



Draft

Program Environmental Impact Statement/ Environmental Impact Report



SCH # 2007081125

April 2011

The San Joaquin River Restoration Program is a comprehensive long-term effort to restore flows to the San Joaquin River from Friant Dam to the confluence of Merced River and restore a self-sustaining Chinook salmon fishery in the river while reducing or avoiding adverse water supply impacts from Interim and Restoration flows.



Mission Statements



The mission of the Bureau of Reclamation is to manage, develop, and protect water and related resources in an environmentally and economically sound manner in the interest of the American public.

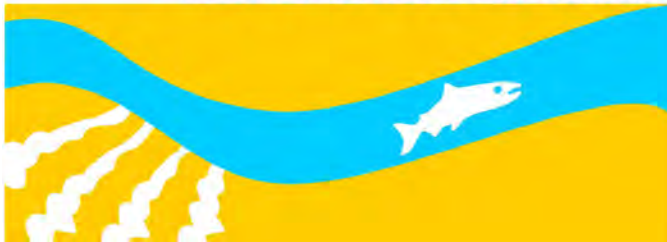


The mission of the California Department of Water Resources is to manage the water resources of California in cooperation with other agencies, to benefit the State's people, and to protect, restore, and enhance the natural and human environments.

Draft

Program Environmental Impact Statement/Report

SAN JOAQUIN RIVER
RESTORATION PROGRAM



1 Table of Contents

2	Chapter 1.0 Introduction.....	1-1
3	1.1 Background.....	1-1
4	1.1.1 Stipulation of Settlement.....	1-2
5	1.1.2 San Joaquin River Restoration Program.....	1-4
6	1.1.3 Scoping and Public Involvement Process.....	1-6
7	1.2 Purpose and Uses of PEIS/R.....	1-7
8	1.2.1 National Environmental Policy Act.....	1-7
9	1.2.2 California Environmental Quality Act.....	1-8
10	1.2.3 Type of Environmental Document.....	1-9
11	1.3 Relationship to Other SJRRP NEPA and CEQA Documents.....	1-13
12	1.4 Purpose and Need for Action and Project Objectives.....	1-13
13	1.5 Responsibilities of Lead Agencies, Responsible Agency, and	
14	Implementing Agencies.....	1-15
15	1.6 Study Area.....	1-16
16	1.7 Organization of PEIS/R.....	1-19
17	Chapter 2.0 Description of Alternatives.....	2-1
18	2.1 Alternatives Development.....	2-1
19	2.1.1 NEPA Requirements.....	2-3
20	2.1.2 CEQA Requirements.....	2-4
21	2.2 Overview of Alternatives Evaluated.....	2-5
22	2.3 No-Action and No-Project Alternatives.....	2-11
23	2.4 Alternative A1 Reach 4B1 at 475 cfs, Delta Recapture.....	2-14
24	2.4.1 Project-Level Actions.....	2-14
25	2.4.2 Program-Level Actions.....	2-34
26	2.4.3 Physical Monitoring and Management Plan.....	2-49
27	2.4.4 Conservation Strategy.....	2-52
28	2.5 Alternative A2 Reach 4B1 at 4,500 cfs, Delta Recapture.....	2-80
29	2.5.1 Additional Restoration Actions.....	2-80
30	2.6 Alternative B1 Reach 4B1 at 475 cfs, San Joaquin River Recapture.....	2-82
31	2.6.1 Additional Water Management Actions on San Joaquin River.....	2-84
32	2.7 Alternative B2 Reach 4B1 at 4,500 cfs, San Joaquin River Recapture.....	2-84
33	2.8 Alternative C1 Reach 4B1 at 475 cfs, New Pumping Plant Recapture.....	2-86
34	2.8.1 Additional Water Management Actions on San Joaquin River.....	2-86

1	2.9	Alternative C2 Reach 4B1 at 4,500 cfs, New Pumping Plant	
2		Recapture	2-88
3	2.10	Alternatives Considered and Eliminated from Further Consideration	2-90
4	2.11	Settlement Implementation	2-92
5	2.11.1	Strategies for Implementation.....	2-94
6	Chapter 3.0	Considerations for Describing the Affected Environment	
7		and Environmental Consequences	3-1
8	3.1	Study Area	3-1
9	3.1.1	San Joaquin River Upstream from Friant Dam.....	3-2
10	3.1.2	San Joaquin River from Friant Dam to Merced River	3-2
11	3.1.3	San Joaquin River from Merced River to the Sacramento-San	
12		Joaquin Delta	3-4
13	3.1.4	Sacramento-San Joaquin Delta	3-4
14	3.1.5	Central Valley Project/State Water Project Water Service	
15		Areas	3-4
16	3.2	Chapter Contents and Definition of Terms.....	3-7
17	3.2.1	NEPA and CEQA Requirements	3-7
18	3.2.2	Significance Criteria	3-9
19	3.2.3	Impact Comparisons and Definitions.....	3-9
20	3.2.4	Impact Levels.....	3-11
21	3.2.5	Mitigation Measures	3-12
22	3.2.6	Significance After Mitigation	3-13
23	3.2.7	Relationship Between Short-Term Uses of the Environment	
24		and Maintenance and Enhancement of Long-Term	
25		Productivity.....	3-14
26	3.2.8	Irreversible and Irretrievable Commitments of Resources	3-14
27	3.3	Resources Eliminated from Further Analysis	3-14
28	Chapter 4.0	Air Quality	4-1
29	4.1	Environmental Setting	4-1
30	4.1.1	Topography, Climate, and Meteorology.....	4-1
31	4.1.2	Criteria Air Pollutants	4-4
32	4.1.3	Toxic Air Contaminants.....	4-13
33	4.1.4	Odors.....	4-13
34	4.1.5	Existing Sensitive Receptors.....	4-14
35	4.2	Regulatory Setting	4-14
36	4.2.1	Federal.....	4-14
37	4.2.2	State of California.....	4-15
38	4.2.3	Regional and Local	4-16

1 4.3 Environmental Consequences and Mitigation Measures 4-18

2 4.3.1 Impact Assessment Methodology 4-22

3 4.3.2 Significance Criteria 4-22

4 4.3.3 Program-Level Impacts and Mitigation Measures..... 4-24

5 4.3.4 Project-Level Impacts and Mitigation Measures 4-34

6 **Chapter 5.0 Biological Resources – Fisheries 5-1**

7 5.1 Historical Perspective 5-2

8 5.1.1 Historical Aquatic Habitat Conditions..... 5-2

9 5.1.2 Historical Fish Communities 5-6

10 5.2 Environmental Setting 5-10

11 5.2.1 General Environmental Conditions Affecting Fish 5-10

12 5.2.2 San Joaquin River Upstream from Friant Dam..... 5-13

13 5.2.3 San Joaquin River from Friant Dam to Merced River 5-15

14 5.2.4 San Joaquin River from Merced River to Delta..... 5-25

15 5.2.5 San Joaquin River Tributaries..... 5-26

16 5.2.6 Sacramento-San Joaquin Delta 5-27

17 5.3 Regulatory Setting 5-30

18 5.3.1 Federal..... 5-30

19 5.3.2 State..... 5-33

20 5.3.3 Regional and Local 5-34

21 5.4 Environmental Consequences and Mitigation Measures 5-35

22 5.4.1 Impact Assessment Methodology 5-42

23 5.4.2 Significance Criteria 5-66

24 5.4.3 Program-Level Impacts and Mitigation Measures..... 5-67

25 5.4.4 Project-Level Impacts and Mitigation Measures 5-77

26 **Chapter 6.0 Biological Resources – Vegetation and Wildlife..... 6-1**

27 6.1 Environmental Setting 6-1

28 6.1.1 Historical and Regional Perspective 6-2

29 6.1.2 San Joaquin River Area Upstream from Friant Dam..... 6-3

30 6.1.3 San Joaquin River from Friant Dam to Merced River 6-5

31 6.1.4 San Joaquin River from Merced River to the Delta..... 6-34

32 6.1.5 Sacramento–San Joaquin River Delta..... 6-35

33 6.1.6 CVP/SWP Water Service Areas 6-35

34 6.2 Regulatory Setting 6-36

35 6.2.1 Federal..... 6-36

36 6.2.2 State of California 6-39

1	6.2.3	Regional and Local	6-41
2	6.3	Environmental Consequences and Mitigation Measures	6-44
3	6.3.1	Impact Assessment Methodology	6-49
4	6.3.2	Program-Level Impacts and Mitigation Measures.....	6-50
5	6.3.3	Project-Level Impacts and Mitigation Measures	6-80
6	Chapter 7.0	Climate Change and Greenhouse Gas Emissions	7-1
7	7.1	Environmental Setting	7-1
8	7.1.1	Background on Global Climate Change	7-1
9	7.1.2	Global Climate Trends and Associated Impacts.....	7-2
10	7.1.3	California Climate Trends and Associated Impacts.....	7-3
11	7.1.4	Local Climate.....	7-3
12	7.1.5	Greenhouse Gas Emissions Sources and Inventory.....	7-4
13	7.2	Regulatory Setting	7-5
14	7.2.1	Federal.....	7-5
15	7.2.2	State of California.....	7-6
16	7.2.3	Regional and Local	7-14
17	7.3	Environmental Consequences and Mitigation Measures.....	7-15
18	7.3.1	Impact Assessment Methodology	7-18
19	7.3.2	Significance Criteria	7-20
20	7.3.3	Program-Level Impacts and Mitigation Measures.....	7-21
21	7.3.4	Project-Level Impacts and Mitigation Measures	7-25
22	Chapter 8.0	Cultural Resources.....	8-1
23	8.1	Historic Context	8-1
24	8.1.1	Prehistoric Era.....	8-1
25	8.1.2	Native Peoples at the Time of European Contact	8-2
26	8.1.3	Historic Era	8-3
27	8.1.4	San Joaquin River Upstream from Friant Dam.....	8-7
28	8.1.5	San Joaquin River from Friant Dam to Merced River	8-7
29	8.1.6	San Joaquin River from Merced River to the Delta.....	8-11
30	8.2	Regulatory Setting	8-11
31	8.2.1	Federal.....	8-12
32	8.2.2	State of California.....	8-12
33	8.3	Environmental Consequences and Mitigation Measures.....	8-12
34	8.3.1	Impact Assessment Methodology	8-15
35	8.3.2	Archaeological and Historic-Era Structural Resources	8-15
36	8.3.3	Traditional Cultural Properties and Areas of Native American	
37		Concern.....	8-16

1 8.3.4 Significance Criteria 8-17

2 8.3.5 Program-Level Impacts and Mitigation Measures..... 8-19

3 8.3.6 Project-Level Impacts and Mitigation Measures 8-22

4 **Chapter 9.0 Environmental Justice 9-1**

5 9.1 Environmental Setting 9-1

6 9.1.1 San Joaquin River from Friant Dam to Merced River 9-1

7 9.1.2 San Joaquin River from Merced River to the Delta and the

8 Delta 9-11

9 9.1.3 Central Valley Project/State Water Project Water Service

10 Areas 9-13

11 9.2 Regulatory Setting 9-24

12 9.2.1 Federal..... 9-24

13 9.2.2 State of California 9-24

14 9.2.3 Regional and Local 9-25

15 9.3 Environmental Consequences and Mitigation Measures 9-25

16 9.3.1 Impact Assessment Methodology 9-28

17 9.3.2 Disproportionately High and Adverse Criteria 9-29

18 9.3.3 Program-Level Impacts..... 9-30

19 9.3.4 Project-Level Impacts 9-36

20 **Chapter 10.0 Geology and Soils 10-1**

21 10.1 Environmental Setting 10-1

22 10.1.1 Regional Setting..... 10-1

23 10.1.2 San Joaquin River from Friant Dam to Merced River 10-15

24 10.2 Regulatory Setting 10-24

25 10.2.1 Federal..... 10-24

26 10.2.2 State of California 10-24

27 10.2.3 Local 10-24

28 10.3 Environmental Consequences and Mitigation Measures 10-25

29 10.3.1 Impact Assessment Methodology 10-28

30 10.3.2 Significance Criteria 10-28

31 10.3.3 Program-Level Impacts and Mitigation Measures on Geology

32 and Soils..... 10-30

33 10.3.4 Project-Level Impacts and Mitigation Measures 10-33

1	Chapter 11.0 Hydrology – Flood Management	11-1
2	11.1 Environmental Setting	11-1
3	11.1.1 Historical Perspective of Flood Protection in the San Joaquin	
4	River Basin.....	11-1
5	11.1.2 Flood Management Structures	11-5
6	11.1.3 Levees	11-13
7	11.1.4 Flood Management Operations and Conditions	11-15
8	11.2 Regulatory Setting	11-19
9	11.2.1 Federal.....	11-19
10	11.2.2 State of California.....	11-22
11	11.2.3 Regional and Local Agencies	11-23
12	11.3 Environmental Consequences and Mitigation Measures.....	11-23
13	11.3.1 Impact Assessment Methodology	11-27
14	11.3.2 Significance Criteria	11-29
15	11.3.3 Environmental Consequences and Mitigation Measures.....	11-30
16	11.3.4 Program-Level Impacts and Mitigation Measures.....	11-30
17	11.3.5 Project-Level Impacts and Mitigation Measures	11-41
18	Chapter 12.0 Hydrology – Groundwater	12-1
19	12.1 Environmental Setting	12-1
20	12.1.1 Groundwater Resources of San Joaquin River Hydrologic	
21	Region.....	12-4
22	12.1.2 Groundwater Resources of Tulare Lake Hydrologic Region	12-36
23	12.2 Regulatory Setting	12-47
24	12.2.1 Federal.....	12-47
25	12.2.2 State.....	12-47
26	12.2.3 Regional and Local	12-51
27	12.3 Environmental Consequences and Mitigation Measures.....	12-58
28	12.3.1 Impact Assessment Methodology	12-60
29	12.3.2 Program-Level Impacts and Mitigation Measures.....	12-65
30	12.3.3 Project-Level Impacts and Mitigation Measures	12-66
31	Chapter 13.0 Hydrology – Surface Water Supplies and Facilities	
32	Operations	13-1
33	13.1 Environmental Setting	13-1
34	13.1.1 San Joaquin River Upstream from Friant Dam.....	13-1
35	13.1.2 San Joaquin River from Friant Dam to Merced River.....	13-6
36	13.1.3 San Joaquin River from Merced River to the Delta.....	13-44
37	13.1.4 Sacramento-San Joaquin Delta	13-50

1	13.1.5 Central Valley Project/State Water Project Water Service	
2	Areas	13-54
3	13.2 Regulatory Setting	13-66
4	13.2.1 Federal.....	13-66
5	13.2.2 State of California.....	13-68
6	13.2.3 Regional and Local	13-69
7	13.3 Environmental Consequences and Mitigation Measures	13-70
8	13.3.1 Impact Assessment Methodology	13-73
9	13.3.2 Program-Level Impacts and Mitigation Measures.....	13-77
10	13.3.3 Project-Level Impacts and Mitigation Measures	13-79
11	13.3.4 Changes to Restoration Area Flows and CVP and SWP	
12	Operations.....	13-87
13	Chapter 14.0 Hydrology – Surface Water Quality	14-1
14	14.1 Environmental Setting	14-1
15	14.1.1 San Joaquin River Upstream from Friant Dam.....	14-1
16	14.1.2 San Joaquin River from Friant Dam to Merced River.....	14-1
17	14.1.3 San Joaquin River from Merced River to Delta.....	14-4
18	14.1.4 Sacramento-San Joaquin Delta	14-4
19	14.1.5 Central Valley Project/State Water Project Water Service	
20	Areas	14-6
21	14.2 Regulatory Setting	14-7
22	14.2.1 Federal.....	14-7
23	14.2.2 State.....	14-9
24	14.2.3 Local	14-11
25	14.3 Environmental Consequences and Mitigation Measures	14-12
26	14.3.1 Impact Assessment Methodology	14-15
27	14.3.2 Significance Criteria	14-17
28	14.3.3 Program-Level Impacts and Mitigation Measures.....	14-17
29	14.3.4 Project-Level Impacts and Mitigation Measures	14-22
30	Chapter 15.0 Indian Trust Assets.....	15-1
31	15.1 Environmental Setting	15-1
32	15.2 Regulatory Setting	15-3
33	15.3 Environmental Consequences and Mitigation Measures.....	15-3
34	Chapter 16.0 Land Use Planning and Agricultural Resources.....	16-1
35	16.1 Environmental Setting	16-1
36	16.1.1 San Joaquin River from Friant Dam to Merced River.....	16-1

1	16.1.2 San Joaquin River from Merced River to the Delta.....	16-13
2	16.1.3 Central Valley Project/State Water Project Water Service	
3	Areas	16-13
4	16.2 Regulatory Setting	16-19
5	16.2.1 Federal.....	16-19
6	16.2.2 State of California.....	16-20
7	16.2.3 Regional and Local	16-22
8	16.3 Environmental Consequences and Mitigation Measures.....	16-26
9	16.3.1 Impact Assessment Methodology	16-28
10	16.3.2 Significance Criteria	16-29
11	16.3.3 Program-Level Impacts and Mitigation Measures.....	16-30
12	16.3.4 Project-Level Impacts and Mitigation Measures	16-39
13	Chapter 17.0 Noise	17-1
14	17.1 Environmental Setting	17-1
15	17.1.1 Background.....	17-1
16	17.1.2 San Joaquin River from Friant Dam to the Merced River	17-6
17	17.1.3 San Joaquin River from Merced River to the Delta.....	17-14
18	17.2 Regulatory Setting	17-14
19	17.2.1 Federal.....	17-14
20	17.2.2 State of California.....	17-15
21	17.2.3 Regional and Local	17-16
22	17.2.4 Fresno County General Plan Noise Element	17-16
23	17.2.5 Fresno County Noise Ordinance Code	17-18
24	17.2.6 Madera County General Plan Noise Element	17-19
25	17.2.7 Merced County General Plan Noise Element	17-20
26	17.2.8 Merced County Code	17-21
27	17.2.9 City of Fresno General Plan Noise Element.....	17-22
28	17.2.10 City of Fresno Noise Municipal Code	17-25
29	17.2.11 San Joaquin River Parkway Master Plan.....	17-25
30	17.3 Environmental Consequences and Mitigation Measures.....	17-27
31	17.3.1 Impact Assessment Methodology	17-29
32	17.3.2 Significance Criteria	17-30
33	17.3.3 Program-Level Impacts and Mitigation Measures.....	17-31
34	17.3.4 Project-Level Impacts and Mitigation Measures	17-45
35	Chapter 18.0 Paleontological Resources	18-1
36	18.1 Environmental Setting	18-1
37	18.1.1 Physiographic Environment.....	18-1

