. Therefore, additional areas would not be exposed under the No Action Alternative as compared to existing conditions.

Projected land use changes would result in additional agricultural lands either being converted to municipal uses or more frequently fallowed due to reduced water supply allocations. Increased municipal land use would be related to an increased potential of disturbance and exposure of cultural resources. These changes have been addressed in local general plans and associated environmental documentation.

Alternative 1A. Under Alternative 1A, it is anticipated that minimum and maximum reservoir elevations and stream flows would be similar to the No Action Alternative conditions. It is also anticipated that land use patterns would be identical to the No Action Alternative conditions. Therefore, it is anticipated that cultural resources under Alternative 1A would be similar to those described under the No Action Alternative. This alternative does not require construction. Therefore, there are no impacts associated with additional disturbance of cultural resources under this alternative as compared to the No Action Alternative.

Alternative 1B. Under Alternative 1B, it is anticipated that minimum and maximum reservoir elevations and stream flows would be similar to the No Action Alternative conditions. It is also anticipated that land use patterns would be identical to the No Action Alternative conditions. Therefore, it is anticipated that cultural resources under Alternative 1B would be similar to those described under the No Action Alternative. This alternative does not require construction. Therefore, there are no impacts associated with additional disturbance of cultural resources under this alternative as compared to the No Action Alternative.

Alternative 2A. Under Alternative 2A, it is anticipated that minimum and maximum reservoir elevations and stream flows would be similar to the No Action Alternative conditions. It is also anticipated that land use patterns would be identical to the No Action Alternative conditions. Therefore, it is anticipated that cultural resources under Alternative 2A would be similar to those described under the No Action Alternative. This alternative does not require construction. Therefore, there are no impacts associated with additional disturbance of cultural resources under this alternative as compared to the No Action Alternative.

Alternative 2B. Under Alternative 2B, it is anticipated that minimum and maximum reservoir elevations and stream flows would be similar to the No Action Alternative conditions. It is also anticipated that land use patterns would be identical to the No Action Alternative conditions. Therefore, it is anticipated that cultural resources under Alternative 2B would be similar to those described under the No Action Alternative. This alternative does not require construction. Therefore, there are no impacts associated with additional disturbance of cultural resources under this alternative as compared to the No Action Alternative.

Cumulative Effects

These alternatives would not result in cumulative adverse impacts to cultural resources when considered in combination with future projects such as water transfer projects or development of other water supplies.

INDIAN TRUST ASSETS

This section describes Indian Trust Assets (ITAs) for the study area considered in this EA. The description of the Affected Environment has been developed from information presented in the CVPIA PEIS and draft environmental documents prepared by and for Reclamation to support the Long-Term Contract Renewal process and recently reviewed by the Mid-Pacific Region.

Affected Environment

ITAs are legal interests in assets that are held in trust by the U.S. Government for federally recognized Indian tribes or individuals. The trust relationship usually stems from a treaty, executive order, or act of Congress. The Secretary of the Interior is the trustee for the United States on behalf of federally recognized Indian tribes. "Assets" are anything owned that holds monetary value. "Legal interests" means

there is a property interest for which there is a legal remedy, such as compensation or injunction, if there is improper interference. Assets can be real property, physical assets, or intangible property rights, such as a lease, or right to use something. Indian trust assets can not be sold, leased, or otherwise alienated without United States' approval. Trust assets may include lands, minerals, and natural resources, as well as hunting, fishing, and water rights. Indian reservations, rancherias, and public domain allotments are examples of lands that are often considered trust assets. In some cases, Indian trust assets may be located off trust land.

Reclamation shares the Indian trust responsibility with all other agencies of the Executive Branch to protect and maintain ITAs reserved by or granted to Indian tribes, or Indian individuals by treaty, statute, or Executive Order.

The Trinity Division recognizes ITAs of the Hoopa and Yurok tribes. The Redding Rancheria is located in the Shasta Division and receives water from the City of Redding

In the western Sacramento Valley near or adjacent to the Sacramento River Division, the following Federally recognized Indian rancherias are located within the Study Area.

- Grindstone Rancheria in Glenn County
- Cortina Rancheria in Colusa County
- Colusa Rancheria in Colusa County
- Rumsey Rancheria in Yolo County
- Paskenta Band of Nomlaki Indians in Tehama County

The following three Native American rancherias are located in the American River Division.

- United Auburn Rancheria in Placer County
- Shingle Springs Rancheria in El Dorado County

There are no reservations or rancherias in the Delta, West San Joaquin, or San Felipe divisions.

Environmental Consequences

The effects of Alternatives 1A, 1B, 2A, and 2B on ITAs are compared to conditions under the No Action Alternative. Environmental consequences to ITAs are primarily related to disturbances of the land or impacts to other natural resources held in trust by the United States for federally recognized tribes.

No Action Alternative. The No Action Alternative represents the future conditions without implementation of the M&I Water Shortage Policy under the alternatives. Projected land use changes would result in additional agricultural lands either being converted to municipal uses or more frequently fallowed due to reduced water supply allocations. Increased municipal land use could be related to an increased potential of disturbance. These changes have been addressed in local general plans and associated environmental documentation.

Alternative 1A. Under Alternative 1A, it is anticipated that land use patterns would be identical to the No Action Alternative conditions. Therefore, it is anticipated that conditions for ITAs under this alternative would be similar to those described under the No Action Alternative, and there would be no impacts.

Alternative 1B. Under Alternative 1B, it is anticipated that land use patterns would be identical to the No Action Alternative conditions. Therefore, it is anticipated that conditions for ITAs under this alternative would be similar to those described under the No Action Alternative, and there would be no impacts.

Alternative 2A. Under Alternative 2A, it is anticipated that land use patterns would be identical to the No Action Alternative conditions. Therefore, it is anticipated that conditions for ITAs under this alternative would be similar to those described under the No Action Alternative, and there would be no impacts.

Alternative 2B. Under Alternative 2B, it is anticipated that land use patterns would be identical to the No Action Alternative conditions. Therefore, it is anticipated that conditions for ITAs under this alternative would be similar to those described under the No Action Alternative, and there would be no impacts.

Cumulative Effects

These alternatives would not result in cumulative adverse impacts to ITAs when considered in combination with future projects such as water transfer projects or development of other water supplies.

AIR QUALITY

This section describes air quality for the study area considered in this EA. The description of the Affected Environment has been developed from information presented in the CVPIA PEIS and draft environmental documents prepared by and for Reclamation to support the Long-Term Contract Renewal process.

Affected Environment

Air quality is regulated in accordance with federal and state mandates. These regulations are enforced by local and regional authorities. The federal Clean Air Act was passed in 1963, and provided the first national program to control pollution from automobiles and stationary sources. The U.S. Environmental Protection Agency (EPA) subsequently established national ambient air quality standards in 1971 for the following air pollutants: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and respirable particulate matter (PM_{10}).

California ambient air quality standards were established by the California Air Resources Board starting in 1969, pursuant to the Mulford-Carrell Act. The California ambient air quality standards are generally more stringent and include more pollutants than the national ambient air quality standards. The national and California ambient air quality standards are listed in Table 5-22.

Pollutants commonly associated with agricultural land uses include PM, CO, nitrogen oxides (NO_x), and O_3 precursors (reactive organic gases [ROG} and NO_x). PM results from field burning, farm operations such as tilling, plowing, and the operation of farm equipment on loose earth, and entrained road dust releases and fuels combustion in vehicles and farm equipment. PM emissions may also occur when fallow fields do not have a crop cover to inhibit wind erosion. Suspended PM represents a diverse mixture of solid and liquid material having size, shape, and density characteristics that allow the material to remain suspended in the air for measurable periods.

TABLE 5-22

AMBIENT AIR QUALITY STANDARDS

Pollutant	Averaging Time	California Standards[a]	National Standards[b]	
			Primary[c]	Secondary[d]
Ozone	8 Hour 1 Hour	-- 0.09 ppm	0.08 ppm 0.12 ppm	0.08 ppm 0.12 ppm
Carbon Monoxide	8 Hour 1 Hour	9.0 ppm 20 ppm	9 ppm 35 ppm	-- --
Nitrogen Dioxide	Annual Arithmetic Mean 1 Hour	-- 0.25 ppm	0.053 ppm --	0.053 ppm --
Sulfur Dioxide	Annual Arithmetic Mean 24 Hour 3 Hour 1 Hour	-- 0.04 ppm -- 0.25 ppm	0.030 ppm 0.14 ppm -- --	-- -- 0.5 ppm --
PM_{10}	Annual Arithmetic Mean 24 Hour	20 ug/m^3 50 µg/m^3	50 µg/m^3 150 µg/m^3	50 µg/m^3 150 µg/m^3
$PM_{2.5}$	Annual Arithmetic Mean 24 Hour	12 µg/m^3 --	15 µg/m^3 65 µg/m^3	15 µg/m^3 65 µg/m^3
Sulfates	24 Hour	25 µg/m^3	--	--
Lead	30 Day Average Calendar Quarter	1.5 µg/m^3 --	-- 1.5 µg/m^3	-- 1.5 µg/m^3
Hydrogen Sulfide	1 Hour	0.03 ppm	--	--
Vinyl Chloride	24 Hour	0.01 ppm	--	--
Visibility Reducing Particles	8 Hour	See Note[e]	--	--

[a]California standards for ozone, carbon monoxide, sulfur dioxide (1-hour and 25-hour), nitrogen dioxide, suspended particulate matter (PM_{10}, $PM_{2.5}$, and visibility reducing particles) are values that are not to be exceeded. All others are not to be equaled or exceeded.
[b]National standards, other than ozone, particulate matter, and those based on annual averages or annual arithmetic means, are not to be exceeded more than once a year. The ozone standard is attained when the fourth highest eight hour concentration in a year, averaged over three years, is equal to or less than the standard. For PM_{10}, the 25-hour standard is attained when the expected number of days/calendar year with a 25-hour average concentration above 150 ug/m^3 is equal to or less than one. For $PM_{2.5}$, the 24 hour standard is attained when 98 percent of the daily concentrations, averaged over three years, are equal to or less than the standard.
[c]National Primary Standards: The levels of air quality necessary, with an adequate margin of safety, to protect the public health.
[d]National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.
[e]In sufficient amount to produce an extinction coefficient of 0.23/kilometer due to particles when the relative humidity is less than 70 percent.

ppm = parts/million (by volume).

Source: California Air Resources Board, 2003.

The physical and chemical composition of suspended particulate matter is highly variable, resulting in a wide range of public health concerns. Health concerns associated with suspended PM focus on those particles small enough to reach the lungs when inhaled (PM_{10} or smaller). Particulates can damage human health and retard plant growth. Particulates also reduce visibility, stain buildings, and corrode materials.

CO is released to the atmosphere during field burning and fuel combustion in farm equipment. NO_x is also released during field burning. ROG and NO_x are released in farm equipment emissions and during the application of pesticides and fertilizers.

Many M&I 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.

O_3 is a respiratory irritant and an oxidant that, when at unhealthy levels, increases susceptibility to respiratory infections and can cause substantial damage to vegetation and other materials. It is formed by a photochemical reaction in the atmosphere by its precursors, ROG and NO_x.

Section 176(c) of the Clean Air Act requires federal agencies to ensure that actions undertaken in nonattainment or maintenance areas are consistent with the Clean Air Act and with federally enforceable air quality management plans. The EPA has promulgated separate rules that establish conformity analysis procedures for highway/mass-transit projects and for other (general) federal agency actions. General conformity requirements are potentially applicable to most other federal agency actions but apply only to those aspects of an action that involve ongoing federal agency responsibility and control over direct or indirect sources of air pollutant emissions.

The EPA conformity rule establishes a process that is intended to demonstrate that the proposed federal action.

- Would not cause or contribute to new violations of federal air quality standards
- Would not increase the frequency or severity of existing violations of federal air quality standards
- Would not delay the timely attainment of federal air quality standards

The EPA general conformity rule applies to federal actions occurring in nonattainment or maintenance areas when the net increase in total direct and indirect emissions of nonattainment pollutants (or their precursors) exceeds specified thresholds. The emission thresholds that trigger requirements of the conformity rule are called de minimis levels.

The federal Clean Air Act requires each state to identify areas that have ambient air quality in violation of federal standards. States are required to develop, adopt, and implement a State Implementation Plan (SIP) to achieve, maintain, and enforce federal ambient air quality standards in these nonattainment areas. Deadlines for achieving the federal air quality standards vary according to air pollutant and the severity of existing air quality problems. The SIP must be submitted to and approved by EPA. SIP elements are developed on a pollutant-by-pollutant basis whenever one of more air quality standards are being violated.