1 18.1.2 Regional Geologic Setting 18-2

2 18.1.3 Local Geologic Setting 18-2

3 18.1.4 Paleontological Resource Inventory Methods 18-4

4 18.1.5 Paleontological Resource Assessment Criteria..... 18-4

5 18.1.6 Resource Inventory Results 18-5

6 18.2 Regulatory Setting 18-7

7 18.3 Environmental Consequences and Mitigation Measures 18-7

8 18.3.1 Significance Criteria 18-9

9 18.3.2 Program-Level Impacts and Mitigation Measures..... 18-10

10 18.3.3 Project-Level Impacts and Mitigation Measures 18-12

11 **Chapter 19.0 Power and Energy..... 19-1**

12 19.1 Environmental Setting 19-1

13 19.1.1 San Joaquin River Upstream from Friant Dam..... 19-1

14 19.1.2 Central Valley Project/State Water Project Water Service

15 Areas 19-2

16 19.2 Regulatory Setting 19-14

17 19.3 Environmental Consequences and Mitigation Measures 19-14

18 19.3.1 Impact Assessment Methodology 19-17

19 19.3.2 Significance Criteria 19-18

20 19.3.3 Program-Level Impacts and Mitigation Measures..... 19-19

21 19.3.4 Project-Level Impacts and Mitigation Measures 19-23

22 **Chapter 20.0 Public Health and Hazardous Materials..... 20-1**

23 20.1 Environmental Setting 20-1

24 20.1.1 Anthropogenic Hazards 20-1

25 20.1.2 West Nile Virus..... 20-3

26 20.1.3 Naturally Occurring Asbestos..... 20-4

27 20.1.4 Valley Fever..... 20-4

28 20.1.5 School Safety 20-5

29 20.1.6 Oil and Gas Wells 20-6

30 20.1.7 Wildland Fire 20-7

31 20.1.8 Aircraft Safety..... 20-7

32 20.2 Regulatory Setting 20-8

33 20.2.1 Federal..... 20-8

34 20.2.2 State of California..... 20-9

35 20.2.3 Regional and Local 20-11

36 20.3 Environmental Consequences and Mitigation Measures 20-12

37 20.3.1 Impact Assessment Methodology 20-14

1	20.3.2 Significance Criteria	20-15
2	20.3.3 Program-Level Impacts and Mitigation Measures.....	20-15
3	20.3.4 Project-Level Impacts and Mitigation Measures	20-25
4	Chapter 21.0 Recreation.....	21-1
5	21.1 Environmental Setting	21-1
6	21.1.1 San Joaquin River Upstream from Friant Dam.....	21-1
7	21.1.2 San Joaquin River from Friant Dam to Merced River.....	21-4
8	21.1.3 San Joaquin River from Merced River to the Delta.....	21-14
9	21.1.4 Sacramento–San Joaquin Delta.....	21-15
10	21.1.5 Outdoor Recreation Activity Participation and Demand.....	21-16
11	21.2 Regulatory Setting	21-17
12	21.2.1 Federal.....	21-17
13	21.2.2 State of California.....	21-17
14	21.2.3 Regional and Local	21-18
15	21.3 Environmental Consequences and Mitigation Measures.....	21-21
16	21.3.1 Impact Assessment Methodology	21-27
17	21.3.2 Significance Criteria	21-27
18	21.3.3 Program-Level Impacts and Mitigation Measures.....	21-28
19	21.3.4 Project-Level Impacts and Mitigation Measures	21-41
20	Chapter 22.0 Socioeconomics.....	22-1
21	22.1 Environmental Setting	22-1
22	22.1.1 San Joaquin River Upstream from Friant Dam and from	
23	Friant Dam to Merced River.....	22-2
24	22.1.2 San Joaquin River from Merced River to the Delta.....	22-12
25	22.1.3 Friant Division	22-13
26	22.2 Regulatory Setting	22-47
27	22.2.1 Federal.....	22-47
28	22.2.2 State of California.....	22-47
29	22.3 Environmental Consequences and Mitigation Measures.....	22-48
30	22.3.1 Impact Assessment Methodology	22-50
31	22.3.2 Significance Criteria	22-52
32	22.3.3 Program-Level Impacts and Mitigation Measures.....	22-54
33	22.3.4 Project-Level Impacts and Mitigation Measures	22-73
34	Chapter 23.0 Transportation and Infrastructure	23-1
35	23.1 Environmental Setting	23-2
36	23.1.1 San Joaquin River from Friant Dam to Merced River.....	23-2

1 23.1.2 San Joaquin River from Merced River to the Delta..... 23-8

2 23.2 Regulatory Setting 23-9

3 23.2.1 Federal..... 23-9

4 23.2.2 State..... 23-10

5 23.2.3 Regional and Local 23-11

6 23.3 Environmental Consequences and Mitigation Measures 23-12

7 23.3.1 Impact Assessment Methodology 23-15

8 23.3.2 Significance Criteria 23-16

9 23.3.3 Program-Level Impacts and Mitigation Measures..... 23-17

10 23.3.4 Project-Level Impacts and Mitigation Measures 23-23

11 **Chapter 24.0 Utilities and Service Systems..... 24-1**

12 24.1 Environmental Setting 24-1

13 24.1.1 Wastewater Collection 24-1

14 24.1.2 Fire Protection Services 24-2

15 24.1.3 Law Enforcement Services 24-3

16 24.1.4 Emergency Services..... 24-5

17 24.1.5 Solid Waste Management 24-6

18 24.2 Regulatory Setting 24-7

19 24.2.1 Federal..... 24-8

20 24.2.2 State of California..... 24-8

21 24.2.3 Regional and Local 24-8

22 24.3 Environmental Consequences and Mitigation Measures 24-8

23 24.3.1 Impact Assessment Methodology 24-14

24 24.3.2 Significance Criteria 24-15

25 24.3.3 Program-Level Impacts and Mitigation Measures..... 24-15

26 24.3.4 Project-Level Impacts and Mitigation Measures 24-27

27 **Chapter 25.0 Visual Resources 25-1**

28 25.1 Environmental Setting 25-1

29 25.1.1 San Joaquin River System Upstream from Friant Dam..... 25-1

30 25.1.2 San Joaquin River from Friant Dam to Merced River..... 25-2

31 25.1.3 San Joaquin River from Merced River to the Delta..... 25-4

32 25.2 Regulatory Setting 25-5

33 25.2.1 Federal..... 25-5

34 25.2.2 State of California..... 25-5

35 25.2.3 Regional and Local 25-6

1	25.3 Environmental Consequences and Mitigation Measures	25-7
2	25.3.1 Impact Assessment Methodology	25-9
3	25.3.2 Significance Criteria	25-9
4	25.3.3 Program-Level Impacts and Mitigation Measures.....	25-10
5	25.3.4 Project-Level Impacts and Mitigation Measures	25-16
6	Chapter 26.0 Cumulative Impacts.....	26-1
7	26.1 Definitions of Cumulative Effects	26-1
8	26.2 Methods and Assumptions.....	26-2
9	26.2.1 Quantitative Assessments	26-2
10	26.2.2 Qualitative Assessment of Other Actions	26-3
11	26.3 Geographic Scope of Effects	26-33
12	26.4 Significance Criteria	26-35
13	26.5 Mitigation Measures for Significant Cumulative Impacts.....	26-35
14	26.6 Cumulative Effects Analysis.....	26-35
15	26.6.1 Air Quality	26-36
16	26.6.2 Biological Resources – Fisheries	26-38
17	26.6.3 Biological Resources - Vegetation and Wildlife	26-41
18	26.6.4 Climate Change.....	26-44
19	26.6.5 Cultural Resources	26-44
20	26.6.6 Geology and Soils.....	26-45
21	26.6.7 Hydrology – Flood Management	26-45
22	26.6.8 Hydrology – Groundwater	26-47
23	26.6.9 Hydrology – Surface Water Supplies and Facilities	
24	Operations	26-49
25	26.6.10 Hydrology – Surface Water Quality	26-50
26	26.6.11 Indian Trust Assets	26-52
27	26.6.12 Land Use Planning and Agriculture.....	26-52
28	26.6.13 Noise	26-54
29	26.6.14 Paleontological Resources	26-56
30	26.6.15 Power and Energy	26-56
31	26.6.16 Public Health and Hazardous Materials.....	26-58
32	26.6.17 Recreation	26-59
33	26.6.18 Socioeconomics	26-60
34	26.6.19 Transportation and Infrastructure	26-62
35	26.6.20 Utilities and Service Systems.....	26-64
36	26.6.21 Visual Resources.....	26-68

1 **Chapter 27.0 Other NEPA and CEQA Considerations..... 27-1**
2 27.1 Significant and Unavoidable Impacts 27-1
3 27.2 Relationship Between Short-Term Uses and Long-Term Productivity 27-14
4 27.3 Irreversible and Irretrievable Commitments of Resources 27-16
5 27.4 Growth-Inducing Impacts 27-17
6 27.4.1 Project-Level Actions 27-18
7 27.4.2 Program-Level Actions 27-19
8 27.5 Environmentally Preferable/Superior Alternative 27-19
9 27.5.1 Air Quality 27-21
10 27.5.2 Biological Resources – Fisheries 27-21
11 27.5.3 Biological Resources – Vegetation and Wildlife 27-21
12 27.5.4 Climate Change 27-22
13 27.5.5 Cultural Resources 27-22
14 27.5.6 Geology and Soils 27-22
15 27.5.7 Hydrology – Flood Management 27-22
16 27.5.8 Hydrology – Groundwater 27-22
17 27.5.9 Hydrology – Surface Water Supplies and Facilities
18 Operations 27-22
19 27.5.10 Hydrology – Surface Water Quality 27-23
20 27.5.11 Indian Trust Assets 27-23
21 27.5.12 Land-Use Planning and Agricultural Resources 27-23
22 27.5.13 Noise 27-23
23 27.5.14 Paleontological Resources 27-23
24 27.5.15 Power and Energy 27-23
25 27.5.16 Public Health and Hazardous Materials 27-23
26 27.5.17 Recreation 27-24
27 27.5.18 Socioeconomics 27-24
28 27.5.19 Transportation and Traffic 27-24
29 27.5.20 Utilities and Service Systems 27-24
30 27.5.21 Visual Resources 27-24

31 **Chapter 28.0 Consultation, Coordination, and Compliance..... 28-1**
32 28.1 Compliance with Related Laws, Rules, Regulations, and Executive
33 Orders 28-1
34 28.1.1 Federal Requirements 28-1
35 28.1.2 State Requirements 28-22
36 28.1.3 Local Plans and Policies 28-31
37 28.2 Consultation and Coordination 28-32
38 28.2.1 Program Scoping 28-32

1	28.2.2 Agencies and Organizations Consulted	28-42
2	28.2.3 Future Public Involvement.....	28-43
3	28.3 Distribution List	28-43
4	28.3.1 Federal Agencies.....	28-44
5	28.3.2 United States Congress	28-44
6	28.3.3 State Agencies.....	28-44
7	28.3.4 California Legislature	28-45
8	28.3.5 Tribes	28-45
9	28.3.6 Libraries	28-46
10	28.3.7 Local Agencies.....	28-46
11	28.3.8 County Board of Supervisors.....	28-50
12	28.3.9 Organizations	28-52
13	28.3.10 Individuals.....	28-53
14	Chapter 29.0 References.....	29-1
15	29.1 Chapter 1 – Introduction	29-1
16	29.2 Chapter 2 – Description of Alternatives	29-2
17	29.3 Chapter 3 – Considerations for Describing the Affected Environment	
18	and Environmental Consequences.....	29-4
19	29.4 Chapter 4 – Air Quality.....	29-4
20	29.5 Chapter 5 – Biology – Fisheries.....	29-6
21	29.6 Chapter 6 – Biological Resources – Vegetation and Wildlife	29-19
22	29.7 Chapter 7 – Climate Change	29-27
23	29.8 Chapter 8 – Cultural Resources	29-30
24	29.9 Chapter 9 – Environmental Justice	29-33
25	29.10 Chapter 10 – Geology and Soils	29-34
26	29.11 Chapter 11 – Hydrology – Flood Management	29-37
27	29.12 Chapter 12 – Hydrology – Groundwater	29-39
28	29.13 Chapter 13 – Hydrology – Surface Water Supplies and Facilities	
29	Operations.....	29-44
30	29.14 Chapter 14 – Hydrology – Surface Water Quality	29-47
31	29.15 Chapter 15 – Indian Trust Assets	29-49
32	29.16 Chapter 16 – Land Use Planning and Agricultural Resources	29-49
33	29.17 Chapter 17 – Noise	29-52
34	29.18 Chapter 18 – Paleontological Resources	29-54
35	29.19 Chapter 19 – Power and Energy	29-55
36	29.20 Chapter 20 – Public Health and Hazardous Materials.....	29-56
37	29.21 Chapter 21 – Recreation	29-58

1 29.22 Chapter 22 – Socioeconomics 29-65
2 29.23 Chapter 23 – Transportation and Traffic 29-67
3 29.24 Chapter 24 – Utilities and Service Systems..... 29-69
4 29.25 Chapter 25 – Visual Resources..... 29-71
5 29.26 Chapter 26 – Cumulative Impacts 29-72
6 29.27 Chapter 27 – Other NEPA and CEQA Considerations 29-77
7 29.28 Chapter 28 – Consultation, Coordination, and Compliance 29-77

8 **Chapter 30.0 List of Preparers 30-1**

9 **Chapter 31.0 Index 31-1**

10

1 **Appendices**

2	Appendix A	Stipulation of Settlement in <i>NRDC, et al., v. Rodgers, et al.</i>
3	Appendix B	San Joaquin River Restoration Settlement Act
4	Appendix C	Glossary and Reader's Guide
5	Appendix D	Physical Monitoring and Management Plan
6	Appendix E	Fisheries Management Plan
7	Appendix F	Coordination Act Report
8	Appendix G	Plan Formulation
9	Appendix H	Modeling
10	Appendix I	Supplemental Hydrologic and Water Operations Analyses
11	Appendix J	Surface Water Supplies and Facilities Operations
12	Appendix K	Biological Resources – Fisheries
13	Appendix L	Biological Resources - Vegetation and Wildlife
14	Appendix M	Soil Classes and Geomorphology in the Restoration Area
15	Appendix N	Geomorphology, Sediment Transport, and Vegetation Assessment
16	Appendix O	Socioeconomics
17	Appendix P	Land Use
18	Appendix Q	Transportation and Infrastructure
19		

1 **Tables**

2 Table 1-1. Restoration and Water Management Actions in Key Settlement
 3 Paragraphs..... 1-4
 4 Table 1-2. Key Settlement Milestones 1-5
 5 Table 1-3. Compliance, Consultation, and Coordination Supported by This
 6 Draft PEIS/R 1-12
 7
 8 Table 2-1. Actions Included Under Action Alternatives 2-5
 9 Table 2-2. NEPA/CEQA Level of Compliance for Actions Included Under
 10 Action Alternatives 2-9
 11 Table 2-3. Projects Included Under No-Action Alternative 2-12
 12 Table 2-4. Estimated Maximum Water Available for Transfer Under Action
 13 Alternatives 2-17
 14 Table 2-5. Schedule for Release of Interim and Restoration Flows 2-20
 15 Table 2-6. Minimum Factors of Safety – Levee Slope Stability 2-24
 16 Table 2-7. Conservation Measures for Biological Resources that May Be
 17 Affected by Settlement Actions 2-55
 18 Table 2-8. Site-Specific NEPA/CEQA Environmental Compliance
 19 Documentation for Settlement Actions Completed or in Progress..... 2-92
 20
 21 Table 4-1. Summary of Annual Ambient Air Quality Data for Restoration Area 4-9
 22 Table 4-2. Summary of Restoration Area Attainment Status Designations and
 23 Ambient Air Quality Standards 4-11
 24 Table 4-3. Actions Included Under Action Alternatives..... 4-19
 25 Table 4-4. Summary of Impacts and Mitigation Measures – Air Quality..... 4-20
 26
 27 Table 5-1. Summary of Anadromous Salmonid Spawning Habitat Estimates in
 28 Reach 1 of Restoration Area 5-18
 29 Table 5-2. Actions Included Under Action Alternatives..... 5-36
 30 Table 5-3. Summary of Environmental Consequences – Fisheries..... 5-37
 31 Table 5-4. Fish Species Considered in PEIS/R Impacts Assessment, by
 32 Geographic Area 5-45
 33 Table 5-5. Environmental Conditions for Each Representative Fish Species in
 34 Millerton Lake and Upper San Joaquin River 5-47
 35 Table 5-6. Environmental Conditions for Each Representative Fish Species in
 36 San Joaquin River from Friant Dam to Merced River 5-49
 37 Table 5-7. Environmental Conditions for Each Representative Fish Species in
 38 San Joaquin River from Merced River to Delta..... 5-50

San Joaquin River Restoration Program

1 Table 5-8. Summary of Wetted Length by Reach of San Joaquin River in
2 Restoration Area5-53

3 Table 5-9. Existing Barriers and Impediments to Fish Migration in
4 Restoration Area5-55

5 Table 5-10. Diversions and Pumps Located on San Joaquin River from Friant
6 Dam to Delta5-56

7 Table 5-11. Tributary Flows Assumed to Provide Maximum Habitat.....5-61

8 Table 5-12. Environmental Conditions Included in Impact Assessment for
9 Each Representative Species, by Life Stage, in Sacramento-San
10 Joaquin Delta5-64

11 Table 5-13. Potential Effects of Increased Water-Level Fluctuations on
12 Predation Risk and Food Web Support for Largemouth Bass,
13 Spotted Bass, and Smallmouth Bass 5-89

14

15 Table 6-1. Plant Communities and Land Cover in the Restoration Area..... 6-7

16 Table 6-2. Prevalent Invasive Species in the Restoration Area 6-13

17 Table 6-3. Acreage of Invasive Species Mapped in the Restoration Area..... 6-15

18 Table 6-4. Actions Included Under Action Alternatives..... 6-45

19 Table 6-5. Summary of Environmental Consequences and Mitigation Measures
20 – Vegetation and Wildlife..... 6-46

21 Table 6-6. Programmatic Evaluation of Potential Effects from Construction and
22 Modification of Facilities and Other Restoration Projects on
23 Special-Status Wildlife Species in the Restoration Area 6-64

24

25 Table 7-1. Summary of State Laws and Executive Orders that Address Climate
26 Change 7-7

27 Table 7-2. Actions Included Under Action Alternatives..... 7-16

28 Table 7-3. Summary of Impacts and Mitigation Measures – Climate Change 7-17

29 Table 7-4. Greenhouse Gas Emissions from Energy Consumption Under
30 Program Alternatives 7-28

31 Table 7-5. Factors Used to Estimate Total Carbon Dioxide Equivalents 7-28

32 Table 7-6. Potential Mitigation Strategies..... 7-31

33 Table 7-7. Existing and Future Regulatory Programs 7-31

34

35 Table 8-1. Summary of Cultural Resources Results by Reach in the Restoration
36 Area..... 8-8

37 Table 8-2. Actions Included Under Action Alternatives..... 8-13

38 Table 8-3. Summary of Environmental Consequences and Mitigation Measures
39 – Cultural Resources 8-14

40

1 Table 9-1. Restoration Area Race, Hispanic Origin, and Proportion of Total
2 Minority, 2000 9-4

3 Table 9-2. Restoration Area Population Below Poverty Level, 1999 9-9

4 Table 9-3. San Joaquin-Sacramento River Delta Race, Hispanic Origin, and
5 Proportion of Total Minority, 2005–2007 Estimates 9-12

6 Table 9-4. San Joaquin-Sacramento River Delta Population Below Poverty
7 Level, 2005–2007 Estimates 9-13

8 Table 9-5. Friant Division Water Service Areas Race, Hispanic Origin, and
9 Proportion of Total Minority, 2005–2007 Estimates 9-15

10 Table 9-6. Friant Division Water Service Areas Race and Hispanic Origin of
11 Farm Operators, 2002 9-18

12 Table 9-7. Friant Division Water Service Areas Race, Hispanic Origin, and
13 Proportion of Total Minority of Laborers and Helpers, 2000 9-19

14 Table 9-8. Friant Division Water Service Areas Population Below Poverty
15 Level, 2005–2007 Estimates 9-22

16 Table 9-9. Friant Division Water Service Areas Agricultural Workers Median
17 Annual Wages, 2008 9-23

18 Table 9-10. Impacts Potentially Causing Adverse Environmental Justice
19 Effects 9-26

20

21 Table 10-1. Summary of Soils in San Joaquin River Basin 10-5

22 Table 10-2. California Nonfuel Mineral Production in 2006 10-11

23 Table 10-3. Major Dams and Reservoirs with Storage Capacity Greater than
24 50,000 Acre-Feet in San Joaquin River Basin 10-13

25 Table 10-4. Generalized Effects on Geomorphic Processes of Major Flood
26 Control and Water Supply Infrastructure 10-14

27 Table 10-5. Aggregate Mining Areas in Reach 1 Between Friant Dam and
28 Skaggs Bridge 10-17

29 Table 10-6. Acreages of Soil Textures in Reaches and Bypasses 10-18

30 Table 10-7. Actions Included Under Action Alternatives 10-26

31 Table 10-8. Summary of Environmental Consequences and Mitigation
32 Measures – Geology and Soils 10-27

33 Table 10-9. Summary of Potential Channel Erosion Rates Under Project-Level
34 Alternatives 10-34

35

36 Table 11-1. Design Capacities of San Joaquin River and Bypasses Within the
37 Restoration Area 11-17

38 Table 11-2. Design Capacity of Lower San Joaquin River and Tributaries
39 Flood Control Project 11-19

40 Table 11-3. Actions Included Under Action Alternatives 11-24

San Joaquin River Restoration Program

1	Table 11-4. Summary of Environmental Consequences and Mitigation	
2	Measures – Flood Management	11-25
3	Table 11-5. Estimated Annual Damages Under Program Alternatives.....	11-33
4		
5	Table 12-1. Water Districts, Irrigation Districts, and Municipal and Industrial	
6	Regions Considered in the Groundwater Analysis	12-4
7	Table 12-2. Timeline of Historical Events Affecting Groundwater Production	
8	in San Joaquin River Hydrologic Region	12-14
9	Table 12-3. Typical Groundwater Production in San Joaquin River Hydrologic	
10	Region	12-16
11	Table 12-4. Gross Groundwater Pumping for Friant Division Contractors in	
12	San Joaquin River Hydrologic Region	12-16
13	Table 12-5. Spring 2006 Contour Map Groundwater Elevations in Subbasins of	
14	San Joaquin River Hydrologic Region	12-22
15	Table 12-6. Events Affecting Drainage Conditions on West Side of San	
16	Joaquin Valley	12-30
17	Table 12-7. Timeline of Historical Events Affecting Groundwater Production	
18	in Tulare Lake Hydrologic Region	12-41
19	Table 12-8. Typical Groundwater Production in Tulare Lake Hydrologic	
20	Region	12-42
21	Table 12-9. Gross Groundwater Pumping for Friant Division Contractors in	
22	Tulare Lake Hydrologic Region	12-42
23	Table 12-10. Spring 2006 Contour Map Groundwater Elevations in Subbasins	
24	of Tulare Lake Hydrologic Region	12-44
25	Table 12-11. Existing AB 3030 Plans in San Joaquin Valley Groundwater	
26	Basin	12-49
27	Table 12-12. Proposed In-Lieu Groundwater Banking and Recharge Projects	12-56
28	Table 12-13. Proposed Direct Groundwater Banking and Recharge Projects	12-57
29	Table 12-14. Actions Included Under Action Alternatives.....	12-58
30	Table 12-15. Summary of Environmental Consequences and Mitigation	
31	Measures – Groundwater	12-59
32	Table 12-16. Average Annual Simulated Groundwater Pumping of All	
33	Restoration Year Types Used in Schmidt Tool Calculations –	
34	Low	12-68
35	Table 12-17. Average Annual Groundwater Depth of All Restoration Year	
36	Types Using Schmidt Tool – Low	12-70
37	Table 12-18. Average Annual Simulated Groundwater Pumping of All	
38	Restoration Year Types Used in Schmidt Tool Calculations –	
39	High.....	12-72
40	Table 12-19. Average Annual Groundwater Depth of All Restoration Year	
41	Types Using Schmidt Tool – High	12-74

1 Table 12-20. Change in Average Annual Simulated Groundwater Pumping of
2 All Restoration Year Types Used In Mass Balance Calculations
3 – Low12-91
4 Table 12-21. Average Annual Simulated Groundwater Depth of All
5 Restoration Year Types Using Mass Balance Method – Low12-93
6 Table 12-22. Change in Average Annual Simulated Groundwater Pumping of
7 All Restoration Year Types Used in Mass Balance Calculations –
8 High.....12-95
9 Table 12-23. Average Annual Simulated Groundwater Depth of All
10 Restoration Year Types Using Mass Balance Method – High12-97
11 Table 12-24. Maximum Historical Groundwater Depth by Friant Division
12 Long-Term Contractor District12-114
13
14 Table 13-1. U.S. Bureau of Reclamation Water Rights for Millerton Lake 13-4
15 Table 13-2. Historical Average Millerton Lake End-of-Month Storage by
16 Year Type..... 13-5
17 Table 13-3. Pertinent Physical Data – Friant Dam and Millerton Lake..... 13-7
18 Table 13-4. Streamflow Gages in Reach 1A..... 13-9
19 Table 13-5. Historical Average Monthly Flows for Friant Dam Releases..... 13-12
20 Table 13-6. Historical Average Monthly Flows for San Joaquin River Below
21 Friant Dam 13-12
22 Table 13-7. Historical Average Monthly Flows for Cottonwood Creek near
23 Friant Dam 13-13
24 Table 13-8. Historical Average Monthly Flows for Little Dry Creek near
25 Friant Dam 13-13
26 Table 13-9. Streamflow Gages in Reach 1B 13-14
27 Table 13-10. Historical Average Monthly Flows for San Joaquin River at
28 Donny Bridge..... 13-16
29 Table 13-11. Historical Average Monthly Flows for San Joaquin River at
30 Skaggs Bridge 13-17
31 Table 13-12. Historical Average Monthly Flows for San Joaquin River near
32 Biola..... 13-17
33 Table 13-13. Streamflow Gage in Reach 2A 13-19
34 Table 13-14. Historical Average Monthly Flows for San Joaquin River at
35 Gravelly Ford..... 13-20
36 Table 13-15. Streamflow Gage in Reach 2B..... 13-21
37 Table 13-16. Historical Average Monthly Flows for San Joaquin River Below
38 Chowchilla Bypass Bifurcation Structure..... 13-22
39 Table 13-17. Streamflow Gage in Reach 3 13-23
40 Table 13-18. Historical Average Monthly Flows for San Joaquin River near
41 Mendota 13-24

San Joaquin River Restoration Program

1	Table 13-19.	Streamflow Gages in Reach 4A.....	13-25
2	Table 13-20.	Historical Average Monthly Flows for San Joaquin River near	
3		Dos Palos	13-27
4	Table 13-21.	Historical Average Monthly Flows for San Joaquin River near	
5		El Nido.....	13-27
6	Table 13-22.	Streamflow Gages in Reach 5.....	13-29
7	Table 13-23.	Historical Average Monthly Flows for San Joaquin near	
8		Stevinson.....	13-32
9	Table 13-24.	Historical Average Monthly Flows for Salt Slough at	
10		Highway 165 near Stevinson	13-32
11	Table 13-25.	Historical Average Monthly Flows for San Joaquin River at	
12		Fremont Ford Bridge.....	13-33
13	Table 13-26.	Historical Average Monthly Flows for Mud Slough near Gustine.....	13-33
14	Table 13-27.	Streamflow Gage at Fresno Slough/James Bypass.....	13-34
15	Table 13-28.	Historical Average Monthly Flows for Fresno Slough/James	
16		Bypass near San Joaquin River.....	13-35
17	Table 13-29.	Streamflow Gage at Chowchilla Bypass near Head of Reach 2B	13-36
18	Table 13-30.	Historical Average Monthly Flows for Chowchilla Bypass near	
19		Head of Reach 2B	13-37
20	Table 13-31.	Streamflow Gages in Eastside Bypass.....	13-39
21	Table 13-32.	Historical Average Monthly Flows for Eastside Bypass near	
22		El Nido.....	13-41
23	Table 13-33.	Historical Average Monthly Flows for Eastside Bypass Below	
24		Mariposa Bypass.....	13-41
25	Table 13-34.	Historical Average Monthly Flows for Bear Creek Below	
26		Eastside Bypass.....	13-42
27	Table 13-35.	Streamflow Gage in Mariposa Bypass near Crane Ranch	13-42
28	Table 13-36.	Historical Average Monthly Flows for Mariposa Bypass near	
29		Crane Ranch.....	13-43
30	Table 13-37.	San Joaquin River Streamflow Gages Downstream from	
31		Restoration Area	13-45
32	Table 13-38.	Historical Average Monthly Flows for San Joaquin River near	
33		Crows Landing.....	13-47
34	Table 13-39.	Historical Average Monthly Flows for San Joaquin River near	
35		Vernalis.....	13-48
36	Table 13-40.	Historical Average Monthly Flows for Stanislaus River at Ripon	13-48
37	Table 13-41.	Historical Average Monthly Sacramento-San Joaquin Delta	
38		Inflow	13-50
39	Table 13-42.	Calculated Average Monthly Sacramento-San Joaquin	
40		Delta Outflow.....	13-51

1 Table 13-43. Historical Average Monthly Exports from the C.W. “Bill”
 2 Jones Pumping Plant..... 13-52

3 Table 13-44. Historical Average Monthly Exports from the Harvey O. Banks
 4 Pumping Plant..... 13-52

5 Table 13-45. Historical Average Monthly Exports from the Contra Costa
 6 Water District Rock Slough Pumping Plant by Year Type 13-53

7 Table 13-46. Historical Central Valley Project Annual Allocations..... 13-59

8 Table 13-47. Historical Average End-of-Month New Melones Reservoir
 9 Storage 13-60

10 Table 13-48. Historical Average End-of-Month Central Valley Project San
 11 Luis Reservoir Storage..... 13-62

12 Table 13-49. Historical Annual State Water Project Deliveries 13-65

13 Table 13-50. Historical Average End-of-Month State Water Project San Luis
 14 Reservoir Storage..... 13-66

15 Table 13-51. Actions Included Under Action Alternatives..... 13-71

16 Table 13-52. Summary of Environmental Consequences and Mitigation
 17 Measures – Surface Water Supplies and Facilities Operations 13-72

18 Table 13-53. Impact Indicators and Significance Criteria for Surface Water
 19 Supply Facilities Operations 13-75

20 Table 13-54. Simulated Monthly Maximum 15-Minute Change in Water
 21 Levels at Old River near Tracy Road Bridge at Low-Low Tide 13-80

22 Table 13-55. Simulated Monthly Maximum 15-Minute Change in Water
 23 Levels at Grant Line Canal near Grant Line Canal Barrier at
 24 Low-Low Tide 13-80

25 Table 13-56. Simulated Monthly Maximum 15-Minute Change in Water
 26 Levels at Middle River near Howard Road Bridge at Low-Low
 27 Tide 13-81

28 Table 13-57. Simulated Number of Years the Delta Changes from Excess to
 29 Balanced Condition for the No-Action Alternative 13-82

30 Table 13-58. Simulated Number of Years the Delta Changes from Excess to
 31 Balanced Condition for Alternatives A1 and A2..... 13-83

32 Table 13-59. Simulated Number of Years the Delta Changes from Excess to
 33 Balanced Conditions for Alternatives B1 and B2..... 13-85

34 Table 13-60. Simulated Number of Years the Delta Changes from Excess to
 35 Balanced Conditions for Alternatives C1 and C2..... 13-86

36 Table 13-61. Average Simulated End-of-Month Millerton Lake Storage 13-88

37 Table 13-62. Average Simulated End-of-Month Millerton Lake Storage in Dry
 38 and Critical Years 13-89

39 Table 13-63. Maximum Nonflood Friant Dam Releases to San Joaquin River
 40 and Maximum Potential Water Recapture in Wet Years..... 13-92

41 Table 13-64. Maximum Nonflood Friant Dam Releases to San Joaquin River
 42 and Maximum Potential Water Recapture in Normal-Wet Years 13-93

1	Table 13-65.	Maximum Nonflood Friant Dam Releases to San Joaquin River	
2		and Maximum Potential Water Recapture in Normal-Dry Years.....	13-94
3	Table 13-66.	Maximum Nonflood Friant Dam Releases to San Joaquin River	
4		and Maximum Potential Water Recapture in Dry Years	13-95
5	Table 13-67.	Maximum Nonflood Friant Dam Releases to San Joaquin River	
6		and Maximum Potential Water Recapture in Critical-High Years	13-96
7	Table 13-68.	Maximum Nonflood Friant Dam Releases to San Joaquin River	
8		and Maximum Potential Water Recapture in Critical-Low Years.....	13-97
9	Table 13-69.	Average Simulated Flow at Head of Reach 1	13-98
10	Table 13-70.	Average Simulated Flow in Dry Years at Head of Reach 1	13-99
11	Table 13-71.	Average Simulated Flow at Head of Reach 2A	13-102
12	Table 13-72.	Average Simulated Flow in Dry Years at Head of Reach 2A	13-103
13	Table 13-73.	Average Simulated Flow at Head of Reach 2B	13-106
14	Table 13-74.	Average Simulated Flow in Dry Years at Head of Reach 2B.....	13-107
15	Table 13-75.	Average Simulated Flow at Head of Reach 3.....	13-110
16	Table 13-76.	Average Simulated Flow in Dry Years at Head of Reach 3	13-111
17	Table 13-77.	Average Simulated Flow at Head of Reach 4A.....	13-114
18	Table 13-78.	Average Simulated Flow in Dry Years at Head of Reach 4A	13-115
19	Table 13-79.	Average Simulated Flow at Head of Reach 4B	13-118
20	Table 13-80.	Average Simulated Flow in Dry Years at Head of Reach 4B.....	13-119
21	Table 13-81.	Average Simulated Flow at Head of Reach 4B	13-122
22	Table 13-82.	Average Simulated Flow in Dry Years at Head of Reach 4B.....	13-123
23	Table 13-83.	Average Simulated Flow at Head of Reach 5.....	13-126
24	Table 13-84.	Average Simulated Flow in Dry Years at Head of Reach 5	13-127
25	Table 13-85.	Average Simulated Flow at Chowchilla Bypass Below	
26		Bifurcation Structure.....	13-130
27	Table 13-86.	Average Simulated Flow in Dry Years at Chowchilla Bypass	
28		Below Bifurcation Structure	13-131
29	Table 13-87.	Average Simulated Flow at Eastside Bypass Below Sand Slough....	13-134
30	Table 13-88.	Average Simulated Flow in Dry Years at Eastside Bypass Below	
31		Sand Slough	13-135
32	Table 13-89.	Average Simulated Flow at Eastside Bypass Before San Joaquin	
33		River Confluence	13-138
34	Table 13-90.	Average Simulated Flow in Dry Years at Eastside Bypass	
35		Before San Joaquin River Confluence.....	13-139
36	Table 13-91.	Average Simulated Flow at Sand Slough Bypass.....	13-142
37	Table 13-92.	Average Simulated Flow in Dry Years at Sand Slough Bypass	13-143
38	Table 13-93.	Average Simulated Flow at Mariposa Bypass.....	13-146
39	Table 13-94.	Average Simulated Flow in Dry Years at Mariposa Bypass	13-147

1 Table 13-95. Average Simulated Flow at San Joaquin River Above
2 Merced River Confluence 13-150

3 Table 13-96. Average Simulated Flow in Dry Years at San Joaquin River
4 Above Merced River Confluence 13-151

5 Table 13-97. Average Simulated Merced River Inflow to San Joaquin River..... 13-155

6 Table 13-98. Average Simulated Merced River Inflow in Dry and Critical
7 Years to San Joaquin River 13-156

8 Table 13-99. Average Simulated Flow at San Joaquin River Below
9 Merced River 13-159

10 Table 13-100. Average Simulated Flow in Dry and Critical Years at
11 San Joaquin River Below Merced River..... 13-160

12 Table 13-101. Average Simulated Tuolumne River Inflow to San Joaquin River ... 13-163

13 Table 13-102. Average Simulated Tuolumne River Inflow in Dry and Critical
14 Years to San Joaquin River 13-164

15 Table 13-103. Average Simulated Flow at San Joaquin River Below
16 Tuolumne River 13-167

17 Table 13-104. Average Simulated Flow in Dry and Critical Years at
18 San Joaquin River Below Tuolumne River 13-168

19 Table 13-105. Average Simulated Stanislaus River Inflow to San Joaquin River.... 13-171

20 Table 13-106. Average Simulated Stanislaus River Inflow in Dry and Critical
21 Years to San Joaquin River 13-172

22 Table 13-107. Average Simulated Flow at San Joaquin River Upstream from
23 Vernalis 13-175

24 Table 13-108. Average Simulated Flow in Dry Years and Critical Years at
25 San Joaquin River Upstream from Vernalis 13-176

26 Table 13-109. Average Simulated Exports Through Banks and Jones
27 Pumping Plants 13-179

28 Table 13-110. Average Simulated Exports in Dry and Critical Years
29 Through Banks and Jones Pumping Plants 13-180

30 Table 13-111. Average Simulated Delta Outflow 13-183

31 Table 13-112. Average Simulated Delta Outflow in Dry and Critical Years 13-184

32 Table 13-113. Potential Return of Recaptured Water to Friant Pursuant to 16(a)
33 Average Annual Values 13-187

34

35 Table 14-1. Draft 2008 Clean Water Act Section 303(d) List of Water Quality
36 Limited Segments, San Joaquin River System, Reach 5 and
37 Tributaries 14-3

38 Table 14-2. Draft 2008 Clean Water Act Section 303(d) List of Water Quality
39 Limited Segments, San Joaquin River System from Merced River
40 to Delta..... 14-5