Upper Sacramento Valley (Shasta, Trinity, and Sacramento River Divisions). Seven counties form the Northern Sacramento Valley Air Basin (NSVAB), including Shasta, Tehama, Glenn, Butte, Colusa, Yuba, and Sutter. The potential for air pollution in the NSVAB is high due to the basin being surrounded by the Klamath, Coastal, and Cascade Mountains, when combined with the relatively calm

winds and fairly stable atmospheric conditions. Shasta County experiences moderate to very poor capability to disperse pollutants nearly 80 percent of the time due to the relatively stable atmosphere (inversion layer) that suppresses vertical air movement. The inversion layer traps dust and other pollutants at or near the ground surface, which poses significant health risks for plants, animals, and people. Ozone pollution caused by vehicle and industrial emissions is the major contamination concern in the summer. A cold-weather inversion layer that traps airborne particles from open-burning practices, fireplaces, and wood stoves is the major problem in the winter. The NSVAB does not meet the state ambient air quality standards for O_3 and PM_{10}. Shasta County is designated as a moderate nonattainment area with respect to state standards for O_3 and PM_{10}, and meets the federal standards for these two pollutants.

Concentrations of O_3 in the middle and northern part of the Sacramento Valley periodically exceed state standards, but seldom exceed the federal ozone standard in the west Sacramento Valley. PM_{10} concentrations throughout the Sacramento Valley periodically exceed state standards but do not exceed federal standards. The Yolo County portion of the study area is considered a nonattainment area for the federal O_3 standard. Other portions of the study area are considered attainment areas for the O_3 and PM_{10} standards. The Yolo County portion of the study area is subject to the EPA general conformity rule. The conformity de minimis thresholds for the Yolo County portion of the study area are 50 tons/year of reactive organic compounds and 50 tons/year of NO_x.

Lower Sacramento Valley (American River Division). Most of the air pollutants in Sacramento, Placer, and El Dorado counties may be associated with either urban or agricultural land uses. Pollutants commonly associated with agricultural land uses include PM_{10}, CO, NO_x, and O_3 precursors.

Sacramento County and western Placer County (west of Colfax) are located in the Sacramento Valley Air Basin. The eastern portion of Placer County (east of Colfax) and the western portion of El Dorado County are located in the Mountain Counties Air Basin.

In the Sacramento area, pollutants of greatest concern include ROG, NO_x, CO, PM_{10}, and other visibility-reducing material. The largest single source of pollutants in the Sacramento area is automobile exhaust; O_3 and CO pollution are largely attributable to automobile use. Other sources, such as agricultural and construction and/or demolition activities, also contribute to high levels in suspended particulates. Since 1991, local air districts are responsible for preparing SIPs with Sacramento Area Council of Governments taking a support role in document preparation.

The Placer County Air Pollution Control District is responsible for managing the County's air quality in a manner to protect and promote public health by controlling and seeking reductions of air pollutants while recognizing and considering the economic and environmental impacts. The primary sources of PM_{10} in Placer County are entrained road dust and construction and demolition activities. The entire county has been designated as unclassified for CO. The primary source of CO emissions in Placer County is motor vehicle emissions. Regional development patterns cause O_3 problems. Motor vehicles are the primary source of Placer County NO_x and ROG emissions.

Air quality in El Dorado County is affected by stationary sources and mobile sources. Stationary sources include mining operations; lumber processing; industrial boilers; refuse burning; wildfires; service station operations; pesticide use; farm equipment operations; construction equipment operations; utility equipment; range improvement; forest management; residential wood combustion; residential space and water heating; fuel production and transfer; formulation and application of paints, solvents, and other coatings; organic waste disposal; dry cleaning operations; soil decontamination; wastewater processing; and graphic arts processes. Mobile sources include automobiles, trucks, buses, and other vehicles. Vehicle pollutants are produced by vehicles traveling within the county, but are also carried into the county by prevailing wind patterns from the Sacramento County urbanized area and the San Francisco Bay Area.

Vehicular traffic along U.S. Highway 50 between Sacramento and South Lake Tahoe is also a significant contributor of contaminants.

Northern and Central San Joaquin Valley (Eastside, Delta, and West San Joaquin Divisions). The San Joaquin Valley Air Basin (SJVAB) comprises the southern portion of the Central Valley, including the lower slopes of the mountain ranges. Air quality in the SJVAB is regulated by the San Joaquin Valley Unified Air Pollution Control District, which consists of Merced, Madera, Fresno, Kern, Kings, San Joaquin, Stanislaus, and Tulare counties. Major urban centers in the air basin include Bakersfield, Fresno, Modesto and Stockton. The entire SJVAB is designated nonattainment with respect to federal and state O_3 and PM_{10} standards, and is designated attainment or unclassified for CO, NO_2 and SO_2. Most of the air pollutants in the area are associated with urban and agricultural land uses. In general, four basic land uses occur in the area: irrigated agriculture; dryland agriculture (dry cropped, fallow, idle, or grazed); M&I; and undeveloped (natural). The primary air pollutants associated with all four land uses include PM and hydrocarbons or organic gases that may serve as O_3 precursors.

San Francisco Bay Area (American River, Delta, and San Felipe Divisions). Contra Costa, Alameda, and Santa Clara counties are included in the San Francisco Bay Area Air Basin which is managed by the Bay Area Air Quality Management District (BAAQMD). In 2000, the BAAQMD prepared a clean air plan designed to bring the area into compliance with nonattainment area pollutants. The area has been designated as a nonattainment area for O_3 and PM_{10}. The area has been designated as an attainment area for NO_2, SO_2, and CO. The largest sources of air pollution in the area are related to automobile traffic and entrained road dust. Other air pollution sources include petroleum refineries, manufacturers, power plants, construction, demolition, and urban activities such as painting. The counties are coordinating with the Metropolitan Transportation Commission to prepare a Transportation Improvement Plan to be in conformance with the SIP for nonattainment areas.

San Benito County is part of the North Central Coast Air Basin and Monterey Bay Unified Air Pollution Control District (MBUAPCD). The MBUAPCD was named a Federal Maintenance Area for ozone in 1997. There have been violations of the O_3 standards in San Benito County. However, the California Air Resources Board determined that most of these violations are due to emissions upwind of the North Central Coast Air Basin. The MBUAPCD is encouraging the land use agencies to consider air quality issues when considering land use changes, expansion of public transportation within this air basin, and expansion of public education programs, which will be especially important as residential areas of Hollister and San Juan Bautista are developed.

Environmental Consequences

The effects of Alternatives 1A, 1B, 2A, and 2B on air quality are compared to conditions under the No Action Alternative. Environmental consequences to air quality are primarily related to primary impacts associated with construction or disturbances of agricultural land or secondary impacts associated with growth.

No Action Alternative. The No Action Alternative represents the future conditions without implementation of the M&I Water Shortage Policy under the action alternatives. Projected land use changes would result in additional agricultural lands either being converted to municipal uses or more frequently fallowed due to reduced water supply allocations. These changes and responses have been addressed in local general plans and associated environmental documentation and in the CVPIA PEIS.

Alternative 1A. Under Alternative 1A, it is anticipated that land use patterns would be identical to the No Action Alternative conditions. It is not anticipated that additional lands would be fallowed due to changes in the allocations of Irrigation CVP water service contracts. Therefore, it is not anticipated that

air quality would change under this alternative as compared to the No Action Alternative, and there would be no impacts.

Alternative 1B. Under Alternative 1B, it is anticipated that land use patterns would be identical to the No Action Alternative conditions. It is not anticipated that additional lands would be fallowed due to changes in the allocations of Irrigation CVP water service contracts. Therefore, it is not anticipated that air quality would change under this alternative as compared to the No Action Alternative, and there would be no impacts.

Alternative 2A. Under Alternative 2A, it is anticipated that land use patterns would be identical to the No Action Alternative conditions. It is not anticipated that additional lands would be fallowed due to changes in the allocations of Irrigation CVP water service contracts. Therefore, it is not anticipated that air quality would change under this alternative as compared to the No Action Alternative, and there would be no impacts.

Alternative 2B. Under Alternative 2B, it is anticipated that land use patterns would be identical to the No Action Alternative conditions. It is not anticipated that additional lands would be fallowed due to changes in the allocations of Irrigation CVP water service contracts. Therefore, it is not anticipated that air quality would change under this alternative as compared to the No Action Alternative, and there would be no impacts.

Cumulative Effects

Alternatives 1A, 1B, 2A,and 2B may result in cumulative adverse impacts to air quality when considered in combination with future projects such as water transfer projects or development of other water supplies. More frequent fallowing of lands may result in additional violations or prevent compliance with future SIPs. The area to be fallowed may not be different than an area that would be fallowed under future water transfer programs. However, it is difficult to project specific water transfer opportunities. Impacts of future projects would be evaluated under separate environmental documentation.

SOILS

This section describes soils for the study area considered in this EA. The description of the Affected Environment has been developed from information presented in the CVPIA PEIS and draft environmental documents prepared by and for Reclamation to support the Long-Term Contract Renewal process.

Affected Environment

Issues related to soils are defined with respect to soil characteristics and with respect to issues that may be affected by changes that could occur under the alternatives.

Soil Characteristics. In the Central Valley, soils are divided into four physiographic regions. Valley land and valley basin land soils occupy most of the Central Valley floor. Valley land soils consist of deep alluvial and aeolian soils that make up some of the best agricultural land in the state. Valley basin lands consist of organic soils of the Sacramento-San Joaquin Delta, poorly drained soils, and saline and alkali soils in the valley trough and on the basin rims.

Upper Sacramento Valley (Shasta, Trinity, and Sacramento River Divisions). Most of Shasta County is characterized by moderately expansive soils with areas of low expansiveness in the South Central Region and southeastern corner of the County. Small scattered areas of highly expansive

soils occur in the mountains of the Western Upland, French Gulch, and North East Shasta County Planning Areas.

Soils throughout the Upper Sacramento Valley range from decomposed granite in Shasta County to clay and silt loams near Colusa. Many of the soils along the Sacramento River corridor are permeable and of good quality for agricultural activities. Soils on the basin margins tend to have slower infiltration rates than soils on flatter lands toward the center of the basin. Precipitation on soils with slow infiltration rates tends to runoff rather than infiltrate into the soil. This can result in erosion problems.

A significant band of decomposed granite soils is located west of the Redding area from west of Shasta Dam south to Clear Creek. Erosion is a concern whenever development activities are proposed in soils containing parent materials of decomposed granite. Once disturbed, decomposed granite soils are very difficult to re-stabilize and offer poor support for reestablishment of vegetation.

Lower Sacramento Valley (American River Division). The valley floor is divided into several geomorphic land types including low alluvial fans and plains, river flood plains and channels, terraced deposits and dissected uplands. The alluvial fans and plains consist of unconsolidated continental deposits that extend from the edges of the valleys toward the valley floor. The alluvial plains cover most of the valley floor and make up some of the intensely developed agricultural lands in the Central Valley. Alluvial fans along the Sierra Nevada consist of high percentages of clean, well sorted gravel and sand.

River flood plains and channels lie along the major rivers and to a lesser extent the smaller streams that drain into the valley from the surrounding Coast Range and Sierra Nevada. Some flood plains are well-defined where rivers are incised into their alluvial fans. These deposits tend to be coarse and sandy in the channels and finer and silty in the flood plains. Many of these deposits have been used for gravel mining activities.

Calcic brown and noncalcic brown alluvial soils are found in the Sacramento Valley on deep alluvial fans and flood plains occurring in 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.

Terrace soils characterized by a red-iron hardpan layer are found along the east side of the Sacramento Valley. These soils consist of reddish surface soil with a dense silica-iron cemented hardpan, which is generally one foot thick. Some of these hardpan soils have considerable amounts of lime. Dry farming practices support hay, grains, and pastures, although following ripping; these soils are well suited for orchards and vineyards. These soils are subject to expansion, localized landslides, and erosion.

Upland soils located upslope of the terrace soils continue are characterized by shallow depth to bedrock. Soils on the east side of the Sacramento Valley have mostly developed on igneous rocks. The soil has a loam-to-clay-loam texture with low organic matter, and some areas have calcareous subsoils. These soils are found in areas of low to moderate rainfall that support grasslands used primarily for grazing. Tilled areas are subject to erosion.

Northern and Central San Joaquin Valley (Eastside, Delta, and West San Joaquin Divisions). 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 are well-drained, agricultural soils that are generally found on flat to gently sloping surfaces such as on alluvial fans. These soils are composed of alluvial- and aeolian-deposited soils and tend to be loamy. These soils are highly valued for irrigated crops. A gray desert alluvial soil, a light-colored calcareous soil with little organic matter is found on

alluvial fans and floodplains in areas with rainfall of four to seven inches/year. The gray desert alluvial soils are too dry to produce crops without irrigation.