41 Table 14-3. Actions Included Under Action Alternatives..... 14-12

San Joaquin River Restoration Program

1	Table 14-4. Summary of Environmental Consequences and Mitigation	
2	Measures – Surface Water Quality	14-13
3		
4	Table 15-1. Summary of Environmental Consequences and Mitigation	
5	Measures – Vegetation and Wildlife.....	15-4
6		
7	Table 16-1. Acreage of Land Uses Along San Joaquin River in Restoration	
8	Area.....	16-3
9	Table 16-2. Land Use Designations Along the San Joaquin River in the	
10	Restoration Area	16-9
11	Table 16-3. Total 2007 Acreage of Williamson Act Lands in the Restoration	
12	Area.....	16-10
13	Table 16-4. Total 2004 Acreage of Agricultural Lands in the Restoration Area.....	16-11
14	Table 16-5. Habitats and Acreage of Forest Land in the Restoration Area	16-12
15	Table 16-6. Public and Private Lands in the Restoration Area	16-13
16	Table 16-7. Existing Land Uses in Friant Division.....	16-14
17	Table 16-8. Actions Included Under Action Alternatives.....	16-26
18	Table 16-9. Summary of Environmental Consequences and Mitigation	
19	Measures – Land Use Planning and Agricultural Resources.....	16-27
20		
21	Table 17-1. Effects of Various Vibration Levels on People and Buildings	17-5
22	Table 17-2. Human Response to Ground-Borne Vibration Levels.....	17-6
23	Table 17-3. Summary of Existing Noise Levels from Vehicle Traffic in the	
24	Restoration Area	17-7
25	Table 17-4. Summary of Existing Railroad Traffic Noise Levels in the	
26	Restoration Area	17-8
27	Table 17-5. Summary of Land Use Noise Compatibility Guidelines	17-15
28	Table 17-6. Land Use Compatibility for Community Noise Environments	17-17
29	Table 17-7. Fresno County Exterior Noise Standards Title 8 Health and Safety,	
30	Chapter 8.40.040 Noise Control	17-18
31	Table 17-8. Fresno County Interior Noise Standards Title 8 Health and Safety,	
32	Chapter 8.50.040 Noise Control	17-19
33	Table 17-9. Maximum Allowable Noise Exposure for Non-Transportation	
34	Noise Sources.....	17-20
35	Table 17-10. Permissible Sound Levels	17-21
36	Table 17-11. Maximum Allowable Noise Exposure for Noise-Sensitive Land	
37	Uses.....	17-23
38	Table 17-12. Maximum Allowable Noise Exposure-Stationary Noise Sources	17-24
39	Table 17-13. Actions Included Under Action Alternatives.....	17-27
40	Table 17-14. Summary of Impacts and Mitigation Measures – Noise.....	17-28

1 Table 17-15. Noise Emission Levels from Construction Equipment..... 17-34

2 Table 17-16. Summary of Modeled Equipment Noise Levels..... 17-35

3 Table 17-17. Representative Vibration Source Levels for Construction

4 Equipment..... 17-42

5 Table 17-18. Summary of Modeled Equipment Vibration Levels in the

6 Restoration Area 17-42

7

8 Table 18-1. Actions Included Under Action Alternatives..... 18-8

9 Table 18-2. Summary of Environmental Consequences and Mitigation

10 Measures – Paleontological Resources..... 18-9

11

12 Table 19-1. Hydropower Projects at Friant Dam 19-4

13 Table 19-2. Summary of Hydroelectric Project Features at Friant Dam..... 19-4

14 Table 19-3. Historical Hydroelectric Generation at Friant Power Project 19-5

15 Table 19-4. Hydropower Projects Along the Madera Canal 19-6

16 Table 19-5. Central Valley Project Powerplants, Capacities, and Historical

17 Annual Generation 19-7

18 Table 19-6. Central Valley Project Pumping Plants and Consumption in 2007 19-10

19 Table 19-7. State Water Project Powerplants, Capacities, and Historical Power

20 Generation in 2005..... 19-11

21 Table 19-8. State Water Project Power Consumption in 2005..... 19-12

22 Table 19-9. Actions Included Under Action Alternatives..... 19-15

23 Table 19-10. Summary of Impacts and Mitigation Measures – Power and

24 Energy 19-16

25 Table 19-11. Impact Indicators and Significance Criteria for Energy

26 Generation and Usage 19-19

27 Table 19-12. Simulated Annual Average Hydropower for No-Action

28 Alternative..... 19-20

29 Table 19-13. Simulated Annual Average Hydropower for Alternatives B1

30 and B2 19-21

31 Table 19-14. Simulated Annual Average Hydropower for Alternatives C1

32 and C2 19-22

33 Table 19-15. Simulated Annual Average Hydropower for Alternatives A1

34 and A2..... 19-24

35 Table 19-16. Average Annual Simulated Difference in Groundwater Pumping

36 Energy Consumption Percent Change for All Alternatives 19-25

37

38 Table 20-1. Schools Located within the Restoration Area..... 20-5

39 Table 20-2. Known Abandoned Oil and Gas Wells 20-6

40 Table 20-3. Airports and Airstrips within 2 Miles of River and Bypass Reaches 20-8

San Joaquin River Restoration Program

1	Table 20-4. Actions Included Under Action Alternatives.....	20-12
2	Table 20-5. Summary of Environmental Consequences and Mitigation	
3	Measures – Public Health and Hazardous Materials	20-13
4		
5	Table 21-1. Existing Parks and Public Lands in the San Joaquin River Parkway	
6	– Reach 1.....	21-11
7	Table 21-2. Statewide Participation in and Latent Demand for the Primary	
8	Recreation Activities Pursued Within the Restoration Area.....	21-16
9	Table 21-3. Actions Included Under Action Alternatives.....	21-22
10	Table 21-4. Summary of Impacts and Mitigation Measures – Recreation.....	21-23
11		
12	Table 22-1. Historical, Current, and Projected Population, 1990 Through 2050.....	22-3
13	Table 22-2. Restoration Area Census Tracts – Populations – 2000.....	22-6
14	Table 22-3. Restoration Area – Race and Ethnicity – 2000.....	22-7
15	Table 22-4. Restoration Area – Age – 2000.....	22-8
16	Table 22-5. Friant Division Counties and California – Housing Trends –	
17	2000 to 2006	22-9
18	Table 22-6. Restoration Area – Housing – 2000.....	22-9
19	Table 22-7. Friant Division Counties and California – Per Capita Income and	
20	Poverty Status – 1999	22-11
21	Table 22-8. Restoration Area – Income – 1999	22-12
22	Table 22-9. Friant Division Counties, Three-County Area, and California –	
23	Race and Ethnicity – 2006	22-16
24	Table 22-10. Summary of Friant Division Counties and California – Age –	
25	2006.....	22-17
26	Table 22-11. Friant Division Counties – Historical and Current Labor Force –	
27	1990–2008.....	22-19
28	Table 22-12. Friant Division Counties – Top Employers – 2008	22-22
29	Table 22-13. Friant Division Counties – Number of Establishments – 2002	
30	Through 2006.....	22-23
31	Table 22-14. Friant Division Counties – Labor Force and Unemployment –	
32	2006 Through 2008.....	22-24
33	Table 22-15. Friant Division Counties – Employment by Industry Sector –	
34	2008.....	22-25
35	Table 22-16. Revenues and Expenditures in Fresno County – Selected Years,	
36	1999 Through 2006.....	22-27
37	Table 22-17. Revenues and Expenditures in Kern County – Selected Years,	
38	1999 Through 2006.....	22-29
39	Table 22-18. Revenues and Expenditures in Kings County – Selected Years,	
40	1999 Through 2006.....	22-30

1 Table 22-19. Revenues and Expenditures in Madera County – Selected Years,
2 1999 Through 2006..... 22-32

3 Table 22-20. Revenues and Expenditures in Merced County – Selected Years,
4 1999 Through 2006..... 22-33

5 Table 22-21. Revenues and Expenditures in Tulare County – Selected Years,
6 1999 Through 2006..... 22-34

7 Table 22-22. Friant Division Water Deliveries – 1965 Through 2006 22-36

8 Table 22-23. Deliveries and Reductions to Deliveries by Agricultural
9 Contractor 22-39

10 Table 22-24. Employment Estimates for Selected Friant Division
11 Communities – 2000 22-42

12 Table 22-25. Agricultural Production Values – 2000 to 2006 22-43

13 Table 22-26. Actions Included Under Action Alternatives..... 22-48

14 Table 22-27. Summary of Impacts and Mitigation Measures – Socioeconomics..... 22-49

15 Table 22-28. Friant Division Model: 2007 Economic Base..... 22-51

16 Table 22-29. Direct Effects of Yearly San Joaquin River Restoration Program
17 Construction Expenditures of \$1 Million on Total Output and
18 Employment of Fresno, Madera, and Merced Counties22-57

19 Table 22-30. Direct Effects of Yearly San Joaquin River Restoration Program
20 Construction Expenditures of \$10 Million on Total Output and
21 Employment of Fresno, Madera, and Merced Counties22-58

22 Table 22-31. Direct Effects of Yearly San Joaquin River Restoration Program
23 Construction Expenditures of \$50 Million on Total Output and
24 Employment of Fresno, Madera, and Merced Counties22-59

25 Table 22-32. Direct, Indirect, and Induced Effects of 1-Year Agricultural
26 Losses of \$1 Million on Total Output and Employment of
27 Fresno, Madera, and Merced Counties22-60

28 Table 22-33. Direct, Indirect, and Induced Effects of 1-Year Agricultural
29 Losses of \$10 Million on Total Output and Employment of
30 Fresno, Madera, and Merced Counties22-61

31 Table 22-34. Direct, Indirect, and Induced Effects of 1-Year Agricultural
32 Losses of \$50 Million on Total Output and Employment of
33 Fresno, Madera, and Merced Counties22-62

34 Table 22-35. Direct, Indirect, and Induced Effects of 1-Year Agricultural
35 Losses of \$100 Million on Total Output and Employment of
36 Fresno, Madera, and Merced Counties22-63

37 Table 22-36. Alternatives B1 and B2: Annual-Average Regional Economic
38 Impacts on Industry Output and Employment – Friant Division.....22-68

39 Table 22-37. Effects on Output and Employment of Constructing New
40 Pumping and Conveyance Infrastructure.....22-70

41 Table 22-38. Alternatives C1 and C2: Regional Economic Impacts on Industry
42 Output and Employment – Friant Division..... 22-72

San Joaquin River Restoration Program

1 Table 22-39. Annual Regional Economic Impacts on Industry Output and
2 Employment – Friant Division Change from Existing Base to
3 Alternatives A1 Through C2..... 22-76
4
5 Table 23-1. Traffic Counts in the Restoration Area, Years 1998 through 2006 23-7
6 Table 23-2. Actions Included Under Action Alternatives..... 23-13
7 Table 23-3. Summary of Impacts and Mitigation Measures – Transportation
8 and Infrastructure 23-14
9
10 Table 24-1. Actions Included Under Action Alternatives..... 24-9
11 Table 24-2. Summary of Environmental Consequences and Mitigation
12 Measures – Utilities and Service Systems 24-10
13
14 Table 25-1. Actions Included Under Action Alternatives..... 25-7
15 Table 25-2. Summary of Impacts and Mitigation Measures – Visual Resources 25-8
16
17 Table 26-1. Reasonably Foreseeable Future Actions Included in Qualitative
18 Analysis of Cumulative Resource Area Effects..... 26-5
19 Table 26-2. Geographic Areas Evaluated for Potential Significant Cumulative
20 Effects 26-34
21
22 Table 27-1. Summary of Potentially Significant Impacts and Mitigation 27-2
23
24 Table 28-1. Public Scoping Meeting Locations and Comments Received 28-34
25
26

1 **Figures**

2 Figure 1-1. Study Area for This Program Environmental Impact
3 Statement/Report..... 1-17

4 Figure 1-2. San Joaquin River Reaches and Flood Bypass System in
5 Restoration Area 1-18

6

7 Figure 2-1. Approach for Formulating Program Alternatives 2-2

8 Figure 2-2. Flow Routing in Reach 4B and Bypass System Under Action
9 Alternatives 2-6

10 Figure 2-3. Water Recapture Approaches Downstream from Restoration Area
11 Included in Action Alternatives 2-7

12 Figure 2-4. Flow Routing and Water Recapture Under Alternative A1 2-16

13 Figure 2-5. Restoration Flow Schedules Specified in Exhibit B of Settlement..... 2-18

14 Figure 2-6. Continuous Annual Restoration Flow Allocation in Alternatives 2-19

15 Figure 2-7. Major Facilities That May Be Used in Recapture and Recirculation
16 of Interim and Restoration Flows 2-33

17 Figure 2-8. Location of Common Restoration Actions Included in Action
18 Alternatives 2-35

19 Figure 2-9. Flow Routing and Water Recapture Under Alternative A2 2-81

20 Figure 2-10. Flow Routing and Water Recapture Under Alternative B1 2-83

21 Figure 2-11. Flow Routing and Water Recapture Under Alternative B2 2-85

22 Figure 2-12. Flow Routing and Water Recapture Under Alternative C1 2-87

23 Figure 2-13. Flow Routing and Water Recapture Under Alternative C2 2-89

24

25 Figure 3-1. Primary Central Valley Project and State Water Project Storage
26 Facilities 3-6

27

28 Figure 4-1. Restoration Area Within the San Joaquin Valley Air Basin..... 4-2

29

30 Figure 5-1. Annual Unimpaired Hydrograph of San Joaquin River at Friant
31 and Regulated Flows at Friant for Approximately Average Water
32 Year Conditions 5-4

33 Figure 5-2. Millerton Lake Water Temperature and Dissolved Oxygen..... 5-79

34 Figure 5-3. Cumulative Frequencies of March Through June Simulated Water
35 Temperatures at Four Depths..... 5-81

36 Figure 5-4. Mean Increases and Reductions in Water Levels from April
37 Through June for Program Alternatives 5-86

1 Figure 5-5. Millerton Lake Mean Annual Spotted Bass Spawning Index, 1987
 2 – 2003 Simulations, for Program Alternatives 5-86

3 Figure 5-6. Millerton Lake Mean Annual Largemouth Bass Spawning Index,
 4 1987 – 2003 Simulations 5-87

5 Figure 5-7. Mean Percent Changes in San Joaquin River Flow at Vernalis and
 6 Percent of Years with Flow Reductions Greater Than 10 Percent
 7 Between Existing Conditions and Alternatives A1 Through C2,
 8 2005 Level of Development..... 5-99

9 Figure 5-8. Mean Percent Changes in San Joaquin River Flow at Vernalis and
 10 Percent of Years with Flow Reductions Greater Than 10 Percent
 11 Between No-Action Alternative and Alternatives A1 Through C2,
 12 2030 Level of Development..... 5-100

13 Figure 5-9. Mean Percent Changes in Diversions at Banks and Jones Facilities
 14 and Percent of Years with Diversion Increases Greater Than 10
 15 Percent Between Existing Conditions and Alternatives A1 Through
 16 C2, 2005 Level of Development..... 5-103

17 Figure 5-10. Mean Percent Changes in Diversions at Banks and Jones Facilities
 18 and Percent of Years with Diversion Increases Greater Than 10
 19 Percent Between No-Action Alternative and Alternatives A1
 20 Through C2, 2030 Level of Development 5-103

21 Figure 5-11. Maximum Mean Monthly Upstream Shifts in X2 and Percent of
 22 Years with Greater Than 1 Kilometer Mean Monthly Upstream
 23 Shift Under 2005 Level of Development..... 5-105

24 Figure 5-12. Maximum Mean Monthly Upstream Shifts in X2 and Percent of
 25 Years with Greater Than 1 Kilometer Mean Monthly Upstream
 26 Shift Under 2030 Level of Development..... 5-105

27 Figure 5-13. Mean Percent Changes in Ratio of San Joaquin River at Vernalis
 28 Flow to Reverse Flow of Old and Middle Rivers Combined and
 29 Percent of Years with Reverse Flow Increases Greater Than 10
 30 Percent from Existing Conditions and Alternatives A1 Through
 31 C2, 2005 Level of Development..... 5-110

32 Figure 5-14. Mean Percent Changes in Ratio of San Joaquin River at Vernalis
 33 Flow to Reverse Flow of Old and Middle Rivers Combined and
 34 Percent of Years with Reverse Flow Increases Greater Than 10
 35 Percent from the No-Action Alternative and Alternatives A1
 36 Through C2, 2030 Level of Development 5-110

37 Figure 5-15. Mean Percent Changes in Reverse Flow of Old and Middle Rivers
 38 Combined and Percent of Years with Reverse Flow Increases
 39 Greater Than 10 Percent Between Existing Conditions and
 40 Alternatives A1 Through C2, 2005 Level of Development..... 5-111

41 Figure 5-16. Mean Percent Changes in Reverse Flow of Old and Middle Rivers
 42 Combined and Percent of Years with Reverse Flow Increases
 43 Greater Than 10 Percent Between the No-Action Alternative and
 44 Alternatives A1 Through C2, 2030 Level of Development..... 5-111