Valley basin land soils occupy the lowest parts of the San Joaquin Valley, including imperfectly drained soils and saline/alkaline soils. Imperfectly drained soils, found in the troughs of the San Joaquin Valley, 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 soils with excess sodium appear black. 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 soils before cultivation to leach salts from the root zone. These conditions frequently cause drainage and soil salinity problems, as described in the groundwater subsection of this chapter. In addition to drainage, problems have occurred with the accumulation of arsenic, boron, molybdenum, and selenium that have leached from natural deposits in the San Joaquin Valley.

San Francisco Bay Area (American River, Delta, and San Felipe Divisions). Soil characteristics in the San Francisco Bay Area vary widely because of the wide range of topography, parent material, vegetation, and geology. Soils vary from rocky and sandy textures to clayey textures. In much of western Alameda County, Franciscan bedrock is overlain by unconsolidated clays, silts, sands, and gravels These deposits range in thickness from more than 300 feet to more than 1,100 feet and sediments are fairly continuous beneath San Francisco Bay. These muds are often overlain and interlayered with alluvial deposits of fine-grained and clayey sands that are 10 to 50 feet thick on the east side of the bay (Helley and Graymer, 1997a, 1997b).

Overall Santa Clara County is formed by folded and faulted sedimentary and volcanic rock in the foothills and alluvial and bay deposits in the lower valleys. Soils include bay muds along the baylands; poorly drained alluvium under downtown San Jose and southeast of Gilroy; well drained alluvial plains and fans under most of the Santa Clara Valley; alluvial terraces and fans along the edges of the foothills; and bedrock of the Santa Cruz Mountains and Diablo Range which are areas generally not served by CVP water. Soils along the foothills are subject to erosion.

The alluvial materials in Zone 6 of San Benito County Flood Control and Water Conservation District service area includes alluvium and terrace deposits, with terrace deposits more prevalent along the east side of the Hollister Valley. Stream gravel is present along the rivers. Hillside areas to the south and east of the service area are underlain by continental mudstone. Soils on the valley floor are primarily loamy to clayey and have low to moderate shrink expansive potential.

Soil Issues. Critical issues considered in this section include wind erosion, water erosion, and soil salinity and chemical composition.

Wind Erosion. Soil erodibility, local wind erosion climatic factor, soil surface roughness, width of field, and vegetative cover affect wind erosion of soils. The more moisture in the soil, the less susceptible it is to wind erosion. Some soils, such as aeolian-deposited sands, are more susceptible to wind erosion than alluvial soils. Soil taken out of irrigation and allowed to remain barren with no cover vegetation would have greater losses to wind erosion than the same soils under a good crop and land management program with irrigation.

Wind erosion makes the soil shallower and can remove organic matter and needed plant nutrients. Also, blowing soil particles can damage plants, particularly young plants. Blowing soils can also cause offsite

problems such as reduced visibility and increased allergic reaction to dust. Some soils on the west side of the San Joaquin Valley have naturally occurring asbestos. If these soils become airborne, the local population, as well as any nearby surface water facilities, could be affected. Soils prone to wind erosion require a vegetation cover to reduce or eliminate the impacts of blowing soils. Providing water for native plants may allow weeds to grow, potentially providing food and habitat value for wildlife, but also potentially requiring the increased use of pesticides on adjacent farmlands to control weeds, insects, and crop diseases. Also, uncultivated areas covered with cover crops can become fire hazards.

Water Erosion. There are several types of water-based soil erosion, including sheet, splash, and rill/gully erosion. Some factors that influence the erodibility of soils include land slope, 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 less. Based on this factor alone, terrace and upland soils would be more susceptible to water erosion than soils on the valley floor.

Soil Salinity and Chemical Composition. Soil salinity problems occur primarily in the western and southern portions of the San Joaquin Valley. Most soils in this region are derived from marine sediments of the Coast Range, which contain salts and potentially trace elements such as arsenic, boron, molybdenum, and selenium. Soil salinity problems in the San Joaquin Valley 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 selenium is primarily a concern on the west side of the San Joaquin Valley. When the soils on the west side are irrigated, selenium and other salts and trace elements dissolve and leach into the shallow groundwater. Soils derived from the Sierra Nevada on the east side of the valley are less salty and contain much less selenium. Over the past 30 to 40 years of irrigation, soluble selenium has been leached from the soils into shallow groundwater. Reclamation and local water supply agencies are working to minimize the impacts of salinity and selenium on agricultural activities and the water quality of groundwater and surface waters.

Environmental Consequences

The effects of Alternatives 1A, 1B, 2A, and 2B on soils are compared to conditions under the No Action Alternative. Environmental consequences to soils are primarily related to land use on the soils, erosion, and soil salinity.

No Action Alternative. The No Action Alternative represents the future conditions without implementation of proposed 2001 M&I Water Shortage Policy under the alternatives. Reduction in the allocations of Irrigation CVP water service contract water could result in an increase in groundwater use, especially in the San Joaquin Valley. During recent droughts when farmers increased groundwater withdrawals in the San Joaquin Valley, soil salinity increased. The high soil salinity persisted for several years until the salts could be leached. Long-term use of increased groundwater with fewer periods when Delta water is used for irrigation could increase soil salinity. Increased frequency of fallowing due to reductions in water supply allocations also will increase the potential for soil and water erosion.

Alternative 1A. Under Alternative 1A, it is anticipated that land use patterns would be identical to the No Action Alternative conditions. It is not anticipated that additional lands would be fallowed due to changes in the allocations of Irrigation CVP water service contracts, although the frequency of fallowing could be increased.

Alternative 1B. Under Alternative 1B, it is anticipated that land use patterns would be identical to the No Action Alternative conditions. It is not anticipated that additional lands would be fallowed due to

changes in the allocations of Irrigation CVP water service contracts, although the frequency of fallowing could be increased.

Alternative 2A. Under Alternative 2A, it is anticipated that land use patterns would be identical to the No Action Alternative conditions. It is not anticipated that additional lands would be fallowed due to changes in the allocations of Irrigation CVP water service contracts, although the frequency of fallowing could be increased.

Alternative 2B. Under Alternative 2B, it is anticipated that land use patterns would be identical to the No Action Alternative conditions. It is not anticipated that additional lands would be fallowed due to changes in the allocations of Irrigation CVP water service contracts, although the frequency of fallowing could be increased.

Cumulative Effects

These alternatives would not result in cumulative adverse impacts to soils when considered in combination with future projects such as water transfer projects or development of other water supplies.

VISUAL RESOURCES

This section describes visual resources for the study area considered in this EA. The description of the Affected Environment has been developed from information presented in the CVPIA PEIS and draft environmental documents prepared by and for Reclamation to support the Long-Term Contract Renewal process.

Affected Environment

Visual resources are the natural and cultural features of the landscape that can be seen and that contribute to the public's appreciative enjoyment of the environment. Visual resources impacts are generally defined in terms of a project's physical characteristics and potential visibility and the extent to which the project's presence would change the perceived visual character and quality of the environment in which it would be located.

Physical form and visual character are the result of the interaction of natural and engineered elements. Natural elements, including topography, hydrology, vegetation, and climate, create the basic physical context. Engineered elements, including buildings, roads, infrastructure, and settlement patterns, are secondary elements that act on the natural context to establish a particular physical or visual environment.

Upper Sacramento Valley (Shasta, Trinity, and Sacramento River Divisions). Shasta County is situated where the Central Valley meets the convergence of the Klamath and Coastal Mountain Ranges to the northwest and west, with the Cascade Mountain Range to the northeast and east. Elevations in Shasta County range between 400 and 700 feet. Coniferous forest is the predominant vegetation in the mountainous regions of the county; in many areas, this cover has been modified by human activities. Shasta County is characterized by a combination of land uses: municipal, industrial, agricultural, and open space. The human-made environment includes urban/suburban and rural residential areas, commercial and industrial areas, transportation networks, water impoundments, and cultivated areas. Many highways in Shasta County are considered scenic highways. Interstate 5 north of the City of Shasta Lake to the Oregon border is a corridor in which the natural environment is dominant. Along this corridor are outstanding views of Shasta Lake, the Sacramento River Canyon, Castle Crags, and Mount Shasta.

The western Sacramento Valley is characterized as predominately lowlands and plains with few hills. This area is mostly agricultural, with areas of wetlands and oaklands, riparian areas along the major watercourses, and numerous small communities throughout the valley. There are no officially designated state or local scenic highways in the western Sacramento Valley. However, State Route 16 in Yolo County approximately 10 miles west of the Dunnigan is eligible for designation because of views of chaparral, woodland, and grassland areas and unusual rock formations.

Lower Sacramento Valley (American River Division). Visual resources in this area range from urbanized areas to agricultural lands, with rivers, creeks, and lakes. The urbanized portion of this area also ranges from downtown areas in Sacramento to many suburban areas. The rural expanse surrounding the urbanized area consists of a landscape involving little visual diversity but a distinctly agricultural character typical of the region. Views of the Sierra Nevada foothills, rivers that pass through the area provide visual interest. Human-made features include roadways, railroad lines, high voltage transmission line corridors, and the Folsom South Canal.

Folsom Lake, a man-made reservoir consisting of nearly 75 miles of shoreline, is a significant visual entity that contrasts sharply with the foothill landscape, creating a vivid landscape. Reservoir levels are drawn down as summer progresses creating a ring of bare soil along the water's edge. This ring is a dominant negative visual feature, affecting the visual quality of the area, and is accentuated in dry years. Folsom Lake is generally considered to provide a pleasing visual setting. Views of Folsom Lake have become increasingly limited due to restricted access and residential development abutting public lands and recreation areas.

Lake Natoma, the regulating reservoir for releases from Folsom Dam, is a long, narrow lake. Land surrounding the lake is mostly undeveloped and consists primarily of wooded and undeveloped canyon areas, sheer bluffs, and dredge tailings (cobble piles remaining from the gold mining era).

The foothill areas of Placer and El Dorado counties provide a diverse physical and natural environment and exhibits variety in its visual resources. Landscapes include urban areas, small unincorporated communities, timber production and mineral extraction areas, agricultural preserves (lands under Williamson Act contract), areas for preservation of natural resources, recreation areas such as the Granite Chief Wilderness, the Folsom Lake State Recreation Area, and the Auburn State Recreation Area; U.S. Forest Service lands, and Bureau of Land Management lands.

Northern and Central San Joaquin Valley (Eastside, Delta, and West San Joaquin Divisions). The San Joaquin Valley is lowland with predominantly flat and gently sloping terrain bordered by hills and low mountains. The valley is semi-arid to arid, and few natural lakes of perennial streams are present. The San Joaquin River is the principal water feature. A number of wetlands used as wildlife refuges are located in the region. The valley area is developed predominantly for agriculture. It is sparsely to moderately populated with several major urbanized areas, such as Tracy and Stockton.

CVP facilities include the New Melones, San Luis, Los Banos, and Little Panoche reservoirs; O'Neill Forebay, and the Delta-Mendota, San Luis, and Coalinga canals. The reservoirs provide areas with significant views. The landscape in other area is considered common scenic to minimal scenic quality. The areas surrounding the San Luis Unit and Delta-Mendota Canal are predominantly of minimal scenic quality, with some areas of common scenic quality.

Interstate 5 provides panoramic view opportunities in some of the Delta-Mendota Canal Unit, some segments of which are designated scenic highways. Views of the Delta- Mendota Canal and California Aqueduct are the basis for the designation of Interstate 5 as a scenic highway. Similarly, views of San Luis Reservoir are important reasons for State Route 152 being designated a scenic highway.

Wildlife refuges in the region near the San Luis and Delta-Mendota Canal Units are considered to have landscape variety that ranges from common scenic to distinctive scenic quality. These areas provide visual contrast with surrounding agricultural lands primarily because of their vegetation and water. The scenic quality is enhanced seasonally by the large numbers and variety of waterfowl and seasonal wildflower displays, which attract substantial visitation, thereby increasing the viewer sensitivity of the area.

San Francisco Bay Area (Delta, American, and San Felipe Divisions). Topography in the San Francisco Bay area ranges in topography from sea level to the foothills with elevations of 1,500 feet and higher. This provides a diverse physical and natural environment and a wide range of visual resources. Typical views and landscapes include existing urban development, natural and altered open-space areas, open-space corridors, major ridgelines, and scenic waterways. The terrain ranges from the bay plain to the gently sloping hills and wooded ravines. The service area has smaller, localized scenic resources such as isolated hilltops, rock outcroppings, mature stands of trees, lakes, reservoirs, and other natural features. A mix of older and newer developments characterizes the urban areas. Locations in the urban areas that provide visual opportunities include the many ridgelines, knolls, canyons, hillsides, and watershed areas surrounding the communities. City parks and recreation areas, community-wide parks, open-space areas adjacent to ravines, golf courses, and resource preserves also provide visual opportunities for these urban areas.