1 Figure 6-1. Land Preserves in the Vicinity of the Restoration Area 6-4

2

3 Figure 9-1. Restoration Area Census Tracts 2000..... 9-2

4

5 Figure 10-1. Physiographic Region Soil Types in the Central Valley and Delta 10-6

6

7 Figure 11-1. Conceptual Representation of Millerton Storage Requirements 11-6

8 Figure 11-2. Existing Flood Management Facilities in the San Joaquin River

9 Basin 11-7

10 Figure 11-3. Project Levees Along the San Joaquin River from Friant Dam to

11 the Merced River Confluence 11-14

12 Figure 11-4. Conceptual Risk Approach for Estimating Flood Damage..... 11-29

13 Figure 11-5. Economic Impact Areas in the Flood Damage Assessment Model 11-34

14 Figure 11-6. Stage-Frequency Curve for Economic Impact Area SJ2 11-36

15 Figure 11-7. Stage-Frequency Curve for Economic Impact Area SJ8 11-36

16 Figure 11-8. Stage-Frequency Curve for Economic Impact Area SJ14 11-37

17 Figure 11-9. Stage-Frequency Curve for Economic Impact Area SJ18 11-37

18 Figure 11-10. Stage-Frequency Curve for Economic Impact Area SJ19 11-38

19 Figure 11-11. Stage-Frequency Curve for Economic Impact Area SJ21 11-38

20 Figure 11-12. Stage-Frequency Curve for Economic Impact Area SJ26 11-39

21 Figure 11-13. Stage-Frequency Curve for Economic Impact Area SJ29 11-39

22 Figure 11-14. Averages of Simulated San Joaquin River Downstream from the

23 Merced River Flow in Wet Years 11-45

24 Figure 11-15. Simulated Friant Dam Releases for 1983 Water Year – Flood

25 Releases Exceed Exhibit B Flow Targets 11-46

26 Figure 11-16. Historical Friant Dam Releases for 2006 Water Year – Flood

27 Releases Exceed Exhibit B Flow Targets 11-46

28 Figure 11-17. Simulated Friant Dam Releases for 1992 Water Year – Flood

29 Releases Do Not Occur 11-47

30 Figure 11-18. Simulated Friant Dam Releases for 1996 Water Year – Exhibit B

31 Flow Targets Precede Flood Releases 11-47

32 Figure 11-19. Simulated Friant Dam Releases for 1997 Water Year – Exhibit B

33 Flow Targets Follow Flood Releases..... 11-48

34

35 Figure 12-1. Groundwater Subbasins of the San Joaquin Valley Groundwater

36 Basin Within San Joaquin River and Tulare Lake Hydrologic

37 Regions 12-2

38 Figure 12-2. Generalized Hydrogeologic Cross Sections in San Joaquin River

39 and Tulare Lake Hydrologic Regions 12-6

1	Figure 12-3.	Approximate Boundary of Corcoran Clay and Transect Lines for	
2		Hydrogeologic Cross Sections.....	12-7
3	Figure 12-4.	Cumulative Change in Groundwater Storage by Water Year for	
4		San Joaquin River and Tulare Lake Hydrologic Regions.....	12-10
5	Figure 12-5.	Simulated Cumulative Change in Groundwater Storage by Water	
6		Year for Central Valley and San Joaquin River and Tulare Lake	
7		Hydrologic Regions from 1962 – 2003	12-11
8	Figure 12-6.	Historical Groundwater Pumping and Irrigated Agricultural	
9		Acreage for San Joaquin River Hydrologic Region	12-12
10	Figure 12-7.	Simulated Groundwater Pumping in Central Valley from 1962 –	
11		2003.....	12-13
12	Figure 12-8.	Groundwater Elevations in Spring 1970, San Joaquin Valley	
13		Groundwater Basin	12-18
14	Figure 12-9.	Groundwater Elevations in Spring 1995, San Joaquin Valley	
15		Groundwater Basin	12-20
16	Figure 12-10.	Groundwater Elevations in Spring 2007, San Joaquin Valley	
17		Groundwater Basin	12-21
18	Figure 12-11.	Land Subsidence in the San Joaquin River and Tulare Lake	
19		Hydrologic Regions	12-24
20	Figure 12-12.	Total Dissolved Solids Concentrations in Central Valley	
21		Groundwater Basin	12-27
22	Figure 12-13.	Shallow Groundwater in Present and Potential San Joaquin	
23		Valley Drainage Problem Areas in 2001	12-32
24	Figure 12-14.	Electrical Conductivity of Shallow Groundwater in San Joaquin	
25		Valley in 2001.....	12-33
26	Figure 12-15.	River Surface Elevation Above Adjacent Land Surface Elevation	12-34
27	Figure 12-16.	Physical Barrier to Subsurface Flow Prevents Seepage	12-35
28	Figure 12-17.	River Surface Elevation Below Adjacent Land Surface Elevation	12-35
29	Figure 12-18.	Historical Groundwater Pumping and Irrigated Agricultural	
30		Acreage for Tulare Lake Hydrologic Region	12-40
31	Figure 12-19.	Average Annual Change in Groundwater Depth for Arvin-	
32		Edison Water Storage District Using Schmidt Tool.....	12-76
33	Figure 12-20.	Average Annual Change in Groundwater Depth for Chowchilla	
34		Water District Using Schmidt Tool	12-77
35	Figure 12-21.	Average Annual Change in Groundwater Depth for	
36		Delano-Earlimart Irrigation District Using Schmidt Tool.....	12-78
37	Figure 12-22.	Average Annual Change in Groundwater Depth for Exeter	
38		Irrigation District Using Schmidt Tool.....	12-79
39	Figure 12-23.	Average Annual Change in Groundwater Depth for Ivanhoe	
40		Irrigation District Using Schmidt Tool.....	12-80
41	Figure 12-24.	Average Annual Change in Groundwater Depth for Lindmore	
42		Irrigation District Using Schmidt Tool.....	12-81

1 Figure 12-25. Average Annual Change in Groundwater Depth for
2 Lindsay-Strathmore Irrigation District Using Schmidt Tool12-82

3 Figure 12-26. Average Annual Change in Groundwater Depth for Lower Tule
4 River Irrigation District Using Schmidt Tool12-83

5 Figure 12-27. Average Annual Change in Groundwater Depth for Madera
6 Irrigation District Using Schmidt Tool12-84

7 Figure 12-28. Average Annual Change in Groundwater Depth for Orange Cove
8 Irrigation District Using Schmidt Tool12-85

9 Figure 12-29. Average Annual Change in Groundwater Depth for Porterville
10 Irrigation District Using Schmidt Tool12-86

11 Figure 12-30. Average Annual Change in Groundwater Depth for Saucelito
12 Irrigation District Using Schmidt Tool12-87

13 Figure 12-31. Average Annual Change in Groundwater Depth for
14 Shafter-Wasco Irrigation District Using Schmidt Tool12-88

15 Figure 12-32. Average Annual Change in Groundwater Depth for Southern
16 San Joaquin Municipal Utility District Using Schmidt Tool12-89

17 Figure 12-33. Average Annual Change in Groundwater Depth for Tulare
18 Irrigation District Using Schmidt Tool12-90

19

20 Figure 13-1. Conceptual Representation of Millerton Storage Requirements 13-2

21 Figure 13-2. Historical Annual Unimpaired Runoff Below Friant Dam, by
22 Water Year 13-3

23 Figure 13-3. Historical Millerton Lake End-of-Month Storage, Water Years
24 1988-2007..... 13-5

25 Figure 13-4. Historical Annual Average Flow for Friant Dam Releases 13-10

26 Figure 13-5. Historical Annual Average Flow for San Joaquin River Flow
27 Below Friant Dam..... 13-10

28 Figure 13-6. Historical Annual Average Flow for Cottonwood Creek near
29 Friant Dam 13-11

30 Figure 13-7. Historical Annual Average Flow for Little Dry Creek near
31 Friant Dam 13-11

32 Figure 13-8. Historical Annual Average Flow for San Joaquin River at
33 Donny Bridge..... 13-15

34 Figure 13-9. Historical Annual Average Flow for San Joaquin River at
35 Skaggs Bridge 13-15

36 Figure 13-10. Historical Annual Average Flow for San Joaquin River near
37 Biola..... 13-16

38 Figure 13-11. Historical Annual Average Flow for San Joaquin River at
39 Gravelly Ford..... 13-19

40 Figure 13-12. Historical Annual Average Flow for San Joaquin River Below
41 Chowchilla Bypass Bifurcation Structure..... 13-21

1	Figure 13-13. Historical Annual Average Flow for San Joaquin River near	
2	Mendota	13-23
3	Figure 13-14. Historical Annual Average Flow for San Joaquin River near	
4	Dos Palos	13-26
5	Figure 13-15. Historical Annual Average Flow for San Joaquin River near	
6	El Nido	13-26
7	Figure 13-16. Historical Annual Average Flow for San Joaquin River near	
8	Stevinson.....	13-30
9	Figure 13-17. Historical Annual Average Flow for Salt Slough at Highway 165	
10	near Stevinson.....	13-30
11	Figure 13-18. Historical Annual Average Flow for San Joaquin River at	
12	Fremont Ford Bridge.....	13-31
13	Figure 13-19. Historical Annual Average Flow for Mud Slough near Gustine	13-31
14	Figure 13-20. Historical Annual Average Flow for Fresno Slough/James	
15	Bypass near San Joaquin River.....	13-35
16	Figure 13-21. Historical Annual Average Flow for Chowchilla Bypass near	
17	Head of Reach 2B	13-37
18	Figure 13-22. Historical Annual Average Flow for Eastside Bypass near	
19	El Nido	13-39
20	Figure 13-23. Historical Annual Average Flow for Eastside Bypass Below	
21	Mariposa Bypass.....	13-40
22	Figure 13-24. Historical Annual Average Flow for Bear Creek Below Eastside	
23	Bypass	13-40
24	Figure 13-25. Historical Annual Average Flow for Mariposa Bypass near	
25	Crane Ranch.....	13-43
26	Figure 13-26. Historical Annual Average Flow for San Joaquin River near	
27	Crows Landing.....	13-46
28	Figure 13-27. Historical Annual Average Flow for San Joaquin River near	
29	Vernalis	13-46
30	Figure 13-28. Historical Annual Average Flow for Stanislaus River at Ripon.....	13-47
31	Figure 13-29. Friant Division Long-Term Contractors	13-55
32	Figure 13-30. Historical Water Allocation to Friant Division Contractors.....	13-57
33	Figure 13-31. San Joaquin River Exchange Contractors.....	13-63
34	Figure 13-32. Average Simulated End-of-Month Millerton Lake Storage	13-90
35	Figure 13-33. Average Simulated End-of-Month Millerton Lake Storage in	
36	Dry and Critical Years	13-91
37	Figure 13-34. Average Simulated Flow at Head of Reach 1	13-100
38	Figure 13-35. Average Simulated Flow in Dry Years at Head of Reach 1	13-101
39	Figure 13-36. Average Simulated Flow at Head of Reach 2A	13-104
40	Figure 13-37. Average Simulated Flow in Dry Years at Head of Reach 2A	13-105
41	Figure 13-38. Average Simulated Flow at Head of Reach 2B	13-108

1 Figure 13-39. Average Simulated Flow in Dry Years at Head of Reach 2B
2 Flow in Dry Years..... 13-109

3 Figure 13-40. Average Simulated Flow at Head of Reach 3..... 13-112

4 Figure 13-41. Average Simulated Flow in Dry Years at Head of Reach 3 13-113

5 Figure 13-42. Average Simulated Flow at Head of Reach 4A 13-116

6 Figure 13-43. Average Simulated Flow in Dry Years at Head of Reach 4A 13-117

7 Figure 13-44. Average Simulated Flow at Head of Reach 4B1 13-120

8 Figure 13-45. Average Simulated Flow in Dry Years at Head of Reach 4B1..... 13-121

9 Figure 13-46. Average Simulated Flow at Head of Reach 4B2 13-124

10 Figure 13-47. Average Simulated Flow in Dry Years at Head of Reach 4B2..... 13-125

11 Figure 13-48. Average Simulated Flow at Head of Reach 5..... 13-128

12 Figure 13-49. Average Simulated Flow in Dry Years at Head of Reach 5 13-129

13 Figure 13-50. Average Simulated Flow at Chowchilla Bypass Below
14 Bifurcation Structure..... 13-132

15 Figure 13-51. Average Simulated Flow in Dry Years at Chowchilla Bypass
16 Below Bifurcation Structure 13-133

17 Figure 13-52. Average Simulated Flow at Eastside Bypass Below Sand Slough.... 13-136

18 Figure 13-53. Average Simulated Flow in Dry Years at Eastside Bypass Below
19 Sand Slough 13-137

20 Figure 13-54. Average Simulated Flow at Eastside Bypass Before San Joaquin
21 River Confluence 13-140

22 Figure 13-55. Average Simulated Flow in Dry Years at Eastside Bypass Before
23 San Joaquin River Confluence..... 13-141

24 Figure 13-56. Average Simulated Flow at Sand Slough Bypass..... 13-144

25 Figure 13-57. Average Simulated Flow in Dry Years at Sand Slough Bypass 13-145

26 Figure 13-58. Average Simulated Flow at Mariposa Bypass 13-148

27 Figure 13-59. Average Simulated Flow in Dry Years at Mariposa Bypass 13-149

28 Figure 13-60. Average Simulated Flow at San Joaquin River Above Merced
29 River Confluence 13-152

30 Figure 13-61. Average Simulated Flow in Dry Years at San Joaquin River
31 Above Merced River Confluence 13-153

32 Figure 13-62. Average Simulated Merced River Inflow to San Joaquin River..... 13-157

33 Figure 13-63. Average Simulated Merced River Inflow in Dry and Critical
34 Years to San Joaquin River..... 13-158

35 Figure 13-64. Average Simulated Flow at San Joaquin River Below Merced
36 River..... 13-161

37 Figure 13-65. Average Simulated Flow in Dry and Critical Years at San
38 Joaquin River Below Merced River..... 13-162

39 Figure 13-66. Average Simulated Tuolumne River Inflow to San Joaquin River ... 13-165

San Joaquin River Restoration Program

1 Figure 13-67. Average Simulated Tuolumne River Inflow in Dry and Critical
2 Years to San Joaquin River..... 13-166
3 Figure 13-68. Average Simulated Flow at San Joaquin River Below Tuolumne
4 River..... 13-169
5 Figure 13-69. Average Simulated Flow in Dry and Critical Years at San
6 Joaquin River Below Tuolumne River 13-170
7 Figure 13-70. Average Simulated Stanislaus River Inflow to San Joaquin River.... 13-173
8 Figure 13-71. Average Simulated Stanislaus River Inflow in Dry and Critical
9 Years to San Joaquin River..... 13-174
10 Figure 13-72. Average Simulated Flow at San Joaquin River Upstream from
11 Vernalis 13-177
12 Figure 13-73. Average Simulated Flow in Dry and Critical Years at San
13 Joaquin River Upstream from Vernalis 13-178
14 Figure 13-74. Average Simulated Exports Through Banks and Jones Pumping
15 Plants..... 13-181
16 Figure 13-75. Average Simulated Exports in Dry and Critical Years Through
17 Banks and Jones Pumping Plants..... 13-182
18 Figure 13-76. Average Simulated Delta Outflow 13-185
19 Figure 13-77. Average Simulated Delta Outflow in Dry and Critical Years 13-186
20
21 Figure 15-1. Reservations, Rancherias, and Public Domain Allotments 15-2
22
23 Figure 16-1. Wildlife Refuges Near the Restoration Area 16-5
24
25 Figure 17-1. Common Noise Sources and Levels 17-2
26 Figure 17-2. Sierra Sky Park Airport Noise Contours..... 17-9
27 Figure 17-3. Firebaugh Municipal Airport Noise Contours 17-10
28 Figure 17-4. Mendota Municipal Airport Noise Contours 17-11
29
30 Figure 19-1. Friant Power Project Facilities..... 19-3
31
32 Figure 21-1. Recreation Facilities at Millerton Lake..... 21-3
33 Figure 21-2. Millerton Lake Mean End-of-Month Pool Elevation Versus
34 Minimum Useable Elevations of Boat Ramps..... 21-4
35 Figure 21-3. San Joaquin River Parkway and Surrounding Areas 21-6
36 Figure 21-4. Land Preserves in the Vicinity of the Restoration Area 21-7
37 Figure 21-5. Wet Year Millerton Lake Mean End-of-Month Pool Elevation
38 vs. Toe Elevation of Boat Ramps 21-44
39 Figure 21-6. Normal-Wet Year Millerton Lake Mean End-of-Month Pool
40 Elevation vs. Toe Elevation of Boat Ramps 21-44

1 Figure 21-7. Normal Dry Year Millerton Lake Mean End-of-Month Pool
2 Elevation vs. Toe Elevation of Boat Ramps 21-45
3 Figure 21-8. Dry Year Millerton Lake Mean End-of-Month Pool Elevation vs.
4 Toe Elevation of Boat Ramps 21-46
5 Figure 21-9. Critical-High Year Millerton Lake Mean End-of-Month Pool
6 Elevation vs. Toe Elevation of Boat Ramps 21-47
7
8 Figure 22-1. Restoration Area Census Tracts 2000..... 22-5
9 Figure 22-2. Friant Division Counties – Unemployment Rates – 1990 to 2009 22-20
10 Figure 22-3. Friant Division Water Deliveries – 1965 Through 2006 22-37
11
12

1 List of Abbreviations and Acronyms

2	µg/L	microgram per liter
3	µin/sec	microinch per second
4	µmhos/cm	micromhos per centimeter
5	µS/cm	microSiemen per centimeter
6	°F	degree Fahrenheit
7	AB	Assembly Bill
8	Act	San Joaquin River Restoration Settlement Act
9	ALUC	Airport Land Use Commission
10	APCO	Air Pollution Control Officer
11	APE	area of potential effects
12	ARB	California Air Resources Board
13	AT&T	American Telephone and Telegraph
14	B.P.	Before Present
15	BA	Biological Assessment
16	BAAQMD	Bay Area Air Quality Management District
17	BACT	best available control technology
18	Banks Pumping	Harvey O. Banks Pumping Plant
19	Plant	
20	Basin Plan	Water Quality Control Plan for the Sacramento and
21		San Joaquin River Basins
22	Bay Area	San Francisco Bay Area
23	Bay-Delta	San Francisco Bay/Sacramento-San Joaquin Delta
24	BDCP	Bay-Delta Conservation Plan
25	BLM	U.S. Department of the Interior, Bureau of Land
26		Management
27	BMP	best management practice
28	BNSF	Burlington Northern and Santa Fe Railway
29	BO	Biological Opinion
30	BPS	Best Performance Standards
31	Business Plan Act	California Hazardous Materials Release Response
32		Plans and Inventory Law of 1985
33	C2VSIM	California Central Valley Groundwater-Surface
34		Water Simulation Model
35	CAA	Federal Clean Air Act
36	CAAA	Federal Clean Air Act Amendments of 1990
37	CAAQS	California Ambient Air Quality Standards

1	CAL FIRE	California Department of Forestry and Fire Protection
2		
3	Cal/EPA	California Environmental Protection Agency
4	Cal/OSHA	California Occupational Safety and Health Administration
5		
6	CALFED	CALFED Bay-Delta Program
7	CalIPC	California Invasive Plant Council
8	Caltrans	California Department of Transportation
9	CAPCOA	California Air Pollution Control Officers Association
10		
11	CAT	Climate Action Team
12	CBSC	California Building Standards Code
13	CCAA	California Clean Air Act
14	CCAR	California Climate Action Registry
15	CCC	Columbia Canal Company
16	CCP	Comprehensive Conservation Plan
17	CCR	California Code of Regulations
18	CCSP	Climate Change Scoping Plan
19	CCWD	Contra Costa Water District
20	CDC	U.S. Centers for Disease Control and Prevention
21	CDFA	California Department of Food and Agriculture
22	CDPH	California Department of Public Health
23	CEC	Categorical Exclusion Checklist
24	CEQ	Council on Environmental Quality
25	CEQ Regulations	Council on Environmental Quality Regulations for Implementing NEPA
26		
27	CEQA	California Environmental Quality Act
28	CESA	California Endangered Species Act
29	CFCP	California Farmland Conservancy Program
30	CFGC	California Fish and Game Commission
31	CFR	Code of Federal Regulations
32	cfs	cubic foot per second
33	CH ₄	methane
34	CHABA	Committee of Hearing, Bioacoustics, and Biomechanics
35		
36	Charter Group	Suisun Marsh Charter Group Principal Agencies
37	CHP	California Highway Patrol
38	CIWMA	California Integrated Waste Management Act
39	CLUP	Comprehensive Land Use Plan
40	cm	centimeter
41	CMP	congestion management program

San Joaquin River Restoration Program

1	CNDDDB	California Natural Diversity Database
2	CNEL	community noise equivalent level
3	CNPPA	California Native Plant Protection Act
4	CNPS	California Native Plant Society
5	CO	carbon monoxide
6	CO ₂	carbon dioxide
7	CO _{2e}	CO ₂ equivalent
8	COA	Coordinated Operation Agreement
9	COSMA	City of Stockton Metropolitan Area
10	Court	U.S. Eastern District Court of California
11	CPUC	California Public Utilities Commission
12	CT	census tract
13	CVFPB	Central Valley Flood Protection Board
14	CVFPP	Central Valley Flood Protection Plan
15	CVHM	Central Valley Hydrologic Model
16	CVJV	Central Valley Joint Venture
17	CVP	Central Valley Project
18	CVPIA	Central Valley Project Improvement Act
19	CVPM	Central Valley Production Model
20	CWA	Clean Water Act
21	CWC	California Water Code
22	dB	decibel
23	dBA	decibel on the A-weighted scale
24	DBCP	dibromochloropropane
25	DBW	California Department of Boating and Waterways
26	DDT	1,1,1-trichloro-2, 2-bis(4-chlorophenyl)ethane
27	DEET	diethyl(meta)toulamide
28	Delta	Sacramento-San Joaquin Delta
29	DFG	California Department of Fish and Game
30	DHS	California Department of Health Services
31	diesel PM	particulate matter from diesel-fueled engines
32	DMC	Delta-Mendota Canal
33	DO	dissolved oxygen
34	DOC	California Department of Conservation
35	DOF	California Department of Finance
36	DOGGR	California Department of Conservation, Division of Oil, Gas, and Geothermal Resources
37		
38	DOT	U.S. Department of Transportation
39	DPS	distinct population segment
40	DTSC	California Department of Toxic Substances Control
41	DWR	California Department of Water Resources

1	E/I	export/inflow
2	EA	Environmental Assessment
3	EAD	expected annual damages
4	Eagle Act	Bald and Golden Eagle Protection Act
5	EC	electrical conductivity
6	EDD	California Employment Development Department
7	EFH	Essential Fish Habitat
8	EIR	Environmental Impact Report
9	EIS	Environmental Impact Statement
10	EO	Executive Order
11	EPA	U.S. Environmental Protection Agency
12	ESA	Federal Endangered Species Act of 1973
13	ESRI	Environmental Systems Research Institute, Inc.
14	FAA	Federal Aviation Administration
15	FAR	Federal Aviation Regulations
16	FCDPH	Fresno County Department of Public Health, Environmental Health Division
17		
18	FCWD	Fresno County Waterworks District
19	FDHGM	Friant Dam Hydropower Generation Model
20	FEMA	Federal Emergency Management Agency
21	FERC	Federal Energy Regulatory Commission
22	FHWA	Federal Highway Administration
23	FloodSAFE	California FloodSAFE Initiative
24	FMFCD	Fresno Metropolitan Flood Control District
25	FMMP	California Farmland Mapping and Monitoring Program
26		
27	FMWG	Fisheries Management Work Group
28	FONSI	Finding of No Significant Impact
29	FPA	Friant Power Authority
30	FPP	Friant Power Project
31	FR	Federal Register
32	FRA	Federal Railroad Administration
33	Fresno COG	Council of Fresno County Governments
34	FSZ	Farmland Security Zone
35	FTA	Federal Transit Administration
36	FWA	Friant Water Authority
37	FWCA	Fish and Wildlife Coordination Act
38	FY	fiscal year
39	GAMA	Groundwater Ambient Monitoring Assessment
40	GCM	Global Circulation Model
41	GHG	greenhouse gas

1	GIS	geographic information system
2	GMP	groundwater management plan
3	GSM	Central Valley Ground-Surface Water Model
4	Guidance	SJVAPCD Guidance for Valley Land-Use Agencies
5		in Addressing GHG Emission Impacts for New
6		Projects Under CEQA
7	GWh	gigawatt-hour
8	GWP	Global Warming Potential
9	H ₂ SO ₃	sulfuric acid
10	HAP	hazardous air pollutant
11	HFC	hydrofluorocarbons
12	hp	horsepower
13	Hz	hertz
14	I	Interstate
15	ID	irrigation district
16	IEP	USFWS Interagency Ecological Program
17	in/sec	inch per second
18	in/year	inch per year
19	INSAR	Interferometric Synthetic Aperture Radar
20	IPAR	Initial Program Alternatives Report
21	IPCC	Intergovernmental Panel on Climate Change
22	IS	Initial Study
23	ISR	Indirect Source Review
24	ITA	Indian Trust Assets
25	IWM	instream woody material
26	Jones Pumping	C.W. “Bill” Jones Pumping Plant
27	Plant	
28	JPOD	joint point of diversion
29	KingIGSM	Kings Groundwater Basin Model
30	km	kilometer
31	L _{dn}	day-night noise level
32	L _{eq}	equivalent noise level
33	LESA	Land Evaluation and Site Assessment
34	LIM	Land Inventory and Monitoring
35	L _{max}	maximum noise level
36	L _{min}	minimum noise level
37	LOD	level of development
38	LOS	level of service
39	LRA	Local Responsibility Area
40	LSJLD	Lower San Joaquin Levee District
41	LSZ	low salinity zone

1	LUST	leaking underground storage tank
2	M&I	municipal and industrial
3	MAA	may adversely affect
4	MAF	million acre-feet
5	MBTA	Migratory Bird Treaty Act
6	MCDEH	Merced County Department of Environmental
7		Health
8	MCEH	Madera County Department of Environmental
9		Health
10	MCL	maximum contaminant level
11	MCLG	maximum contaminant level goal
12	MCTC	Madera County Transportation Commission
13	MCWPA	Madera-Chowchilla Water and Power Authority
14	mg/L	milligram per liter
15	mm	millimeter
16	MMRP	Mitigation Monitoring and Reporting Program
17	MND	Mitigated Negative Declaration
18	MOA	Memorandum of Agreement
19	MOU	Memorandum of Understanding
20	mph	mile per hour
21	msl	mean sea level
22	MT	metric ton
23	Multi-Hazard	State of California Multi-Hazard Mitigation Plan
24	Mitigation Plan	
25	MW	megawatt
26	MWC	Mutual Water Company
27	MWD	Metropolitan Water District of Southern California
28	MWh	megawatt-hour
29	N ₂ O	nitrous oxide
30	NAAQS	National Ambient Air Quality Standards
31	NAHC	Native American Heritage Commission
32	NAVD	North American Vertical Datum
33	NEPA	National Environmental Policy Act
34	NESHAP	National Emission Standards for Hazardous Air
35		Pollutants
36	NFIP	National Flood Insurance Program
37	NHPA	National Historic Preservation Act
38	NL	California Department of Public Health notification
39		limit
40	NLAA	not likely to adversely affect
41	NMFS	National Marine Fisheries Service

San Joaquin River Restoration Program

1	NO	nitric oxide
2	NO ₂	nitrogen dioxide
3	NOE	Notice of Exemption
4	NOI	Notice of Intent
5	NOP	Notice of Preparation
6	NO _x	oxides of nitrogen
7	NPDES	National Pollutant Discharge Elimination System
8	NRCS	National Resource Conservation Service
9	NRDC	Natural Resources Defense Council
10	NRHP	National Register of Historic Places
11	NTU	nephelometric turbidity unit
12	NULE	Non-Urban Levee Evaluation
13	NWR	National Wildlife Refuge
14	O&M	operations and maintenance
15	OES	Governor's Office of Emergency Services
16	ONC	California Office of Noise Control
17	OPR	Office of Planning and Research
18	OSHA	U.S. Department of Labor, Occupational Safety and
19		Health Administration
20	PA	Programmatic Agreement
21	PARCS	Fresno Department of Parks, After School,
22		Recreation and Community services
23	PCB	polychlorinated biphenyl
24	pCi/L	picocurie per liter
25	PEIS/R	Program Environmental Impact Statement/Report
26	PFC	perfluorocarbons
27	PG&E	Pacific Gas and Electric Company
28	PM ₁₀	particulate matter with an aerodynamic resistance
29		diameter of 10 micrometers or less
30	PM _{2.5}	fine particulate matter with an aerodynamic
31		resistance diameter of 2.5 micrometers or less
32	POU	place of use
33	ppm	part per million
34	ppt	part per thousand
35	PPV	peak particle velocity
36	PRC	Public Resources Code
37	PRI	Port Railroad, Inc.
38	RA	Restoration Administrator
39	RBDD	Red Bluff Diversion Dam
40	RCRA	Resource Conservation and Recovery Act
41	RD	reclamation district

1	Reclamation	U.S. Department of the Interior, Bureau of Reclamation
2		
3	Reporting Rule	EPA Greenhouse Gas Reporting Rule
4	RHA	Rivers and Harbors Act
5	RHJV	Riparian Habitat Joint Venture
6	RHMMP	Riparian Habitat Mitigation and Monitoring Plan
7	RMP/GP	Resource Management Plan and General Plan
8	RMS	root mean square
9	ROG	reactive organic gas
10	RP	recreation policy
11	RPF	recreation policy-facility
12	rpm	revolution per minute
13	RPS	recreation policy siting
14	RTP	Regional Transportation Plan
15	RWA	Recovered Water Account
16	RWD	report of waste discharge
17	RWQCB	Regional Water Quality Control Board
18	SAFETEA-LU	Safe, Accountable, Flexible, and Efficient Transportation Equity Act: A Legacy for Users
19		
20	SB	Senate Bill
21	SCAQMD	South Coast Air Quality Management District
22	SCE	Southern California Edison
23	SCWA	Solano County Water Agency
24	SDIP	South Delta Improvements Program
25	SDWA	South Delta Water Agency
26	SDWSC	Stockton Deep Water Ship Channel
27	SEC	section
28	Secretary	Secretary of the Interior
29	SEL	sound exposure level
30	Settlement	Stipulation of Settlement in <i>NRDC, et al., v. Kirk Rodgers, et al.</i>
31		
32	SF ₆	sulfur hexafluoride
33	SFHA	Special Flood Hazard Areas
34	SHPO	State Historic Preservation Officer
35	SIP	State Implementation Plan
36	SJAPCD	San Joaquin Air Pollution Control District
37	SJRA	San Joaquin River Agreement
38	SJRC	San Joaquin River Conservancy
39	SJRECWA	San Joaquin River Exchange Contractors Water Authority
40		
41	SJRGA	San Joaquin River Group Authority

San Joaquin River Restoration Program

1	SJRGMA	San Joaquin River Gorge Management Area
2	SJRMP	San Joaquin River Management Program
3	SJRPCT	San Joaquin River Parkway and Conservation Trust
4	SJRRP	San Joaquin River Restoration Program
5	SJVAB	San Joaquin Valley Air Basin
6	SJVAPCD	San Joaquin Valley Air Pollution Control District
7	SJVDP	San Joaquin Valley Drainage Program
8	SLCC	San Luis Canal Company
9	SMARA	State Surface Mining and Reclamation Act
10	SO ₂	sulfur dioxide
11	Southern San	Southern San Joaquin Municipal Utilities District
12	Joaquin MUD	
13	SR	State Route
14	SRA	State Recreation Area
15	SRTTG	Sacramento River Temperature Task Group
16	State	State of California
17	STC	Sound Transmission Class
18	SVP	Society of Vertebrate Paleontology
19	SWAT	Special Weapons and Tactics
20	SWP	State Water Project
21	SWPPP	Stormwater Pollution Prevention Plan
22	SWRCB	State Water Resources Control Board
23	TAC	toxic air contaminant
24	TAF	thousand acre-feet
25	TCD	temperature control device
26	TDS	total dissolved solids
27	TMDL	total maximum daily load
28	tpd	ton per day
29	TPY	ton per year
30	TSCA	Toxic Substances Control Act
31	UBC	Uniform Building Code
32	UCMP	University of California, Museum of Paleontology
33	UPRR	Union Pacific Railroad
34	USC	United States Code
35	USDA	U.S. Department of Agriculture
36	USFS	U.S. Forest Service
37	USFWS	U.S. Fish and Wildlife Service
38	USGS	U.S. Geological Survey
39	USJRBSI	Upper San Joaquin River Storage Basin
40		Investigation
41	VAMP	Vernalis Adaptive Management Program

1	VdB	vibration decibel
2	VDE	visible dust emissions
3	VMT	vehicle miles traveled
4	WD	water district
5	WDL	DWR Water Data Library
6	WDR	waste discharge requirement
7	WESTSIM	Westside Simulation Model
8	WG	Work Group
9	WMA	Wildlife Management Area
10	WMA	Water Management Area
11	WNV	West Nile virus
12	WQCP	Water Quality Control Plan
13	WRDA	Water Resources Development Act
14	WSD	water storage district
15	WY	water year
16	X2	distance upstream from the Golden Gate Bridge
17		where tidally averaged salinity is equal to 2 parts
18		per thousand
19		

This page left blank intentionally.

1 Chapter 1.0

2 Introduction

3 The San Joaquin River Restoration Program (SJRRP) was established in late 2006 to
4 implement a Stipulation of Settlement (Settlement) in *NRDC, et al., v. Kirk Rodgers, et*
5 *al.* (Appendix A). The U.S. Department of the Interior, Bureau of Reclamation
6 (Reclamation), as the Federal lead agency under the National Environmental Policy Act
7 (NEPA), and the California Department of Water Resources (DWR), as the State lead
8 agency under the California Environmental Quality Act (CEQA), have prepared this joint
9 Draft Program Environmental Impact Statement/Report (PEIS/R) to implement the
10 Settlement. Federal authorization for implementing the Settlement is provided in the San
11 Joaquin River Restoration Settlement Act (Act) (Public Law 111-11) (Appendix B).

12 Authority for combined Federal and State documents is provided in Title 40, Code of
13 Federal Regulations (CFR), Sections 1502.25, 1506.2, and 1506.4 (Council on
14 Environmental Quality's Regulations for Implementing NEPA (CEQ Regulations)) and
15 California Code of Regulations (CCR) Title 14, Division 6, Chapter 3 (State CEQA
16 Guidelines), Section 15222 (Preparation of Joint Documents). This document also was
17 prepared consistent with U.S. Department of the Interior regulations specified in 43 CFR,
18 Part 46 (U.S Department of the Interior Implementation of NEPA, Final Rule). This Draft
19 PEIS/R evaluates potential direct, indirect, and cumulative impacts on the environment at
20 a program level that could result from implementing the Settlement consistent with the
21 Act. This Draft PEIS/R also analyzes, at a project level of detail, the potential direct,
22 indirect, and cumulative impacts that could result from implementing certain aspects of
23 the Settlement, including release, conveyance, and recapture of Interim and Restoration
24 flows. In addition, this Draft PEIS/R includes feasible mitigation measures to avoid,
25 minimize, rectify, reduce, or compensate for significant adverse impacts.

26 1.1 Background

27 Originating high in the Sierra Nevada Mountains, the San Joaquin River carries snowmelt
28 from mountain meadows to the valley floor before turning north and becoming the
29 backbone of tributaries draining into the San Joaquin Valley. The San Joaquin River is
30 California's second longest river and discharges to the Sacramento-San Joaquin Delta
31 (Delta) and, ultimately, to the Pacific Ocean through San Francisco Bay.

32 Historically, the San Joaquin River supported a rich and diverse ecosystem influenced by
33 seasonal runoff patterns. During winter and spring months, runoff from Sierra Nevada
34 streams would spread over the valley floor and slowly drain to the Delta, providing rich
35 habitat supporting numerous aquatic and wildlife species, including Chinook salmon.

1 Over the past two centuries, development of water resources transformed the San Joaquin
2 River. In the late 1880s, settlers in the Central Valley drained large areas of valley floor
3 lands and put these lands into agricultural production, supported by small and seasonal
4 diversion dams on the river and a series of water conveyance and drainage canals.
5 Hydroelectric project development in the upper portions of the San Joaquin River
6 watershed harnessed power from the river and modified the natural flow patterns.

7 In 1944, Reclamation completed construction of Friant Dam on the San Joaquin River.
8 With the completion of Friant-Kern Canal in 1951 and Madera Canal in 1945, Friant
9 Dam diverted San Joaquin River water supplies to over 1 million acres of highly
10 productive farmland along the eastern portion of the San Joaquin Valley. Operation of the
11 dam ceased flow in some portions of the river and extirpated salmon runs in the San
12 Joaquin River upstream from its confluence with the Merced River.

13 **1.1.1 Stipulation of Settlement**

14 In 1988, a coalition of environmental groups, led by the Natural Resources Defense
15 Council (NRDC), filed a lawsuit, known as *NRDC, et al., v. Kirk Rodgers, et al.*,
16 challenging the renewal of long-term water service contracts between the United States
17 and Central Valley Project (CVP) Friant Division contractors (Appendix A). On
18 September 13, 2006, after more than 18 years of litigation, the Settling Parties, including
19 NRDC, Friant Water Authority (FWA), and the U.S. Departments of the Interior and
20 Commerce, agreed on the terms and conditions of a Settlement (see Appendix A)
21 subsequently approved by the U.S. Eastern District Court of California (Court) on
22 October 23, 2006. The Act, included in Public Law 111-11 (see Appendix B) and signed
23 into law on March 30, 2009, authorizes and directs the Secretary of the Interior
24 (Secretary) to implement the Settlement. The Settlement establishes two primary goals:

- 25 • **Restoration Goal** – To restore and maintain fish populations in “good condition”
26 in the main stem San Joaquin River below Friant Dam to the confluence of the
27 Merced River, including naturally reproducing and self-sustaining populations of
28 salmon and other fish.
- 29 • **Water Management Goal** – To reduce or avoid adverse water supply impacts on
30 all of the Friant Division long-term contractors that may result from the Interim
31 and Restoration flows provided for in the Settlement.

32 To achieve the Restoration Goal, the Settlement calls for releases of water from Friant
33 Dam to the confluence of the Merced River (referred to as Interim and Restoration
34 flows), a combination of channel and structural modifications along the San Joaquin
35 River below Friant Dam, and reintroduction of Chinook salmon. Restoration Flows are
36 specific volumes of water to be released from Friant Dam during different year types,
37 according to Exhibit B of the Settlement; Interim Flows are experimental flows that
38 began in 2009 and will continue until full Restoration Flows are initiated, with the
39 purpose of collecting relevant data concerning flows, temperatures, fish needs, seepage
40 losses, recirculation, recapture, and reuse. To achieve the Water Management Goal, the
41 Settlement calls for recirculation, recapture, reuse, exchange, or transfer of the Interim
42 and Restoration flows to reduce or avoid impacts to water deliveries to all of the Friant

1 Division long-term contractors caused by the Interim and Restoration flows. In addition,
2 the Settlement establishes a Recovered Water Account (RWA) and recovered water
3 program to make water available to all of the Friant Division long-term contractors who
4 provide water to meet Interim or Restoration flows, to reduce or avoid the impact of the
5 Interim and Restoration flows on such contractors. Interim and Restoration flows are
6 described in greater detail in Chapter 2.0, “Description of Alternatives.”

7 The Settlement and the Act authorize and direct specific physical and operational actions
8 that could potentially directly or indirectly affect environmental conditions in the Central
9 Valley. Areas potentially affected by Settlement actions include the San Joaquin River
10 and associated flood bypass system, tributaries to the San Joaquin River, the Delta, and
11 water service areas of the CVP and State Water Project (SWP), including the Friant
12 Division. Settlement Paragraphs 11 through 16 describe the physical and operational
13 actions. Table 1-1 summarizes the level of analysis provided in this Draft PEIS/R for
14 actions identified in key Settlement paragraphs.