The landscape also includes the urbanized shoreline along San Francisco Bay. The water system of San Francisco, San Pablo, and Suisun Bays are major scenic resources in the area. The waterway system provides a pleasant contrast to the land forms of the area. Where the water reaches the shoreline, a mix of land uses occur: salt marshes, railroad tracks, industrial activities, housing, and parkland. All of these uses add to the diversity and interest of the shoreline. There are many localized scenic features in the county, including scenic ridges, isolated hillsides and hilltops, rock outcroppings, mature stands of trees, lakes, reservoirs, and other natural features. State-designated scenic routes occur within Contra Costa, Alameda, Santa Clara, and San Benito counties.

Environmental Consequences

The effects of Alternatives 1A, 1B, 2A, and 2B on visual resources are compared to conditions under the No Action Alternative. Environmental consequences to visual resources are primarily related to disturbances of the land and land uses.

No Action Alternative. The No Action Alternative represents the future conditions without implementation of the M&I Water Shortage Policy under the alternatives. Projected land use changes would result in additional agricultural lands either being converted to municipal uses or more frequently fallowed due to reduced water supply allocations. The related changes in visual resources have been addressed in local general plans and associated environmental documentation.

Alternative 1A. Under Alternative 1A, it is anticipated that land use patterns would be identical to the No Action Alternative conditions. Therefore, it is anticipated that visual resources under this alternative would be similar to those described under the No Action Alternative, and there would be no impacts.

Alternative 1B. Under Alternative 1B, it is anticipated that land use patterns would be identical to the No Action Alternative conditions. Therefore, it is anticipated that visual resources under this alternative would be similar to those described under the No Action Alternative, and there would be no impacts.

Alternative 2A. Under Alternative 2A, it is anticipated that land use patterns would be identical to the No Action Alternative conditions. Therefore, it is anticipated that visual resources under this alternative would be similar to those described under the No Action Alternative, and there would be no impacts.

Alternative 2B. Under Alternative 2B, it is anticipated that land use patterns would be identical to the No Action Alternative conditions. Therefore, it is anticipated that visual resources under this alternative would be similar to those described under the No Action Alternative, and there would be no impacts.

Cumulative Effects

These alternatives would not result in cumulative adverse impacts to visual resources when considered in combination with future projects such as water transfer projects or development of other water supplies.

POWER RESOURCES

This section describes power resources conditions for the study area considered in this EA.

Affected Environment

CVP facilities were constructed and are operated under Reclamation Law and the authorizing legislation for each facility. Initially, Reclamation projects were authorized solely for irrigation and reclamation. Reclamation Law was amended to include power as a purpose of the projects if power was necessary for operation of the irrigation water supply facilities, or if power could be developed economically in conjunction with the water supply projects. Subsequently, Reclamation Law was amended to also allow leasing of surplus power for Preference Power Customers. Surplus power is described as power that exceeds the capacity and energy required to operate the Reclamation facilities (Project Use Load). Preference Power Customers include irrigation and reclamation districts, cooperatives, public utility districts, municipalities, California educational and penal institutions, and Federal defense and other institutions. Preference Power Customers also include “first preference” customers which have priority over other preference contractors, such as customers in Trinity, Calaveras, and Tuolumne counties.

Western Area Power Administration (Western) was established as part of the Department of Energy to operate, maintain, and upgrade the transmission grid that was constructed by the CVP. As part of their marketing function, Western ensures that CVP Project Use loads are met at all times by using a mix of generation resources including CVP generation and other purchased resources. Western also dispatches and markets power surplus to the CVP project needs to preference power customers and other utilities. The CVP power generation facilities were initially developed based on the premise that power could be generated to meet Project Use loads. Currently, Project Use demand uses on average approximately 25 to 30 percent of the power generated by the CVP.

The CVP power facilities include 11 hydroelectric powerplants with 38 generators, and have a total maximum generating capacity of 2,045,000 kilowatts (kW). Major factors that influence powerplant operations include required downstream water releases, electric system needs, and Project Use demand. CVP powerplants have produced an average of 4,800,000 kWh per year over the last 15 years.

Historically, power generation from CVP hydropower facilities has fluctuated significantly in response to reservoir releases. Reservoir releases are significantly affected by droughts, minimum streamflow requirements, flow fluctuation restrictions, and water quality requirements. Changes in CVP operations to meet water quality requirements have also impacted the monthly release patterns and resulting power generation at all CVP hydroelectric generation facilities. Historically, maximum releases from CVP facilities occurred during the summer months in periods of high irrigation water demand, which correspond to the peak power load periods in the area served by CVP generation. Recent water quality

requirements have increased the need for water releases in the winter and spring months, reducing the amount of water available for release during the peak summer months. Consequently, peak generation during the summer period has been reduced and power generation in other months has been increased. Generation patterns may not coincide with power loads.

Environmental Consequences

The effects of Alternatives 1A, 1B, 2A, and 2B on power resources are compared to conditions under the No Action Alternative. Environmental consequences are primarily related to changes monthly on- and off-peak Project Use capacity and energy.

No Action Alternative. The No Action Alternative represents the future conditions without implementation of the September 2001 Draft CVP M&I Water Shortage Policy. Projected CVP water supply allocations and related power generation projections are described as in the OCAP 2004 model runs developed for the 2020 conditions.

Alternative 1A. Total CVP water use would be the same in this alternative as under the No Action Alternative. Use of more water for M&I uses as compared to agricultural uses increases deliveries during winter months. However, the highest M&I water demand occurs during the late summer months when peak power demand is highest. Therefore, the power generation potential under this alternative would be comparable to conditions under the No Action Alternative, and there would be no impacts.

Alternative 1B. Total CVP water use would be the same in this alternative as under the No Action Alternative. Use of more water for M&I uses as compared to agricultural uses increases deliveries during winter months. However, the highest M&I water demand occurs during the late summer months when peak power demand is highest. Therefore, the power generation potential under this alternative would be comparable to conditions under the No Action Alternative, and there would be no impacts.

Alternative 2A. Total CVP water use would be the same in this alternative as under the No Action Alternative. Use of more water for M&I uses as compared to agricultural uses increases deliveries during winter months. However, the highest M&I water demand occurs during the late summer months when peak power demand is highest. Therefore, the power generation potential under this alternative would be comparable to conditions under the No Action Alternative, and there would be no impacts.

Alternative 2B. Total CVP water use would be the same in this alternative as under the No Action Alternative. Use of more water for M&I uses as compared to agricultural uses increases deliveries during winter months. However, the highest M&I water demand occurs during the late summer months when peak power demand is highest. Therefore, the power generation potential under this alternative would be comparable to conditions under the No Action Alternative, and there would be no impacts.

Cumulative Effects

These alternatives would not result in cumulative adverse impacts to power resources when considered in combination with future projects such as water transfer projects or development of other water supplies.

SOCIAL CONDITIONS

This section describes social conditions for the study area considered in this EA.

Affected Environment

The Affected Environment is defined by the description of population, housing, and employment, and income using information from the California Department of Finance, California Economic Development Department, and the U.S. Census Bureau. The information is presented using county-wide data and therefore, may not necessarily be indicative of conditions within water service contractors' service areas. However, county-wide information presents the regional social conditions which need to be considered for an overall analysis of social conditions.

Population estimates and projections through 2030 were developed using information from the California Department of Finance, California Economic Development Department, as summarized in Table 5-23. Housing information was prepared using information from the U.S. Census Bureau, as summarized in Table 5-24. Employment information was prepared using information from the California Economic Development Department, as summarized in Table 5-25. Income information was developed using information from the U.S. Census Bureau, as summarized in Table 5-26.

All of the counties considered in this EA are projecting absolute growth rates in this period of 7 to 19 percent. The highest rate of change is in the Delta and West San Joaquin divisions. This change is primarily caused by the development of bedroom communities for workers in the San Francisco Bay Area and the continued development of communities located along the State Highway 99 corridor between Sacramento and Fresno. This development will result in a loss of agricultural development as lands are converted to municipal uses.

Environmental Consequences

The effects of Alternatives 1A, 1B, 2A, and 2B on social conditions are compared to conditions under the No Action Alternative. Environmental consequences are primarily related to changes in M&I and agricultural economics.

No Action Alternative. The No Action Alternative represents the future conditions without implementation of the M&I Water Shortage Policy under the alternatives. Projected land use changes would result in additional agricultural lands more frequently fallowed due to reduced water supply allocations. These changes could increase M&I employment and reduce agricultural employment. These changes may not necessarily occur simultaneously and therefore, higher unemployment may occur on an interim basis in a localized region, especially in the rural counties that have high agricultural employment.

Alternative 1A. Under Alternative 1A, it is anticipated that land use patterns would be identical to the No Action Alternative conditions. However, the slight reduction in the availability of Irrigation CVP Water service contract water in drier years could result in higher unemployment and lower income in the rural counties and higher employment and incomes within M&I CVP water service contractors service area due to increased water allocations in drier years. This alternative does not support additional growth over values included in the No Action Alternative, but may provide more certainty for industrial and commercial water users.

TABLE 5-23

POPULATION ESTIMATES AND PROJECTIONS BY COUNTY

County	C VP Division	2003	2010	2020	2030
Shasta	Shasta and Trinity	167,500	196,464	227,922	260,160
Tehama	Sacramento River	57,900	62,442	68,323	74,171
Glenn	Sacramento River	27,400	29,348	31,950	34,379
Colusa	Sacramento River	19,750	22,697	26,337	29,353
Sacramento	American River	1,311,700	1,555,848	1,946,679	2,293,028
Placer	American River	283,500	349,113	456,040	544,690
El Dorado	American River	165,900	188,471	221,289	250,173
Stanislaus	Eastside and Delta	483,000	559,051	653,841	744,599
San Joaquin	Delta	616,500	747,149	989,462	744,599
Merced	Delta and West San Joaquin	227,000	277,715	360,831	437,880
Fresno	Delta and West San Joaquin	845,600	949,961	1,114,654	1,297,476
Kings	Delta and West San Joaquin	137,400	156,334	184,751	223,767
Contra Costa	American River and Delta	992,700	1,116,298	1,327,081	1,543,053
Alameda	American River	1,487,700	1,651,164	1,864,145	2,038,482
Santa Clara	San Felipe	1,719,500	1,844,146	2,006,992	2,152,963
San Benito	San Felipe	56,300	62,530	73,547	84,727
TOTALS		8,599,350	9,768,731	11,553,844	12,753,500

TABLE 5-24

HOUSING TYPES IN YEAR 2000 BY COUNTY

County	C VP Division	No. of Single-Family	No. of Multi-Family	No. of Mobile Home	Vacancy Rate	Median Monthly Rent	Median House Value
Shasta	Shasta and Trinity	48,162	10,622	10,610	7.8%	$404	$112,900
Tehama	Sacramento River	14,760	2,805	6,134	10.8%	$398	$97,000
Glenn	Sacramento River	7,190	1,418	1,404	8.1%	$330	$97,800
Colusa	Sacramento River	5,291	783	737	10.0%	$398	$111,000
Sacramento	American River	333,421	131,592	15,484	4.4%	$592	$141,100
Placer	American River	88,534	17,501	4,693	12.2%	$952	$213,900
El Dorado	American River	59,499	8,367	4,373	17.3%	$591	$191,500
Stanislaus	Eastside and Delta	118,841	25,939	8,482	3.8%	$531	$123,900
San Joaquin	Delta	143,591	39,435	9,242	4.0%	$491	$139,800
Merced	Delta and West San Joaquin	51,451	12,633	5,307	6.7%	$394	$110,900
Fresno	Delta and West San Joaquin	187,511	72,130	13,344	6.6%	$411	$102,600
Kings	Delta and West San Joaquin	27,719	6,950	2,092	5.8%	$436	$96,500
Contra Costa	American River and Delta	264,120	85,331	7,572	3.0%	$879	$253,800
Alameda	American River	331,724	204,425	7,650	3.0%	$833	$291,900
Santa Clara	San Felipe	13,891	1,951	874	3.7%	$715	$283,900
San Benito	San Felipe	378,664	185,841	19,658	2.3%	$1,405	$422,600
TOTALS		2,074,369	807,723	117,656	Not Applicable	$9,760	$2,791,100