1
2

**Table 1-1.
Restoration and Water Management Actions in Key Settlement Paragraphs**

Settlement Paragraph	Description	Level of NEPA/CEQA Compliance Supported by Draft PEIS/R
11	Identifies specific channel and structural improvements considered necessary to achieve the Restoration Goal. Includes a list of improvements.	Program Level
12	Acknowledges that additional channel or structural improvements not identified in Paragraph 11 may be needed to achieve the Restoration Goal.	Program Level
13	Identifies specific volumes of water to be released from Friant Dam during different year types (Restoration Flows), and provisional water supplies to meet the Restoration Flow targets, as provided in Exhibit B of the Settlement. Stipulates the release of full Restoration Flows no later than January 1, 2014, subject to then-existing channel capacities.	Project Level
14	Stipulates that spring-run and fall-run Chinook salmon be reintroduced to the San Joaquin River between Friant Dam and the confluence of the San Joaquin River with the Merced River no later than December 31, 2012. Assigns priority to self-sustaining spring-run Chinook salmon over fall-run Chinook salmon.	Program Level
15	Specifies that a program of Interim Flows begins no later than October 1, 2009, and continues until full Restoration Flows can begin, to collect relevant data concerning flows, temperatures, fish needs, seepage losses, recirculation, recapture, and reuse.	Project Level for release of Interim Flows and related actions Program Level for some data collection activities
16	Requires that the Secretary develop and implement a plan for recirculation, recapture, reuse, exchange, or transfer of the Interim and Restoration flows to reduce or avoid impacts to water deliveries for all Friant Division long-term contractors. This paragraph also calls for establishment of an RWA and program to make water available to the Friant Division long-term contractors who provide water to meet Interim or Restoration flows.	Project Level for recapture in the Restoration Area and in the Delta Program Level for all other Water Management actions

Key:
 CEQA = California Environmental Quality Act
 NEPA = National Environmental Policy Act
 PEIS/R = Program Environmental Impact Statement/Report
 RWA = Recovered Water Account
 Secretary = Secretary of the Interior

3 **1.1.2 San Joaquin River Restoration Program**

4 The SJRRP comprises several Federal and State of California (State) agencies
 5 responsible for implementing the Settlement. Implementing Agencies include
 6 Reclamation, U.S. Fish and Wildlife Service, National Marine Fisheries Service,
 7 California Department of Water Resources; and California Department of Fish and
 8 Game. Table 1-2 shows milestone dates recommended in the Settlement. The
 9 Implementing Agencies are committed to attaining these milestones, as demonstrated by
 10 the release of Interim Flows beginning in October 2009; however, these dates may
 11 change, pending completion of compliance, coordination, consultation, data collection,

1 and related efforts. Reclamation and DWR initiated the NEPA and CEQA processes in
 2 August 2007 to analyze implementation of the Settlement. As mentioned, Reclamation is
 3 the lead NEPA agency and DWR is the lead CEQA agency in preparing this Draft
 4 PEIS/R.

5
6

**Table 1-2.
Key Settlement Milestones**

Date	Milestone¹	Status
October 2009	• Initiate Interim Flows and Monitoring Program	Completed
September 2010	• USFWS submits a completed permit application to NMFS for reintroduction of spring-run Chinook salmon	Completed
April 2012	• NMFS issues a decision on the permit application for reintroduction of spring-run Chinook salmon	Future
December 2012	• Reintroduce spring-run and fall-run Chinook salmon, if permitted by NMFS	Future
December 2013	• Complete Phase 1 improvements identified in the Settlement • Secretary of the Interior, in consultation with NRDC and FWA, develops operational guidelines	Future
January 2014	• Initiate full Restoration Flows	Future
December 2016	• Complete Phase 2 improvements identified in the Settlement	Future
December 2024	• Secretary of Commerce reports to Congress on the progress made in reintroducing spring-run and fall-run Chinook salmon and discusses plans for future implementation of the Settlement	Future
December 2025	• Review and revise Restoration Flows, if necessary	Future
January – July 2026	• Any party to the Settlement may file a motion to request an increase, decrease, or material change in the quantity and/or timing of Restoration Flows	Future

Note:

¹ These milestones are set forth in the Settlement.

Key:

FWA = Friant Water Authority

NMFS = National Marine Fisheries Service

NRDC = Natural Resources Defense Council

Settlement = Stipulation of Settlement

USFWS = U.S. Fish and Wildlife Service

7 In addition to the Implementing Agencies, the Settlement stipulates that a Technical
 8 Advisory Committee be established, comprising six members appointed by NRDC and
 9 FWA. The Settlement also calls for a Restoration Administrator (RA) to be appointed by
 10 NRDC and FWA, to facilitate the Technical Advisory Committee and provide specific
 11 recommendations to the Secretary in coordination with the Technical Advisory
 12 Committee. The RA's duties are defined in the Settlement, and include making
 13 recommendations to the Secretary on the release of Interim and Restoration flows. The
 14 RA is also responsible for consulting with the Secretary on implementing actions under
 15 Paragraph 11 of the Settlement, and for identifying and recommending additional actions
 16 under Paragraph 12 of the Settlement. In addition, the RA is responsible for consulting
 17 with the Secretary on the reintroduction of Chinook salmon under Paragraph 14 of the
 18 Settlement. The RA's recommendations would be taken into consideration by the

1 Secretary in making decisions or taking specific actions to be implemented under the
2 Settlement.

3 **1.1.3 Scoping and Public Involvement Process**

4 The Implementing Agencies conducted extensive public and stakeholder outreach
5 activities to engage and inform all interested parties of SJRRP activities, including
6 development of this Draft PEIS/R. Reclamation initiated the NEPA process by issuing a
7 Notice of Intent (NOI) on August 2, 2007, and DWR initiated the CEQA process by
8 issuing a Notice of Preparation (NOP) on August 22, 2007, to prepare this Draft PEIS/R
9 and hold public scoping meetings. The PEIS/R scoping comment period began the date
10 the NOI was issued and ended on September 26, 2007. The Implementing Agencies
11 convened four public meetings, one each in Tulare (August 28, 2007), Fresno (August
12 29, 2007), Los Banos (August 30, 2007), and Sacramento (September 10, 2007), to
13 inform the public and interested stakeholders about the SJRRP, and to solicit comments
14 and input on the scope of the PEIS/R. Reclamation and DWR received comments from
15 85 entities, including Federal and State agencies, local interest groups, local residents,
16 farmers, landowners, environmental groups, public advocacy groups, Native American
17 community groups, and individuals. The comments received were summarized in a
18 *Public Scoping Report* released December 14, 2007 (SJRRP).

19 Public involvement and outreach activities have enabled the Implementing Agencies to
20 successfully involve stakeholders and incorporate public and stakeholder input into the
21 development of major SJRRP documents, including this Draft PEIS/R. These activities
22 seek to create an open and transparent process through which the general public,
23 stakeholders, affected Third Parties, and other interested parties can track and participate
24 in SJRRP activities, including the formulation of alternatives for this Draft PEIS/R.
25 Ongoing public outreach activities conducted in support of the SJRRP include the
26 following:

- 27 • Preparing for and hosting Technical Feedback Meetings with subject-matter
28 experts, Settling Parties, affected stakeholders, and the general public to obtain
29 information and viewpoints from individual attendees; provide updates on the
30 status of SJRRP work products; keep the Technical Feedback Group up-to-date
31 with the current status of the SJRRP; gather feedback on SJRRP documents; and
32 discuss potential opportunities and constraints that may arise. The format of
33 obtaining and disseminating information through Technical Feedback Group
34 meetings is intended to be flexible to address the issues and documents at hand
35 and to accommodate the needs of the SJRRP, Settling Parties, stakeholders, and
36 the general public.
- 37 • Maintaining a publicly accessible, SJRRP-specific Web site that offers timely
38 information and updates, a document repository that includes technical
39 memoranda, a calendar of events, and contact information (www.restoresjr.net).
- 40 • Making available technical memoranda and other milestone SJRRP documents to
41 the general public, stakeholders, affected Third Parties, and other interested
42 parties on the SJRRP Web site.

- 1 • Developing and distributing a wide variety of SJRRP information, including
2 quarterly SJRRP updates, news releases, fact sheets, and brochures to keep the
3 public informed.

4 The lead agency must, whenever practicable, use a consensus-based management
5 approach to the NEPA process, as required by 43 CFR 46.110. Consensus-based
6 management "...involves outreach to persons, organizations or communities who may be
7 interested in or affected by a proposed action with an assurance that their input will be
8 given consideration by the Responsible Official in selecting a course of action" (43 CFR
9 46.110(a)). The Draft PEIS/R was developed with a consensus-based management
10 approach. The completed and ongoing activities conducted in support of the SJRRP, as
11 described above, constitute outreach performed in support of this approach.

12 **1.2 Purpose and Uses of PEIS/R**

13 The purpose of this Draft PEIS/R is to disclose the potential direct, indirect, and
14 cumulative impacts of implementing the Settlement, as directed by the Act, consistent
15 with NEPA/CEQA requirements. This Draft PEIS/R serves as an informational document
16 for decision makers, public agencies, nongovernmental organizations, and the general
17 public regarding the potential direct, indirect, and cumulative environmental
18 consequences of implementing any of the alternatives. It is anticipated that future site-
19 specific environmental analysis would be developed based on information from the
20 PEIS/R.

21 This Draft PEIS/R does not identify a preferred alternative for implementation.
22 Consistent with CEQ Regulations, 40 CFR Part 46.425, and State CEQA Guidelines, the
23 Final PEIS/R will identify a preferred alternative for implementation (or alternatives, if
24 more than one exists). The preferred alternative will be identified in the Final PEIS/R
25 based on the information presented in this Draft PEIS/R, in light of any potential
26 revisions made in response to comments received on this Draft PEIS/R. After the Final
27 PEIS/R is published, Reclamation will prepare and adopt a Record of Decision, and
28 DWR will prepare and adopt a Notice of Determination, to implement a preferred
29 alternative.

30 **1.2.1 National Environmental Policy Act**

31 NEPA provides an interdisciplinary framework for Federal agencies to take
32 environmental factors into account during a decision making process (42 United States
33 Code (USC) 4321, 40 CFR 1500.1). NEPA requires an Environmental Impact Statement
34 (EIS) whenever a proposed major Federal action (e.g., a proposal for legislation or an
35 activity financed, assisted, conducted, or approved by a Federal agency with Federal
36 agency control) significantly affects the quality of the human environment. Section
37 1508.14 of the CEQ Regulations defines the human environment to include "the natural
38 and physical environment and the relationship of people with that environment."

39 The EIS, in conjunction with other relevant material, is used by the Federal Government
40 to plan actions and make decisions. Section 1502.1 of the CEQ Regulations states that an

1 EIS primarily serves as an action-forcing device to infuse the policies and goals defined
2 in NEPA into ongoing programs and actions of the Federal Government. As an
3 informational document, an EIS provides a rigorous and objective evaluation of all
4 reasonable alternatives; full and open disclosure of environmental consequences before
5 agency action; an interdisciplinary approach to project evaluation; identification of
6 measures to mitigate impacts; and an avenue for public and agency participation in
7 decision making (40 CFR 1502.1). NEPA defines mitigation as avoiding, minimizing,
8 rectifying, reducing, or compensating for significant effects of a proposed action (40 CFR
9 1508.20). NEPA also requires evaluating a proposed action and alternatives at an equal
10 level of detail.

11 NEPA requires that a lead agency “include [in an EIS] appropriate mitigation measures
12 not already included in the proposed action or alternatives” (40 CFR 1502.14(f)). An EIS
13 must also include discussions of “means to mitigate adverse environmental impacts (if
14 not fully covered under Section 1502.14(f)).” In preparing a Record of Decision under 40
15 CFR 1505.2, a lead agency must “[s]tate whether all practicable means to avoid or
16 minimize environmental harm from the alternative selected have been adopted, and if not,
17 why they were not. A monitoring and enforcement program shall be adopted and
18 summarized where applicable for any mitigation.”

19 **1.2.2 California Environmental Quality Act**

20 The State CEQA Guidelines (14 CCR Section 15064(f)(1)) require that an Environmental
21 Impact Report (EIR) be prepared whenever a project may result in a significant
22 environmental impact. Section 15064(d) states that “in evaluating the significance of the
23 environmental effect of a project, the lead agency shall consider direct physical changes
24 in the environment which may be caused by the project and reasonably foreseeable
25 indirect physical changes in the environment which may be caused by the project.” An
26 EIR is an informational document used to inform public agency decision makers and the
27 general public of the significant environmental effects of a project, identify possible ways
28 to mitigate or avoid the significant effects, and describe a range of reasonable alternatives
29 to the project that could feasibly attain most of the basic objectives of the project while
30 substantially lessening or avoiding any of the significant environmental impacts. When
31 determining whether to approve a project, State and local public agencies are required by
32 CEQA to consider the information presented in the EIR.

33 CEQA requires that State and local government agencies consider the potential
34 environmental effects of projects over which they have discretionary authority before
35 taking action on those projects (Public Resources Code (PRC) Section 21000 et seq.).
36 CEQA also requires that each public agency avoid or mitigate to less-than-significant
37 levels, wherever feasible, the significant environmental effects of projects it approves or
38 implements. If a project would result in significant and unavoidable environmental
39 impacts that cannot be feasibly mitigated to less-than-significant levels, the project can
40 still be approved, but the lead agency’s decision makers must issue a “statement of
41 overriding considerations” explaining in writing the specific economic, social, or other
42 considerations that they conclude, based on substantial evidence, make those significant
43 effects acceptable.

1 Section 15126.6(a) of the State CEQA Guidelines also requires that an EIR describe and
2 evaluate a reasonable range of alternatives that would feasibly attain most of the basic
3 project objectives, and would avoid or substantially lessen any significant impact of the
4 project, as proposed. A range of reasonable alternatives is analyzed to define issues and
5 provide a clear basis for choice among options. CEQA requires that the lead agency
6 consider alternatives that would avoid or reduce one or more of the significant impacts
7 identified for a project in an EIR. The State CEQA Guidelines state that the range of
8 alternatives required to be evaluated in an EIR is governed by the “rule of reason”; the
9 EIR needs to describe and evaluate only those alternatives necessary to permit a
10 reasonable choice and to foster informed decision making and informed public
11 participation (Section 15126.6(f)). Consideration of alternatives focuses on those that can
12 either eliminate significant adverse environmental impacts, or reduce them to less-than-
13 significant levels; alternatives considered in this context may include those that are more
14 costly and those that could impede to some degree the attainment of all project objectives
15 (Section 15126(b)). CEQA does not require alternatives to be evaluated in the same level
16 of detail as the proposed project.

17 **1.2.3 Type of Environmental Document**

18 This Draft PEIS/R presents two levels of analyses, program-level and project level
19 analyses. The program-level, or first-tier, analysis of the alternatives is performed in
20 accordance with CEQ Regulations (40 CFR 1502.20), and consistent with California
21 PRC Sections 21093 and 21094; Title 14 CCR Sections 15152 and 15168; and 40 CFR
22 1500.4(i), 1502.4(b), and 1502.20, among others. The program-level analysis evaluates
23 the actions identified in the Settlement. (See Chapter 2.0, “Description of Alternatives,”
24 for further detail on Settlement actions.) For actions evaluated at a program level of
25 detail, a potential range of future construction and management actions is included in the
26 alternatives to bracket the probable range of effects. This bracketed range of potential
27 effects also will allow for an informed analysis of system-wide and cumulative impacts
28 resulting from implementing the entirety of the Settlement. This Draft PEIS/R also
29 includes more detailed project-level analysis of certain actions fully described in each
30 alternative. Table 1-1 summarizes the level of analysis (program or project) provided in
31 this Draft PEIS/R for Settlement actions. Actions considered for evaluation but not
32 included in the action alternatives (described in Appendix G, “Plan Formulation”) are not
33 prohibited from future implementation, but would require separate analysis pursuant to
34 NEPA and/or CEQA at a project level of detail.

35 ***Program-Level Analysis***

36 The program-level analysis considers the broad environmental effects of implementing
37 the Settlement, and addresses the entire suite of effects of implementing the Settlement,
38 including the project-level actions evaluated in detail in this Draft PEIS/R, as well as
39 cumulative impacts. Based on the program-level analysis, this Draft PEIS/R also
40 identifies mitigation measures and performance standards that would apply to
41 subsequent, future project components implemented as part of the Settlement (as
42 conditions of approval). The Implementing Agencies would incorporate these
43 performance standards into the implementation of Settlement actions to avoid or reduce
44 impacts. In addition, the program-level analysis addresses a reasonable range of
45 alternatives at an equal level of detail. A No-Action Alternative (which also constitutes

1 the No-Project alternative under CEQA) is also analyzed, as required by NEPA and
2 CEQA.

3 The Implementing Agencies acknowledge that additional analysis pursuant to NEPA
4 and/or CEQA will be required in the future for activities addressed at a program level in
5 this Draft PEIS/R, after specific project details are identified. At that time, the
6 Implementing Agencies would require compliance with the mitigation measures and
7 performance standards set forth in this PEIS/R as conditions for approval of subsequent
8 actions. The extent of environmental review for future actions will depend on a number
9 of factors, including the extent to which the programmatic analysis, mitigation measures,
10 and performance standards have anticipated and accounted for the project-specific
11 impacts of the future action. All actions evaluated only at a program level in this Draft
12 PEIS/R must complete additional analysis pursuant to NEPA and/or CEQA at a project
13 level of detail.

14 This Draft PEIS/R provides broad direction for a wide range of possible future actions
15 while allowing the opportunity for flexibility to respond to changing needs and
16 conditions. Future project-level NEPA/CEQA documents may incorporate the findings of
17 the PEIS/R by reference through “tiering,” or incorporating by reference general
18 discussions from the PEIS/R. It is anticipated that later documents will focus solely on
19 issues specific to the later project. A PEIS/R can be used in this way to simplify the task
20 of preparing environmental documents for later parts of a program.

21 Incorporation of previous analysis by reference is encouraged for NEPA analysis under
22 the CEQ Regulations (40 CFR 1500.4, 1502.21):

23 *Agencies shall incorporate material into an environmental impact*
24 *statement by reference when the effect will be to cut down on bulk*
25 *without impeding agency and public review of the action. The*
26 *incorporated material shall be cited in the statement and its content*
27 *briefly described. No material may be incorporated by reference*
28 *unless it is reasonably available for inspection by potentially*
29 *interested persons within the time allowed for comment. Material*
30 *based on proprietary data which is itself not available for review and*
31 *comment shall not be incorporated by reference.*

32 The State CEQA Guidelines allow for incorporation by reference when project-specific
33 analysis is tiered from previous analysis (Sections 15150 and 15152). Under Section
34 15152 of the State CEQA Guidelines, when CEQA documentation has been prepared for
35 a program of projects, project-specific studies for subsequent projects within the program
36 should be limited to effects which:

- 37 • Were not examined as significant effects on the environment in the program EIR
38 because appropriate mitigation (when available) would be identified for
39 significant effects identified in the program EIR.

- 1 • Were examined as significant effects on the environment in the program EIR, but
2 which could be reduced or avoided through specific revisions in the project (State
3 CEQA Guidelines Section 15152(d)).