TABLE 5-25

EMPLOYMENT IN YEAR 2003 BY COUNTY

County	C VP Division	Civilian Labor Force	Agricultural Employment	Total Employment	Rate of Unemployment
Shasta	Shasta and Trinity	81,900	800	65,100	7.8%
Tehama	Sacramento River	27,390	1,220	17,650	7.2%
Glenn	Sacramento River	9,840	1,260	7,110	12.7%
Colusa	Sacramento River	8,690	7,240	2,070	18.9%
Sacramento	American River	650,000	2,500	581,300	5.6%
Placer	American River	141,600	600	126,400	4.7%
El Dorado	American River	82,600	300	48,200	5.4%
Stanislaus	Eastside and Delta	216,700	13,500	165,500	11.5%
San Joaquin	Delta	279,000	16,500	214,100	10.1%
Merced	Delta and West San Joaquin	89,800	10,600	66,100	14.8%
Fresno	Delta and West San Joaquin	456,200	53,800	368,700	14.0%
Kings	Delta and West San Joaquin	49,200	39,700	7,300	14.6%
Contra Costa	American River and Delta	517,700	2,100	336,300	5.5%
Alameda	American River	750,300	600	691,100	6.8%
Santa Clara	San Felipe	895,100	4,200	858,400	8.2%
San Benito	San Felipe	28,980	2,360	15,750	9.6%
TOTALS		4,285,000	157,280	3,571,080	Not Applicable

TABLE 5-26

INCOME IN YEAR 1999 BY COUNTY

County	C VP Division	Per Capita Income/Year	Median Household Income/Year	Poverty Rate
Shasta	Shasta and Trinity	$17,738	$34,335	15%
Tehama	Sacramento River	$15,793	$31,206	17%
Glenn	Sacramento River	$14,069	$32,107	18%
Colusa	Sacramento River	$14,730	$35,062	16%
Sacramento	American River	$21,142	$43,816	14%
Placer	American River	$27,963	$57,535	6%
El Dorado	American River	$25,560	$51,484	7%
Stanislaus	Eastside and Delta	$16,913	$40,101	16%
San Joaquin	Delta	$17,365	$41,282	18%
Merced	Delta and West San Joaquin	$14,257	$35,532	33%
Fresno	Delta and West San Joaquin	$15,495	$34,725	23%
Kings	Delta and West San Joaquin	$15,848	$35,532	22%
Contra Costa	American River and Delta	$30,615	$63,675	8%
Alameda	American River	$26,680	$55,946	11%
Santa Clara	San Felipe	$32,795	$74,335	8%
San Benito	San Felipe	$20,932	$57,469	10%
TOTALS		$327,895	$724,142	Not Applicable

Alternative 1B. Under Alternative 1B, it is anticipated that land use patterns would be identical to the No Action Alternative conditions. However, the slight reduction in the availability of Irrigation CVP Water service contract water in drier years could result in higher unemployment and lower income in the rural counties and higher employment and incomes within M&I CVP water service contractors service area due increased water allocations in drier years. This alternative does not support additional growth over values included in the No Action Alternative, but may provide more certainty for industrial and commercial water users.

Alternative 2A. Under Alternative 2A, it is anticipated that land use patterns would be identical to the No Action Alternative conditions. However, the slight reduction in the availability of Irrigation CVP Water service contract water in drier years could result in higher unemployment and lower income in the rural counties and higher employment and incomes within M&I CVP water service contractors service area due increased water allocations in drier years. This alternative does not support additional growth over values included in the No Action Alternative, but may provide more certainty for industrial and commercial water users.

Alternative 2B. Under Alternative 2B, it is anticipated that land use patterns would be identical to the No Action Alternative conditions. However, the slight reduction in the availability of Irrigation CVP Water service contract water in drier years could result in higher unemployment and lower income in the rural counties and higher employment and incomes within M&I CVP water service contractors service area due increased water allocations in drier years. This alternative does not support additional growth over values included in the No Action Alternative, but may provide more certainty for industrial and commercial water users.

Cumulative Effects

Alternatives 1A and 1B would not result in cumulative adverse impacts when considered in combination with future projects. Issues of reduced CVP irrigation deliveries, alternative water supplies, and water transfers were evaluated as part of the CVPIA PEIS and environmental evaluations prepared to support the Long-term Contract Renewal process. The CVPIA PEIS indicated that future projects may alter CVP water supply allocations, but not change long term CVP Contract Totals or deliveries from within historical ranges. However, Alternatives 2A and 2B with full implementation of the second tier water supply by M&I CVP water service contractors could add an additional four years where agricultural contractors would receive zero CVP irrigation deliveries. This could result in employment and income changes in agricultural areas. However, Alternatives 2A and 2B could increase reliability of employment in municipal areas that rely upon CVP water supplies.

ENVIRONMENTAL JUSTICE

The concept of environmental justice embraces two principles: (1) fair treatment of all people regardless of race, color, nation of origin, or income and (2) meaningful involvement of people in communities potentially affected by program actions. Executive Order 12898, Section 2-2, signed by the President in 1994, requires all Federal agencies to conduct “programs, policies, and activities that substantially affect human health or the environment, in a manner that ensures that such programs, policies, and activities do not have the effect of excluding persons (including populations) from participation in, denying persons the benefits of, or subjecting persons to discrimination because of their race, color or national origin”. Section 1-101 requires Federal agencies to identify and address, as appropriate, “disproportionately high and adverse human health or environmental effects” of programs on minority and low-income populations. This section describes environmental justice conditions for the study area considered in this EA.

Affected Environment

Minority populations included in the California Department of Finance databases are identified as Hispanic, Asian or Pacific Islander, Black, American Indian, or Multirace. The U.S. Census treats Hispanic as an ethnic designation such that an ethnically Hispanic person may be included in a race category and in the Hispanic category. This can result in the double counting of some individuals. The California Department of Finance avoids double counting by treating Hispanic as a unique category. That is if a person identifies himself or herself as Hispanic, he or she is placed in that category and no other. Therefore the percentage of each group with respect to total population will sum to 100 percent. Racial and ethnic distribution within the counties in the study area as defined by the California Department of Finance are summarized in Table 5-27. It should be noted that several counties are located in two CVP divisions.

Environmental Consequences

The effects of Alternatives 1A, 1B, 2A, and 2B on environmental justice conditions are compared to conditions under the No Action Alternative. Environmental consequences are primarily related to changes in M&I and agricultural employment.

No Action Alternative. The No Action Alternative represents the future conditions without implementation of proposed 2001 M&I Water Shortage Policy under the alternatives. Projected land use changes would result in additional agricultural lands more frequently fallowed due to reduced water supply allocations. These changes could increase M&I employment and reduce agricultural employment. These changes may not necessarily occur simultaneously and therefore, higher unemployment may occur on an interim basis in a localized region, especially in the rural counties that have high agricultural employment.

Alternative 1A. Under Alternative 1A, it is anticipated that land use patterns would be identical to the No Action Alternative conditions. However, the slight reduction in the availability of Irrigation CVP Water service contract water in drier years could result in higher unemployment and lower income in the rural counties and higher employment and incomes within M&I CVP water service contractors service area due increased water allocations in drier years. This alternative does not support additional growth over values included in the No Action Alternative, but may provide more certainty for industrial and commercial water users.

Alternative 1B. Under Alternative 1B, it is anticipated that land use patterns would be identical to the No Action Alternative conditions. However, the slight reduction in the availability of Irrigation CVP Water service contract water in drier years could result in higher unemployment and lower income in the rural counties and higher employment and incomes within M&I CVP water service contractors service area due increased water allocations in drier years. This alternative does not support additional growth over values included in the No Action Alternative, but may provide more certainty for industrial and commercial water users.

Alternative 2A. Under Alternative 2A, it is anticipated that land use patterns would be identical to the No Action Alternative conditions. However, the slight reduction in the availability of Irrigation CVP Water service contract water in drier years could result in higher unemployment and lower income in the rural counties and higher employment and incomes within M&I CVP water service contractors service area due increased water allocations in drier years. This alternative does not support additional growth over values included in the No Action Alternative, but may provide more certainty for industrial and commercial water users.

TABLE 5-27

ETHNICITY BY COUNTY

County	CVP Divisions	Year	White	Hispanic	Asian and Pacific Islander	Black	American Indian	Multi-Race	Total
Shasta	Shasta and Trinity	2000	142,087	9,355	3,440	1,311	4,426	4,129	164,748
		2010	149,337	18,604	6,407	3,519	13,570	5,027	196,464
		2020	151,530	30,427	9,821	5,989	24,365	5,790	227,922
		2030	150,735	44,216	13,807	8,731	36,251	6,420	260,160
Tehama	Sacramento River	2000	44,018	8,947	513	320	1,055	1,189	56,042
		2010	44,566	13,313	821	459	1,869	1,414	62,442
		2020	43,296	18,939	1,114	585	2,783	1,606	68,323
		2030	41,584	25,138	1,394	726	3,592	1,737	74,171
Glenn	Sacramento River	2000	16,716	7,931	1,006	137	475	453	26,718
		2010	16,898	9,959	1,248	169	508	566	29,348
		2020	16,962	12,112	1,468	189	549	670	31,950
		2030	18,047	13,141	1,655	187	578	771	34,379
Colusa	Sacramento River	2000	9,007	8,844	358	103	362	249	18,923
		2010	8,745	12,595	443	102	491	321	22,697
		2020	8,640	16,030	525	97	640	405	26,337
		2030	8,704	18,707	579	91	782	490	29,353
Sacramento	American River	2000	713,744	199,516	147,008	120,820	9,987	39,390	1,230,465
		2010	680,646	349,014	247,683	187,057	41,354	50,094	1,555,848
		2020	670,563	512,027	350,322	271,318	82,825	59,624	1,946,679
		2030	656,975	661,199	440,854	347,006	117,732	69,262	2,293,028
Placer	American River	2000	208,741	24,337	7,775	1,980	1,723	4,915	249,471
		2010	278,574	38,036	14,757	7,117	4,114	6,515	349,113
		2020	349,421	53,579	24,439	12,470	7,854	8,277	456,040
		2030	404,278	68,696	33,263	17,041	11,263	10,149	544,690
El Dorado	American River	2000	134,626	15,044	3,706	833	1,459	2,902	158,570
		2010	152,024	21,955	6,144	1,445	3,249	3,654	188,471
		2020	169,678	30,775	8,831	2,260	5,356	4,389	221,289
		2030	182,523	40,602	11,509	3,133	7,360	5,046	250,173
Stanislaus	Eastside and Delta	2000	260,078	144,321	21,148	11,065	3,829	9,336	449,777
		2010	266,122	223,800	27,699	19,404	9,749	12,277	559,051
		2020	277,764	290,031	32,098	24,208	14,718	15,022	653,841
		2030	283,780	359,512	35,368	28,682	19,523	17,734	744,599
San Joaquin	Delta	2000	270,630	175,488	67,099	37,380	3,691	13,510	567,798
		2010	282,985	283,008	85,549	63,532	14,348	17,727	747,149
		2020	292,440	448,371	120,639	81,349	25,139	21,524	989,462
		2030	308,073	616,678	150,655	98,325	30,727	25,299	1,229,757

TABLE 5-27

ETHNICITY BY COUNTY

County	CVP Divisions	Year	White	Hispanic	Asian and Pacific Islander	Black	American Indian	Multi-Race	Total
Merced	Delta and West San Joaquin	2000	87,130	96,265	15,043	7,736	1,186	3,516	210,876
		2010	101,418	144,014	16,436	8,479	2,297	5,071	277,715
		2020	125,411	195,873	19,795	9,470	3,441	6,841	360,831
		2030	142,669	249,045	22,747	10,151	4,496	8,772	437,880
Fresno	Delta and West San Joaquin	2000	321,395	355,912	66,780	41,334	6,755	11,225	803,401
		2010	276,470	514,076	75,435	54,294	15,515	14,171	949,961
		2020	263,563	655,064	85,103	68,858	25,438	16,628	1,114,654
		2030	252,113	809,639	91,841	86,142	38,802	18,939	1,297,476
Contra Costa	American River and Delta	2000	555,747	171,239	110,166	88,534	4,059	24,759	954,504
		2010	515,397	283,455	166,832	108,386	12,199	30,029	1,116,298
		2020	478,508	411,890	243,905	135,078	23,753	33,947	1,327,081
		2030	452,761	536,219	320,073	160,800	35,279	37,921	1,543,053
Alameda	American River	2000	594,970	279,521	316,487	212,061	6,242	41,828	1,451,109
		2010	474,206	409,899	501,475	199,154	15,815	50,615	1,651,164
		2020	455,827	523,434	605,462	201,217	21,564	56,641	1,864,145
		2030	424,596	639,718	682,102	202,783	27,080	62,203	2,038,482
Santa Clara	San Felipe	2000	755,102	409,168	441,098	45,330	5,509	34,976	1,691,183
		2010	738,626	489,144	522,735	43,626	6,775	43,240	1,844,146
		2020	724,491	608,542	573,868	43,526	7,998	48,567	2,006,992
		2030	707,455	743,414	592,244	46,816	8,993	54,041	2,152,963
San Benito	San Felipe	2000	24,995	25,803	1,333	521	308	810	53,770
		2010	27,134	31,942	1,600	600	328	926	62,530
		2020	30,148	39,389	1,980	692	342	996	73,547
		2030	32,798	47,378	2,381	752	346	1,072	84,727

Alternative 2B. Under Alternative 2B, it is anticipated that land use patterns would be identical to the No Action Alternative conditions. However, the slight reduction in the availability of Irrigation CVP Water service contract water in drier years could result in higher unemployment and lower income in the rural counties and higher employment and incomes within M&I CVP water service contractors service area due increased water allocations in drier years. This alternative does not support additional growth over values included in the No Action Alternative, but may provide more certainty for industrial and commercial water users.

Cumulative Effects

Alternatives 1A and 1B would not result in cumulative adverse impacts when considered in combination with future projects. Issues of reduced CVP irrigation deliveries, alternative water supplies, and water transfers were evaluated as part of the CVPIA PEIS and environmental evaluations prepared to support the Long-term Contract Renewal process. The CVPIA PEIS indicated that future projects may alter CVP water supply allocations, but not change long term CVP Contract Totals or deliveries from within historical ranges. However, Alternatives 2A and 2B with full implementation of the second tier water supply by M&I CVP water service contractors could add an additional four years where agricultural contractors would receive zero CVP irrigation deliveries. This could result in employment and income changes in agricultural areas. However, Alternatives 2A and 2B could increase reliability of employment in municipal areas that rely upon CVP water supplies.

SECONDARY GROWTH IMPACTS

A project would not cause a secondary growth impact unless the growth would not occur without the project. For the purpose of this EA, secondary growth effects would need to be evaluated for the alternatives as compared to conditions under the No Action Alternative.

The No Action Alternative assumes continued delivery of CVP water service contract water with full deliveries to M&I CVP water service contracts in 55 of 72 years evaluated in the water supply model simulation. The No Action Alternative provides less allocations than historical CVP water operations due to implementation of environmental protections and CVPIA.

None of the alternatives increase the amount of water provided by the CVP water service contracts or the amount of water provided in years with 100 percent allocations. Population and land use projections developed by municipal agencies are generally based upon full water service Contract Totals with an assumption of water conservation during drier times. The alternatives considered in this EA will reduce the hardship associated with reductions of 25 to 50 percent of total M&I CVP water service contract water allocations (i.e., 75 to 50 percent allocations). None of these alternatives would affect reductions in water demand from zero to 25 percent (i.e., 100 to 75 percent allocations). The alternatives do not involve any construction, enlargement, or alteration of facilities in the CVP service area. Therefore, it is not foreseen that the alternatives would lead to an increase in growth or secondary growth impacts as compared to the No Action Alternative, and the same level of growth would occur without the project.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

NEPA Section 102(C)(v) requires federal agencies to consider to the fullest extent possible irreversible and irretrievable commitments of resources that would be involved in the proposed action should it be implemented. The alternatives considered in this EA do not involve construction or use of resources except water. There is no commitment of nonrenewable resources, and the alternatives would not commit future generations to permanent use of nonrenewable natural resources.

CHAPTER 6
CONSULTATION AND COORDINATION

CHAPTER 6
Consultation and Coordination

INTRODUCTION

Prior to preparation of this EA, input was solicited and incorporated from a broad range of agencies and the public. This chapter summarizes the public involvement program and key issues raised by the public and interest groups. This chapter also addresses the manner in which Federal statutes, implementing regulations, and executive orders potentially applicable to implementation of the CVPIA have been addressed. The conclusions of compliance are based on the Environmental Consequences presented in Chapter 5. The compliance summaries apply only to the alternatives discussed in this EA and not the development of concurrent CVPIA implementation programs.

PUBLIC INVOLVEMENT

Reclamation considered a wide range of alternatives through a public process that started in 1993, as described in Chapter 2 of this EA. Public input continued during long-term contract negotiations and the Administrative Proposal process, and through public workshops and public notice and comment, in order to define the alternatives. The Draft EA also is to undergo public review with the response to comments in the Final EA.

CONSULTATION WITH OTHER AGENCIES

This EA was prepared in accordance with the policies and regulations for the following issues. Brief discussions of these issues and how compliance was addressed in this EA is discussed in the remaining sections of this chapter.

- National Environmental Policy Act
- California Environmental Quality Act
- Endangered Species Act
- Fish and Wildlife Coordination Act
- National Historic Preservation Act
- Indian Trust Assets
- Indian Sacred Sites on Federal Land
- Environmental Justice
- State, Area-wide, and Local Plan and Program Consistency
- Floodplain Management
- Wetlands Protection
- Wild and Scenic Rivers Act
- Farmland Protection Policy Act and Farmland Preservation
- Clean Air Act
- Safe Drinking Water Act
- Clean Water Act

National Environmental Policy Act

This EA was prepared pursuant to regulations implementing the National Environmental Policy Act (NEPA) (42 USC 4321 *et seq.*). NEPA provides a commitment that Federal agencies will consider the environmental effects of their actions. This EA provides information regarding the No Action Alternative and alternatives, and environmental impacts of the alternatives.

California Environmental Quality Act

Implementation, funding and permitting actions carried out by State and local agencies must comply with the California Environmental Quality Act (CEQA). The CEQA requirements are similar to NEPA requirements. This EA could be used as a basis for preparation of a CEQA document.

Endangered Species Act

The description of the biological resources as presented in Chapter 5 provides information that would be required for a biological assessment to determine if the preferred alternative will affect listed, threatened, and endangered species. The analysis addresses all species affected by alternatives considered for the M&I Water Shortage Policy. Reclamation will complete required compliance activities pursuant to the ESA prior to any final decisions on implementing any alternative.

Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act (FWCA) requires that Reclamation consult with fish and wildlife agencies (federal and state) 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 by Reclamation and the Service and is being jointly implemented. This continuous consultation and consideration of the views of the Service in addition to their review of this document and consideration of their comments satisfies any applicable requirements of the FWCA.

National Historic Preservation Act

Section 106 of the National Historic Preservation Act (NHPA) requires that Federal agencies evaluate the effects of Federal undertakings on historical, archeological, and cultural resources and afford the Advisory Council on Historic Preservation opportunities to comment on the proposed undertaking. The first step in the process is to identify cultural resources included on (or eligible for inclusion on) 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 proposed actions. The lead agency must examine whether feasible alternatives exist that would avoid such effects. If an effect cannot reasonably be avoided, measures must be taken to minimize or mitigate potential adverse effects.

During preparation of this EA, information from the State Clearinghouse was collected. This project does not include construction activities. Related activities approved by local planning agencies must undergo separate evaluation as part of CEQA and permitting processes.

Indian Trust Assets

The United States Government's trust responsibility for Indian resources requires Reclamation and other agencies to take measures to protect and maintain trust resources. These responsibilities include taking reasonable actions to preserve and restore tribal resources. ITAs are legal interests in property and rights held in trust by the United States for Indian tribes or individuals. Indian reservations, rancherias, and allotments are common ITAs, as described in Chapter 5.

Indian Sacred Sites on Federal Land

Executive Order 13007 provides that in managing Federal lands, each Federal agency with statutory or administrative responsibility for management of Federal 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 such sacred sites. During preparation of EA, it was determined based upon information provided in other Reclamation studies, that no Indian Sacred Sites would be affected by the alternatives.

Environmental Justice

Executive Order 12898 requires each Federal agency to achieve environmental justice as part of its mission, by identifying and addressing disproportionately high and adverse human health or environmental effects, including social or economic effects, of programs, policies, and activities on minority populations and low-income populations of the United States. This EA has evaluated the environmental, social, and economic impacts on minority and low-income populations in the impact assessment of alternatives, as described in Chapter 5.

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 EA was prepared with extensive information from local planning agencies.

Floodplain Management

If a Federal agency program will affect a floodplain, the agency must consider alternatives to avoid adverse effects in the flood plain 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 alternatives would not affect floodplain management, as described in Chapter 5.

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 the public health, safety, and welfare due to modifications in water supply and water quality; maintenance of natural ecosystems and conservation of flora and fauna; and other recreational, scientific, and cultural uses. The alternatives would not affect wetlands, as described in Chapter 5.

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, as well as rivers designated on the National Rivers Inventory. Under the Act, a Federal agency may not assist the construction of a water resources project that would have a direct and 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.

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. These policies are 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 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 for nonagricultural purposes. 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 National Resource Conservation Agency is the federal agency responsible for ensuring that these laws and polices are followed. The alternatives would not affect the ability to use agricultural or urban lands as compared to the No Action Alternative, as described in Chapter 5.

Clean Air Act

The Federal Clean Air Act (CAA) 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 CAA 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 as well as with the EPA. This coordination would determine whether the project conforms to the Federal Implementation Plan and the State Implementation Plan (SIP).

Section 176 of the CAA (42 U.S.C. Section 7506(c)) prohibits federal agencies from engaging in or supporting in any way an action or activity that does not conform to an applicable SIP. Actions and activities must conform to a SIP'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. EPA promulgated conformity regulations (codified in 40 CFR Section 93.150 et seq.).

The alternatives assume that current practices to control dust and soil erosion on lands that are seasonally fallowed, as described as part of the Preferred Alternative in the CVPIA PEIS, would continue and the land use agencies would continue to work with the air quality districts. Therefore, no air quality impacts would occur due to the alternatives as compared to the No Action Alternative, as described in Chapter 5.

Safe Drinking Water Act

The Safe Drinking Water Act (SDWA) (PL 99-339) became law in 1974 and was reauthorized in 1986 and again in August 1996. Through the SDWA, Congress gave the EPA the authority to set standards for

contaminants in drinking water supplies. Amendments to the SDWA 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 and to ensure compliance with drinking water regulations and to support state drinking water program activities.

Under the SDWA provisions, 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 analysis of the EA alternatives as compared to the SDWA requirements indicated that there were no changes in compliance as compared to the No Action Alternative, as described in Chapter 5.

Clean Water Act

The Clean Water Act (CWA) gave the EPA the authority to develop a program to make all waters of the United States "fishable and swimmable." This program has included identifying existing and proposed beneficial uses and methods to protect and/or restore those beneficial uses. The CWA contains many provisions, including provisions that regulate the discharge of pollutants into the water bodies. The discharges may be direct flows from point sources, such as an effluent from a wastewater treatment plant, or a non-point source, such as eroded soil particles from a construction site. The analysis of the EA alternatives as compared to the CWA requirements indicated that there were no changes in compliance as compared to the No Action Alternative, as described in Chapter 5.

ATTACHMENT A
LIST OF PREPARERS

ATTACHMENT A
List of Preparers

Preparers	Degree(s)/Years of Experience	Experience and Expertise	Role in Preparation
U.S. Bureau of Reclamation			
Robert Colella	B.S. Electrical Engineering M.B.A. Management J.D. Seven years experience in water resources management	Water service contracts, water rights	Agency Technical Project Lead Review and editing
David Lewis	B.A., M.A. Economics 13 years experience in economics, 13 years experience in project management	Project management	Contracting Officer's Technical Representative Project management assistance; review and editing
Frank Michny	M.S. Fish and Wildlife Biology 32 years experience	Regional Environmental Officer, NEPA, ESA, fish and wildlife biology	Review and editing
William Shipp	M.Phil Environmental Studies M.S. Environmental Studies M.S. Geology B.S. Geology Thirteen years in water quality and water resources	California certified hydrogeologist and professional geologist.	Review and editing of groundwater section
Frank Perniciaro	B.S. Geological Engineering 10 years experience in ITA issues	Regional Native American Affairs Program Manager	Review and editing of ITA section.
Nancy Parker	B.S. System Science Engineering M.S. Civil Engineering 15 years experience in river and reservoir modeling	Water resources modeling	Technical assistance; review and editing
Lloyd Peterson	B.S. Forest Engineering M.S Engineering 29 years experience	Water resources modeling	Technical assistance; review and editing
Craig Stroh	B.A., M.A. Economics 30 years experience	Economics	Review and editing
Charles Johnson	B.A. Geology M.S. Soil Science	Regional Soil Scientist	Review of soils section
Joel Zander, P.E.	B.S. Agricultural and Irrigation Engineering 20 years experience in water resources management	Water use and management	Review
Cathi Bailey	B.S. Wildland Recreation Management 20 years experience	Outdoor recreation management planning	Review of Recreation section
Tracy Slavin	B.A. Biology M.S. General Agriculture 25 years experience in water resources management	Water conservation and utilization; water management	Review and editing.
Lucille Billingsley	B.A. Sociology 13 years experience in water resources management	Regional Drought Coordinator: Water Conservation Team Leader	Review and editing.
CH2M HILL			
	M.S., Civil-Environmental	Environmental	

Preparers	Degree(s)/Years of Experience	Experience and Expertise	Role in Preparation
Gwendolyn M. Buchholz	Engineering B.S., Physics 28 years	Engineer/Planner	Project Manager
Allan Highstreet	M.S., Agricultural Economics B.S., Agricultural Business Management 22 Years	Agricultural Land Use and Resources Economist	Agricultural Economics and Land Use, Municipal Water Costs
Nancy Lee	Ph.D., Economics, Planning, and Natural Resources M.S., Agricultural Economics B.A., Environmental and Business Economics 8 years	Agricultural Land Use and Resources Economist	Agricultural Economics and Land Use, Municipal Water Costs
Fatuma Yusuf	Ph.D, candidate, Economics M.S., Agricultural Economics B.S., Agricultural Economics 6 years	Agricultural and Resources Economist	Regional Economics, IMPLAN, Municipal Water Costs
Sandra Taylor	M.S./1993/Zoology and Physiology B.A./1989/Biology	Biologist	Biological Resources
Meri Miles	M.S./1993/Fisheries B.S./1988/Biology	Biologist	Biological Resources
Wendy Haydon	M.S./Recreation B.A./Environmental Studies	Planner	Natural, Physical, and Human Resources
Water Resource Economics			
Steve Hatchett	Ph.D., Agricultural Economics M. Admin., Environmental Administration B.S., Forestry 20 Years	Agricultural and Resources Economist	Agricultural Economics

ATTACHMENT B
BIBLIOGRAPHY

ATTACHMENT B
Bibliography

Alameda County Water District, "Urban Water Management Plan, 2001-2005," 2000

Albuquerque, City of , "Evaluation of Alternatives for the Middle Rio Grande Regional Water Plan, A Technical and Physical Feasibility Fact Sheet, Alternative 18: Urban Conservation"

Avenal, City of, "Projected Water Needs," 2001

California Urban Water Agencies, "Survey of 1991, Drought Management Measures," 1991

Colusa County, Statistics as presented on the web, information dated 1997

Connecticut Water Planning Council, "Connecticut Drought Preparedness and Response Plan: Working Draft," 2003

Contra Costa Water District, "Urban Water Management Plan," 2000

Fresno County, "Fresno County Westside Economic Development Project, Draft Working Document: Economic Assessment of Priority Industries," 2003

GWF Energy LLC, "Tracy Peaker Project AFC Supplement, EIR," 2001

Irving, City of, "Drought Contingency Plan and Water Conservation Plan"

Merced County, "General Plan - Land Use Element"

Merced County Association of Government, "Population Growth Projections," 2001

Pajaro Valley Water Management Agency, "Draft EIR, Broadview Water Contract Assignment Project," 2004

Patterson Irrigation District, "Water/Wastewater Case Study: Patterson Irrigation District"

Peoria, City of, "Drought Contingency Plan," 2003

Redding Area Water Council, "Redding Basin Water Resources Management Plan," 2003

Redding Area Water Council, "Coordinated AB 3030, Groundwater Management Plan for the Redding Groundwater Basin," 1998

Rockland, City of, "Mandatory Water Conservation Measures," 2002

Roseville, City of, "Urban Water Management Plan," 2002

San Benito County, "San Benito County Ground-Water Investigation," 1991

San Benito County, "General Plan and Environmental Impact Report Documentation," 1997

San Benito County Water Agency Advisory Group, "Groundwater Management Plan for the San Benito County Part of the Gilroy-Hollister Groundwater Basin," 1998

Santa Clara Valley Water District, "Urban Water Management Plan," 2001

Santa Clara Valley Water District, "Integrated Water Resources Plan," 2004

Shasta County, "Shasta County General Plan," 1998

Shasta Local Area Formation Commission, "Draft Municipal Services Review" 1999

St. George, City of, "Culinary Water Supply/Shortage and Drought Management Conservation Plan," 2003

Texas Natural Resource Conservation Commission, "Cash Water Supply Corporation, Water Conservation Plan,"

Tracy, City of, "Water Inventory Report," 2003

Tracy, City of, "Water Inventory Report," 2004

Tuolumne County, "General Plan," 1996

Tuolumnes Utilities District, "Urban Water Management Plan, 2000 Update," 2001

U.S. Bureau of Reclamation, "Water Shortage Contingency/Drought Planning Handbook," 2003

U.S. Bureau of Reclamation, Lower Colorado Region, "Achieving Efficient Water Management, A Guidebook for Preparing Municipal Water Conservation Plans," 1997

U.S. Bureau of Reclamation, Mid Pacific Region, letter to City of Shasta Lake, March 31, 1994

U.S. Bureau of Reclamation, Mid Pacific Region, "Environmental Assessment, Central Valley Project Service Area Expansion for City of Shasta Lake," 2002

U.S. Bureau of Reclamation, Mid Pacific Region, "Draft Environmental Assessment, Long-Term Renewal Contract for Delta Division, Contra Costa Canal," and associated Biological Assessment, 2004

U.S. Bureau of Reclamation, Mid Pacific Region, "Draft Environmental Assessment, Long-Term Contract Renewal for Shasta and Trinity River Divisions," and associated Biological Assessment, 2004

U.S. Bureau of Reclamation, Mid Pacific Region, "Draft Environmental Assessment, Long-Term Contract Renewal for Delta-Mendota Canal Unit," and associated Biological Assessment, 2004

U.S. Bureau of Reclamation, Mid Pacific Region, "Draft Environmental Assessment, Long-Term Contract Renewal for Black Butte Unit, Corning Canal Unit, and Tehama-Colusa Canal Unit of the Sacramento River Division ," and associated Biological Assessment, 2004

U.S. Bureau of Reclamation, Mid Pacific Region, "Draft Environmental Impact Statement, Long-Term Contract Renewal for West San Joaquin Division, San Luis Unit," 2005

U.S. Bureau of Reclamation, Mid Pacific Region, "Draft Environmental Impact Statement, Long-Term Contract Renewal for American River Division," 2005

U.S. Bureau of Reclamation, Mid Pacific Region, Information prepared for previous public workshops during the development of the M&I Water Shortage Policy

U.S. Bureau of Reclamation, Mid Pacific Region, "Central Valley Project Ratebooks," 2000-2004

Westlands Water District, "Water Management Plan," 1999

Westlands Water District, "2001 Annual Report," 2002

ATTACHMENT C
ACRONYMS, ABBREVIATIONS, AND METRIC CONVERSIONS

ATTACHMENT C
Acronyms, Abbreviations, and Metric Conversions

ACHP	Advisory Council on Historic Places
AFRP	Anadromous Fisheries Restoration Project
BAAQMD	Bay Area Air Quality Management District
BMP	Best Management Practices
CAA	Clean Air Act
CDFG	California Department of Fish and Game
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CNDDB	California Natural Diversity Database
CO	Carbon Monoxide
COA	Coordinated Operations Agreement
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
CRHP	California Register of Historic places
CWA	Clean Water Act
CWHR	California Wildlife Habitats Relationship System
EA	Environmental Assessment
EFH	Essential Fish Habitat
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
ESU	Evolutionary Significant Unit
EWA	Environmental Water Account
FWCA	Fish and Wildlife Coordination Act
FLPMA	Federal Land Policy and Management Act of 1976
HCP	Habitat Conservation Plan
ITA	Indian Trust Asset
kW	Kilowatt
kWh	Kilowatt-hour
LAFCO	Local Area Formation Commission
LTCR	Long-Term Contract Renewal
M&I	Municipal and Industrial
MSHCP	Multi-Species Habitat Conservation Plan
NCCP	Natural Community Conservation Plan
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NO_2	Nitrogen Dioxide
NOx	Nitrogen Oxides
NRDC	Natural Resources Defense Council
NRHP	National Register Historic Places

NSVAB	North Sacramento Valley Air Basin
NWR	National Wildlife Refuge
OCAP	Operations Criteria and Plan
O_3	Ozone
PG&E	Pacific Gas & Electric Company
PEIS	Programmatic Environmental Impact Statement
PM	Particulate Matter
PL	Public Law
Reclamation	U.S. Bureau of Reclamation
ROD	Record of Decision
ROG	Reactive Organic Gases
SDWA	Safe Drinking Water Act
Secretary	Secretary of the Interior
Service	U.S. Fish and Wildlife Service
SHPO	State Historic Preservation Officer
SJVAB	San Joaquin Valley Air Basin
SIP	State Implementation Plan
SO_2	Sulfur Dioxide
SRA	State Recreation Area
SWP	State Water Project
SWRCB	State Water Resources Control Board
TCD	Temperature Control Device
VAMP	Vernalis Adaptive Management Program
Western	Western Area Power Administration
WQCP	Water Quality Control Plan
°F	degrees Fahrenheit

CONVERSION TABLES

U.S. CUSTOMARY TO METRIC

Multiply	By	To Obtain
inches (in)	25.4	millimeters
inches (in)	2.54	centimeters
feet (ft)	0.3048	meters
miles (mi)	1.609	kilometers
square feet (ft^2)	0.0929	square kilometers
acres (ac)	0.4047	hectares
square miles (mi^2)	2.590	square kilometers
gallons (gal)	3.785	liters
cubic feet (ft^3)	0.02832	cubic meters
acre-feet (af)	1,233.0	cubic meters
pounds (lb)	0.4536	kilograms
tons (ton)	0.9072	metric tons

Temperature in degrees Fahrenheit can be converted to degrees Celsius as follows:
degrees Celsius = 5/9 (degrees Fahrenheit - 32)

OTHER USEFUL CONVERSION FACTORS

Multiply	By	To Obtain
acre-feet	43,560	cubic-feet
acre-feet	325,851	gallons
cubic feet per second	1.9835	acre-feet per day
cubic feet per second	724.0	acre-feet per year

ATTACHMENT D
SUMMARY OF PROJECT EFFECTS ON LISTED SPECIES IN THE STUDY AREA

ATTACHMENT D
SUMMARY OF PROJECT EFFECTS ON LISTED SPECIES IN THE STUDY AREA

An effects summary specific to federally listed species (both aquatic and terrestrial) is presented in this attachment. Unlike the EA, in which all the action alternatives must be compared against a future no project condition, the effects analysis compares the proposed project be evaluated relative to existing conditions. An effect determination has been made for each species potentially affected by the project (e.g., no effect; may affect, not likely to adversely affect; may affect and likely to adversely affect; and whether the project would result in adverse modification of critical habitat.

The proposed action under the M&I Shortage Policy is Alternative 1B. For this effects determination, the analysis is conducted for existing conditions using the "Current" model run used in the OCAP 2004. Under current conditions, the years in which the M&I CVP water service contractor allocations are less than 75 percent and the amount of allocations are different than under the "Future" conditions that were used in the definition of the No Action Alternative. Under current and future conditions, there are 13 of the 72 years considered in the OCAP 2004 CALSIM II model runs that meet the criteria for inclusion in this study. However, the number of years with zero deliveries to Irrigation CVP water service contractors occurs only during 3 years under the existing conditions and for 4 years under the future conditions, as shown in Table D-1.

The primary effect of Alternative 1B is that water deliveries to irrigation users would be slightly reduced in drier years as compared to existing conditions. These changes are not anticipated to result in any land use changes but would increase the frequency of fallowing agricultural lands. The dry-year delivery scenario under Alternative 1B is similar to conditions that occur in the analysis for long-term water contract renewals for the divisions covered by the M&I Water Shortage Policy. As part of the long-term contract renewal process, each water division was required to develop a biological assessment (BA) to assess the terrestrial effects to federally listed species of continuing their water service contracts. The consultations that follow development of the BAs assume full contract deliveries in all years. Thus, any impacts that may be related to increased M&I CVP water allocations in drier years will have been addressed in the contract specific consultations.

Water-related effects of CVP and SWP operations to federally listed species from continued water contract deliveries were assessed in the recently completed biological assessments for the OCAP 2004 and the Long-term Contract Renewal process for the CVP water service contracts. The M&I Shortage Policy would not result in any effects to federally listed species outside those already being addressed in the long-term contract renewal consultation process (for terrestrial species), and OCAP 2004 consultation (for aquatic species). Alternative 1B would not increase the total amount of water allocated to CVP water service contractors in any one year. All or part of the water that would be diverted by Irrigation CVP water service contractors in the drier years under the existing conditions would be diverted by M&I CVP water service contractors under Alternative 1B with a frequency of 9 of the 72 years evaluated in the OCAP 2004 CALSIM II model runs (which represent the existing conditions). Under Alternative 1B, water allocated to Irrigation CVP water service contractors in Alternative 1B would be reduced by 1 to 3 percent in the 9 of the 72 years. It should also be noted that most of the water to be re-allocated would be diverted from irrigation to M&I users both located south of the Delta. Therefore, there should be no noticeable difference in Delta outflow or exports under Alternative 1B as compared to existing conditions. Any effects that may result from implementing Alternative 1B have already been addressed in the contract specific and/or the OCAP 2004 consultation.

TABLE D-1

PERCENT DELIVERIES TO CENTRAL VALLEY PROJECT WATER SERVICE CONTRACT DELIVERIES FOR M&I AND IRRIGATION WATER SERVICE CONTRACTORS FOR EXISTING CONDITIONS AND ALTERNATIVE 1B

Number of Years over 72 Years	EXISTING CONDITIONS		Alternative 1B	
	M&I	Irrig.	M&I	Irrig.
3 years (1924, 1933, 1990)	50%	0%	50%	0 [a]
2 years (1931, 1977)	54%	4%	69%	2%
1 year (1988)	57%	7%	71%	5%
2 years (1934, 1929)	61%	10%	73%	8%
1 year (1991)	62%	12%	73%	10%
1 year (1932)	64%	13%	74%	11%
1 year (1976)	66%	16%	75%	15%
1 year (1926)	69%	19%	77%	17%

"Irrig." = Irrigation
All percentages calculated as compared to M&I or Irrigation CVP water service Contracts Totals

[a] Under the No-Action Alternative for 50 percent M&I Allocation years, deliveries to Irrigation CVP water service contractors are equal to zero. Therefore, there are no changes in deliveries to M&I or Irrigation water users.

[b] Re-allocation of water to increase M&I CVP water service contract water in these alternatives will result in zero deliveries to Irrigation CVP water service contractors

Tables D-2 through D-4 summarize the incremental effects for aquatic and terrestrial species, respectively, and critical habitats in the divisions covered in the M&I Shortage Policy for implementing Alternative 1B as compared to continuation with the existing conditions without implementation of the M&I Water Shortage Policy.

TABLE D-2

DETERMINATION OF EFFECTS OF IMPLEMENTING ALTERNATIVE 1B AS COMPARED TO CONTINUATION OF EXISTING CONDITIONS

Determination[a]	Species	Federal Status
NLAF	Coho salmon – Central California Coast ESU	T
NLAF	Delta smelt	T
NLAF	Spring-run chinook salmon – Central Valley ESU	C
No Effect	Steelhead – Central California Coast ESU	T
NLAF	Steelhead – Central Valley ESU	T
NLAF	Winter-run chinook salmon	E

[a] NLAF – May Affect, Not Likely to Adversely Affect. NLAF includes the determination that there are no effects (if any) resulting from implementing Alternative 1B that have not been addressed in related consultations.

Effect determinations for existing conditions as described in the U.S. Bureau of Reclamation. 2004. Long-Term Central Valley Project and State Water Project Operations Criteria and Plan Biological Assessment.

TABLE D-3

DETERMINATION OF EFFECTS OF IMPLEMENTING ALTERNATIVE 1B AS COMPARED TO CONTINUATION OF EXISTING CONDITIONS AND OCCURRENCE OF LISTED AND PROPOSED PLANT AND WILDLIFE SPECIES BASED UPON LONG-TERM CONTRACT RENEWAL BIOLOGICAL ASSESSMENTS

	DIVISION AND EFFECT DETERMINATION[a]					
	Shasta, Trinity and Sacramento River	**American River (Sacramento Valley**	**Delta (San Joaquin Valley)**	**West San Joaquin**	**American River and Delta (Alameda and Contra Costa Counties)**	**San Felipe**
PLANTS						
Antioch Dunes evening-primrose					NLAF	
Butte County Meadowfoam	No Effect					
California jewelflower			NLAF	NLAF		
California sea-blite					NLAF	NLAF
Colusa grass	No Effect				NLAF	
Contra Costa wallflower					NLAF	
Contra Costa goldfields					NLAF	NLAF
Coyote ceanothus						NLAF
El Dorado Bedstraw		NLAF				
Green's tuctoria	No Effect					
Hairy Orcutt grass	No Effect					
Hoover's eriastrum			NLAF			
Hoover's sprurge	No Effect					
Large-flowered fiddleneck					NLAF	
Layne's butterweed		NLAF				
Metcalf Canyon jewelflower						NLAF
Pallid manzanita					NLAF	
Palmate-bracted bird's beak	No Effect		NLAF	NLAF		
Pine Hill ceanothus		NLAF				
Pine Hill flannelbush		NLAF				
Sacramento Orcutt grass		NLAF				
San Joaquin woolly-threads				NLAF		
Santa Clara Valley dudleya						NLAF
Santa Cruz tarplant					NLAF	NLAF
Slender Orcutt grass	No Effect	NLAF				
Showy Indian clover			NLAF			
Soft bird's beak					NLAF	

TABLE D-3

DETERMINATION OF EFFECTS OF IMPLEMENTING ALTERNATIVE 1B AS COMPARED TO CONTINUATION OF EXISTING CONDITIONS AND OCCURRENCE OF LISTED AND PROPOSED PLANT AND WILDLIFE SPECIES BASED UPON LONG-TERM CONTRACT RENEWAL BIOLOGICAL ASSESSMENTS

	DIVISION AND EFFECT DETERMINATION[a]					
	Shasta, Trinity and Sacramento River	**American River (Sacramento Valley**	**Delta (San Joaquin Valley)**	**West San Joaquin**	**American River and Delta (Alameda and Contra Costa Counties)**	**San Felipe**
Solano grass						
Stebbin's morning glory		NLAF				
Succulent owl's clover		NLAF				
Tiburon Indian paintbrush						NLAF
INVERTEBRATES						
Bay checkerspot butterfly						NLAF
California freshwater shrimp					NLAF	
Callipe silverspot butterfly					NLAF	
Conservancy fairy shrimp	NLAF		NLAF			
Delta green ground beetle					NLAF	
Lange's metalmark butterfly					NLAF	
Longhorn fairy shrimp					NLAF	
Valley elderberry longhorn beetle		NLAF	NLAF	NLAF	NLAF	
Vernal pool fairy shrimp	NLAF	NLAF	NLAF	NLAF	NLAF	
Vernal pool tadpole shrimp	NLAF	NLAF	NLAF	NLAF	NLAF	
AMPHIBIANS						
California red-legged frog	NLAF	NLAF	NLAF	NLAF	NLAF	NLAF
California tiger salamander –Central California DPS	NLAF	NLAF	NLAF	NLAF	NLAF	NLAF
REPTILES						
Alameda whipsnake			NLAF		NLAF	NLAF
Blunt-nosed leopard lizard			NLAF	NLAF	NLAF	
Giant garter snake	NLAF	NLAF	NLAF	NLAF		
San Francisco garter snake						NLAF
BIRDS						
Bald Eagle	NLAF	NLAF	NLAF	NLAF	NLAF	NLAF

TABLE D-3

DETERMINATION OF EFFECTS OF IMPLEMENTING ALTERNATIVE 1B AS COMPARED TO CONTINUATION OF EXISTING CONDITIONS AND OCCURRENCE OF LISTED AND PROPOSED PLANT AND WILDLIFE SPECIES BASED UPON LONG-TERM CONTRACT RENEWAL BIOLOGICAL ASSESSMENTS

	DIVISION AND EFFECT DETERMINATION[a]					
	Shasta, Trinity and Sacramento River	**American River (Sacramento Valley**	**Delta (San Joaquin Valley)**	**West San Joaquin**	**American River and Delta (Alameda and Contra Costa Counties)**	**San Felipe**
California brown pelican					NLAF	
California clapper rail					NLAF	NLAF
California condor				NLAF		
California least tern					NLAF	NLAF
Least Bell's vireo						NLAF
Marbled murrelet						NLAF
Northern spotted owl	NLAF					
Western snowy plover					NLAF	
MAMMALS						
Fresno kangaroo rat			NLAF	NLAF		
Giant kangaroo rat			NLAF	NLAF		
Riparian woodrat			NLAF	NLAF	NLAF	
Riparian brush rabbit					NLAF	
Salt marsh harvest mouse					NLAF	NLAF
San Joaquin kit fox			NLAF	NLAF	NLAF	NLAF
Tipton kangaroo rat			NLAF	NLAF		

[a] NLAF – May Affect, Not Likely to Adversely Affect. NLAF includes the determination that there are no effects (if any) resulting from implementing Alternative 1B that have not been addressed in related consultations.

Sources for the Effect Determinations:

1. Bureau of Reclamation. 2004. Biological Assessment for the Long-term Renewal of Water Service Contracts In the Black Butte Unit Corning Canal Unit and Tehama-Colusa Canal Unit of the Sacramento River Division, Central Valley Project, California
2. Bureau of Reclamation. 2004. Central Valley Project American River Division Final Biological Assessment for the Central Valley Project Long-Term Water Service Contract Renewals. September 2004.
3. Bureau of Reclamation. 2003. Delta-Mendota Canal Unit Draft Biological Assessment Long-Term Contract Renewal. June 14, 2003.
4. Bureau of Reclamation. 2004. West San Joaquin Division San Luis Unit Administrative Draft Biological Assessment Long-Term Water Service Contract Renewal. February 2004.
5. Bureau of Reclamation. 2004. Central Valley Project Delta Division Contra Costa Canal Final Biolgical Assessment Long-Term Water Service Contract Renewal Volume I. March 2004.
6. Bureau of Reclamation. 2004. San Felipe Division Long-Term Contract Renewal Biological Assessment.

TABLE D-4

DETERMINATION OF EFFECTS OF IMPLEMENTING ALTERNATIVE 1B AS COMPARED TO CONTINUATION OF EXISTING CONDITIONS AND OCCURRENCE OF CRITICAL HABITAT FOR LISTED PLANT AND WILDLIFE BASED UPON LONG-TERM CONTRACT RENEWAL BIOLOGICAL ASSESSMENTS

	DIVISION / EFFECT DETERMINATION					
	Shasta, Trinity and Sacramento River	**American River (Sacramento Valley**	**Delta (San Joaquin Valley)**	**West San Joaquin**	**American River and Delta (Alameda and Contra Costa Counties)**	**San Felipe**
PLANTS						
Antioch evening-dunes primrose					No Adverse Modification	
Colusa grass	No Adverse Modification					
Contra Costa wallflower					No Adverse Modification	
Green's tuctoria	No Adverse Modification					
Hairy Orcutt grass	No Adverse Modification					
Hoover's sprurge	No Adverse Modification					
Slender Orcutt grass	No Adverse Modification					
INVERTEBRATES						
Bay checkerspot butterfly						No Adverse Modification
Conservancy fairy shrimp	No Adverse Modification					
Vernal pool fairy shrimp	No Adverse Modification			No Adverse Modification		
Vernal pool tadpole shrimp	No Adverse Modification			No Adverse Modification		
AMPHIBIAN						
California red-legged frog			No Adverse Modification			
BIRDS						
Northern spotted owl	No Adverse Modification					
MAMMALS						
Fresno kangaroo rat			No Adverse Modification			
Giant kangaroo rat				No Adverse Modification		

TABLE D-4

DETERMINATION OF EFFECTS OF IMPLEMENTING ALTERNATIVE 1B AS COMPARED TO CONTINUATION OF EXISTING CONDITIONS AND OCCURRENCE OF CRITICAL HABITAT FOR LISTED PLANT AND WILDLIFE BASED UPON LONG-TERM CONTRACT RENEWAL BIOLOGICAL ASSESSMENTS

Sources for the Effect Determinations:

1. Bureau of Reclamation. 2004. Biological Assessment for the Long-term Renewal of Water Service Contracts In the Black Butte Unit Corning Canal Unit and Tehama-Colusa Canal Unit of the Sacramento River Division, Central Valley Project, California
2. Bureau of Reclamation. 2003. Delta-Mendota Canal Unit Draft Biological Assessment Long-Term Contract Renewal. June 14, 2003.
3. Bureau of Reclamation. 2004. West San Joaquin Division San Luis Unit Administrative Draft Biological Assessment Long-Term Water Service Contract Renewal. February 2004.
4. Bureau of Reclamation. 2004. Central Valley Project Delta Division Contra Costa Canal Final Biolgical Assessment Long-Term Water Service Contract Renewal Volume I. March 2004.
5. Bureau of Reclamation. 2004. San Felipe Division Long-Term Contract Renewal Biological Assessment.