4 ***Project-Level Analysis***

5 In addition to the program-level analysis described above, this Draft PEIS/R also includes
6 a more detailed project-level analysis of the following actions:

- 7 • Reoperate Friant Dam and downstream flow-control structures to release Interim
8 and Restoration flows, as constrained by then-existing channel capacities, to the
9 San Joaquin River, and make water supplies available to Friant Division long-
10 term contractors at a preestablished rate (Reclamation action).
- 11 • Provide additional funding to support additional maintenance activities, including
12 patrolling to assess levee conditions when increased potential for seepage is
13 identified through monitoring, as described in the Physical Monitoring and
14 Management Plan (Appendix D); performing any additional operations and
15 maintenance needed on flap gates in the Eastside and Mariposa bypasses, at the
16 Chowchilla Bypass Bifurcation Structure, at the Eastside Bypass Bifurcation
17 Structure, or at the Mariposa Bypass Bifurcation Structure to facilitate routing
18 Interim and Restoration flows; and removing vegetation and sediment by
19 mechanical or chemical means that would cause Interim or Restoration flows to
20 exceed channel capacity (Reclamation action).
- 21 • Recapture Interim and Restoration flows at existing facilities within the
22 Restoration Area and the Delta (Reclamation action).
- 23 • Reduce, redirect, or divert Interim or Restoration flows to reduce flow in
24 downstream reaches to address any issues identified through implementation of
25 the Physical Monitoring and Management Plan (Reclamation action).
- 26 • Modify releases from Friant Dam to adjust flows to flush or mobilize spawning
27 gravel based on monitoring reports and recommendations on spawning gravel
28 conditions (Reclamation action).
- 29 • Grant an order by the State Water Resources Control Board (SWRCB) for the
30 downstream protection and diversion of Interim and Restoration flows
31 (SWRCB action, serving as CEQA Responsible Agency).

32 ***Compliance and Permits Supported by PEIS/R***

33 Table 1-1 summarizes the level of analysis provided in this Draft PEIS/R for Settlement
34 actions. This Draft PEIS/R supports the needed permits, petitions, and similar
35 compliance, coordination, and consultation efforts for program- and project-level actions,
36 as shown in Table 1-3 and described in Chapter 28.0, “Consultation, Coordination, and
37 Compliance.”

1
2

**Table 1-3.
Compliance, Consultation, and Coordination Supported By This Draft PEIS/R**

Resource	Applicable Laws/Regulations/Permits	Regulating Agency/Agencies	Level of Compliance of Applicable Actions
All	San Joaquin River Restoration Settlement Act	Secretary of the Interior	Program and Project
Wetlands, Waters of the United States, and Federal Levees	Section 404 of the Clean Water Act – Individual or General Permit	U.S. Army Corps of Engineers	Program
	Section 10 of the Clean Water Act – Individual or General Permit	U.S. Army Corps of Engineers	Program
	Section 14 of the Clean Water Act (“Section 408”) – Permission	U.S. Army Corps of Engineers	Program
	Section 401 of the Clean Water Act – Water Quality Certification or Waiver	Regional Water Quality Control Board	Program
	Section 402 of the Clean Water Act – National Pollutant Discharge Elimination System permit(s)	State Water Resources Control Board and Regional Water Quality Control Board	Program
	Sections 1600 through 1607 of the California Fish and Game Code – Streambed Alteration Agreement	California Department of Fish and Game	Program
Federally Listed Species	Section 7 of the Federal Endangered Species Act – Section 7 Consultation	U.S. Fish and Wildlife Service and National Marine Fisheries Service	Program and Project
	Section 10(j) of the Federal Endangered Species Act – Section 10 permit	National Marine Fisheries Service	Program
Essential Fish Habitat	Magnuson-Stevens Fishery Conservation and Management Act	National Marine Fisheries Service	Program and Project
Fish and Wildlife Resources	Fish and Wildlife Coordination Act report	U.S. Fish and Wildlife Service	Program and Project
Cultural Resources	National Historic Preservation Act – Section 106 Consultation	State Historic Preservation Officer	Program and Project
State-Listed Species/State Special-Status Species	Section 2081 of the California Endangered Species Act – Incidental Take Permit/Consistency Determination	California Department of Fish and Game	Program and Project
	California Native Plant Protection Act	California Department of Fish and Game	Program and Project
Levees and Floodways	Central Valley Flood Protection Board Encroachment Permit and 33 Code of Federal Regulations 208.10 (U.S. Army Corps of Engineers review)	Central Valley Flood Protection Board and U.S. Army Corps of Engineers	Program
Water Rights	California Water Code – Water Right Petitions (including petitions for changes to Water Right Permits 11885, 11886, and 11887)	State Water Resources Control Board	Program and Project
State Lands	Land Use Lease	State Lands Commission	Program
Air Quality	Authority to Construct, Permit to Operate	San Joaquin Valley Air Pollution Control District	Program
State-Owned Roadways	Encroachment Permit	California Department of Transportation	Program
Surface Mining	California Surface Mining and Reclamation Act permit	California Surface Mining and Reclamation Act lead agencies and California Department of Conservation	Program

1.3 Relationship to Other SJRRP NEPA and CEQA Documents

Several environmental documents have been prepared previously to facilitate early actions needed to implement the Settlement. These documents are described further in Chapter 2.0, “Description of Alternatives,” and include the following:

- *San Joaquin River Restoration Program Water Level Recorder Installation and Data Collection Notice of Exemption (NOE)*. DWR. February 2009.
- *San Joaquin River Restoration Program Scour Chain Installation and Data Collection NOE*. DWR. February 2009.
- *Installation and Rehabilitation of Stream Gages on the San Joaquin River, Fresno, Madera, and Merced Counties, California Environmental Assessment (EA)/Finding of No Significant Impact (FONSI)*. Reclamation. December 2008.
- *Stream Gage Installation and Operation and Maintenance Project Initial Study (IS)/Mitigated Negative Declaration (MND)*. DWR. March 2009.
- *San Joaquin River Restoration Program Stream Bed and Sand Sampling NOE*. DWR. April 2009.
- *Chowchilla Bifurcation Structure Gate Seal Installation NOE*. DWR. August 2009.
- *Water Year 2010 Interim Flows Project EA/FONSI and IS/MND*. Reclamation and DWR. September 2009.
- *Draft San Joaquin River Restoration Program Geotechnical Investigation and Seepage Well Installation Project IS/MND*. DWR. October 2009
- *Water Year 2011 Interim Flows Project Supplemental EA/FONSI*. Reclamation. September 2010.

1.4 Purpose and Need for Action and Project Objectives

NEPA regulations require a statement of “the underlying purpose and need to which the agency is responding in proposing the alternatives, including the Proposed Action” (40 CFR 1502.13). The State CEQA Guidelines require a clearly written statement of objectives, including the underlying purpose of a project (Section 15124(b)).

The purpose of the proposed action is to implement the Settlement consistent with the Act. The Act authorizes and directs the Secretary to implement the Settlement.

1 The Settlement specifies the need, which requires changes to the operation of Friant Dam
2 in support of achieving the Restoration Goal while reducing or avoiding adverse impacts
3 to Friant Division long-term contractors' water deliveries caused by releasing Interim or
4 Restoration flows in support of achieving the Water Management Goal. The
5 Implementing Agencies identified several objectives of the proposed action:

- 6 • Release Interim Flows from Friant Dam in accordance with Settlement Paragraph
7 15.
- 8 • Release Restoration Flows from Friant Dam in accordance with Settlement
9 Paragraph 13.
- 10 • Implement channel and structure modifications in accordance with Settlement
11 Paragraph 11.
- 12 • Implement additional modifications to meet the Restoration Goal, in accordance
13 with Settlement Paragraph 12.
- 14 • Reintroduce spring-run and fall-run Chinook salmon to the San Joaquin River
15 below Friant Dam, in accordance with Settlement Paragraph 14.
- 16 • Develop and implement a plan to recirculate, recapture, reuse, exchange, or
17 transfer water released for Restoration Flows in accordance with criteria identified
18 in Settlement Paragraph 16(a).
- 19 • Establish an RWA that would account for reductions in water supply deliveries to
20 Friant Division long-term contractors resulting from the release of Interim and
21 Restoration flows, and make water available, at \$10 an acre-foot, to Friant
22 Division long-term contractors who have experienced water supply reductions
23 resulting from the release of Interim or Restoration flows, in accordance with
24 Settlement Paragraph 16(b).
- 25 • Develop and implement monitoring and management plans to guide
26 implementation of the Settlement, including the actions listed in the preceding
27 bullets, in accordance with the Settlement and the Act.

28 The purpose and objectives respond to a need to increase water releases from Friant Dam
29 to support achieving the Restoration Goal while implementing a plan for recirculation,
30 recapture, reuse, exchange, or transfer of the Interim and Restoration flows for the
31 purpose of reducing or avoiding adverse impacts to water deliveries to the Friant Division
32 long-term contractors caused by releasing Interim and Restoration flows.

1.5 Responsibilities of Lead Agencies, Responsible Agency, and Implementing Agencies

As previously described, Reclamation is the lead NEPA agency and DWR is the lead CEQA agency in preparing this Draft PEIS/R. The project-level actions addressed in the PEIS/R include actions to be undertaken by Reclamation, and the effects of these actions are the sole responsibility of Reclamation. DWR serves as the CEQA lead agency for the entire SJRRP, although DWR is not taking any discretionary action for the project-level actions analyzed in this Draft PEIS/R. SWRCB is the only State agency expected to take a discretionary action, in the form of a water rights approval related to the release and conveyance of Interim and Restoration flows. It is anticipated that SWRCB would use this PEIS/R in support of that decision as a CEQA Responsible Agency. In the future, it is expected that DWR, and other State agencies, will complete project-level CEQA review in support of discretionary actions to implement some of the actions addressed at a program level in the Final PEIS/R.

To implement the project-level actions, Reclamation would require a modified water rights permit from SWRCB. Under CEQA, SWRCB is a Responsible Agency insofar as it has a limited role related to the project-level actions analyzed in this Draft PEIS/R. To allow SWRCB to take its action as a Responsible Agency, which involves making findings that the agency has “considered” the EIR (see State CEQA Guidelines Section 15096(f)), DWR, as the CEQA Lead Agency, will be required to certify the PEIS/R as meeting CEQA requirements; adopt Findings of Fact, a Statement of Overriding Considerations, if needed, and a Mitigation Monitoring and Reporting Program; approve the program; and file a Notice of Determination. As the CEQA Lead Agency for the PEIS/R, DWR has prepared an EIR that provides sufficient project-level information to allow SWRCB, as a Responsible Agency, to (1) consider the environmental effects of the project-level actions, (2) mitigate or avoid environmental effects of those parts of the project over which those agencies have discretionary authority, and (3) make findings, required by CEQA Guidelines Section 15091, that its decision making body reviewed and considered the project-level environmental effects presented in the PEIS/R. As a Responsible Agency, if SWRCB decides to take action to approve its portion of the project, SWRCB must approve feasible mitigation measures that would reduce the magnitude of, or avoid any, significant impacts.

The Implementing Agencies, as previously mentioned, include Reclamation, U.S. Fish and Wildlife Service, National Marine Fisheries Service, California Department of Water Resources, and California Department of Fish and Game. The Settlement identifies the need for the involvement of the Secretary through Reclamation as the lead Federal agency responsible for implementation, and through U.S. Fish and Wildlife Service (USFWS) as the lead Federal agency responsible for reintroduction of spring-run and fall-run Chinook salmon. The Settlement also identifies the Secretary of the U.S. Department of Commerce, through National Marine Fisheries Service (NMFS), as a necessary participant to allow for permitting the reintroduction of spring-run Chinook salmon. The Act authorizes and directs the Secretary to implement the Settlement and appropriates funds for implementation. Implementation of the Settlement also requires

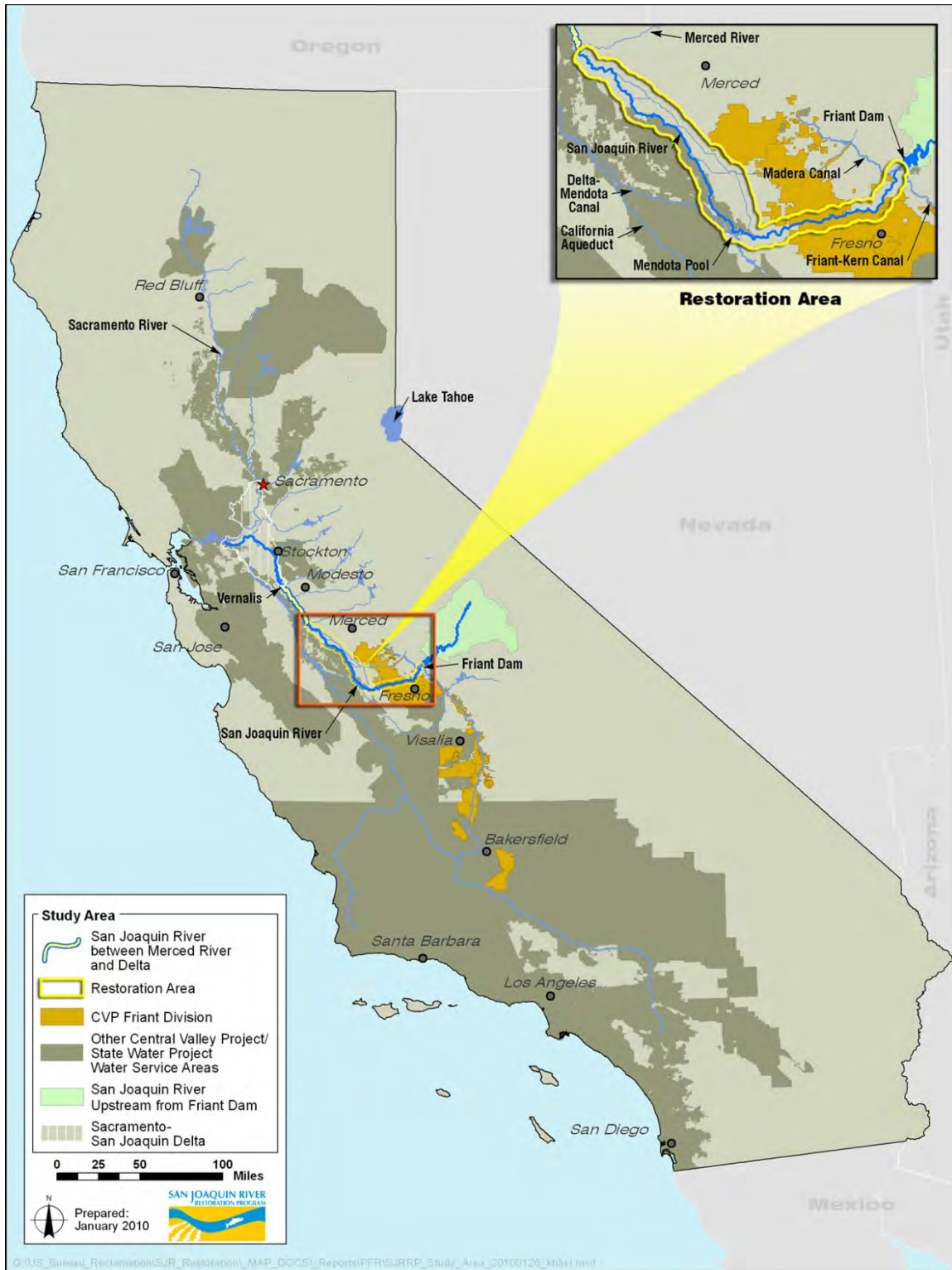
1 involvement of the State’s Natural Resources Agency through DWR and California
2 Department of Fish and Game (DFG). Consistent with a Memorandum of Understanding
3 (MOU) between the Settling Parties and the State, the California Natural Resources
4 Agency will play a major role in funding and implementing actions called for in the
5 Settlement and in the Act. DWR will assist in planning, designing, and constructing the
6 physical improvements identified in the Settlement, including projects related to flood
7 protection, levee relocation, and modifications to and maintenance of channel facilities.
8 DFG will provide technical assistance on actions related to the release of Interim and
9 Restoration flows and the reintroduction and monitoring of fish, and planning, designing,
10 and constructing facilities to provide fish passage.

11 **1.6 Study Area**

12 The study area for this Draft PEIS/R, shown in Figure 1-1, has been broadly defined to
13 evaluate potential direct, indirect, and cumulative effects within five geographic areas:

- 14 • San Joaquin River upstream from Friant Dam, including Millerton Lake
- 15 • San Joaquin River from Friant Dam to the Merced River confluence (Restoration
16 Area, which includes Reaches 1 through 5 and the flood bypasses, as shown in
17 Figure 1-2)
- 18 • San Joaquin River from the Merced River to the Delta
- 19 • Delta
- 20 • CVP/SWP water service areas, including the Friant Division of the CVP

21 These geographic areas are described in greater detail in Chapter 3.0, “Considerations for
22 Describing Affected Environment and Environmental Consequences.” Interim and
23 Restoration flows would contribute a relatively small amount of water to the Delta
24 compared to contributions of the San Joaquin and Sacramento rivers and other tributaries.
25 Therefore, effects of the SJRRP would be negligible downstream from the Delta (in
26 Suisun, San Pablo, or San Francisco bays, or in the Pacific Ocean). For this reason, the
27 Delta was identified as the downstream extent of the study area.



1
2
3

Figure 1-1.
Study Area for This Program Environmental Impact Statement/Report

San Joaquin River Restoration Program



1
2
3

Figure 1-2.
San Joaquin River Reaches and Flood Bypass System in Restoration Area

1 **1.7 Organization of PEIS/R**

2 This Draft PEIS/R is organized as shown below.

3 **Executive Summary** presents the purpose and intended uses of this Draft PEIS/R, and
4 describes lead agencies, project location, project background and future actions, need for
5 action, and project purpose/objectives; provides an overview of the alternatives under
6 consideration, and major conclusions of the environmental analysis; documents the
7 known areas of controversy and issues to be resolved; and summarizes in a table the
8 environmental impacts, mitigation measures, and significance conclusions for the
9 alternatives under consideration.

10 **Chapter 1.0, “Introduction,”** summarizes project background and context, PEIS/R
11 purpose and uses, relationship to other SJRRP NEPA and CEQA documents, purpose and
12 need for action and objectives, responsibilities of lead/responsible/Implementing
13 agencies, study area, and PEIS/R organization.

14 **Chapter 2.0, “Description of Alternatives,”** summarizes the methods used for selecting
15 the program alternatives, describes the program alternatives under consideration, and
16 discusses alternatives that have been eliminated from further discussion.

17 **Chapter 3.0, “Considerations for Describing the Affected Environment and
18 Environmental Consequences,”** describes the study area, and the approach and terms
19 used to describe the environmental and regulatory setting and environmental
20 consequences for the resource topics presented in Chapters 4.0 through 25.0.

21 **Chapters 4.0 through 25.0** include the environmental and regulatory settings for
22 resource topics, and discussions of methods, significance criteria, environmental
23 impacts, and mitigation measures for potential direct and indirect impacts.

24 **Chapter 26.0, “Cumulative Impacts,”** provides an analysis of overall cumulative
25 effects of the program alternatives, including the No-Action Alternative, together with
26 other past, present, and reasonably foreseeable future projects.

27 **Chapter 27.0, “Other NEPA and CEQA Considerations,”** describes potential
28 significant and unavoidable impacts, the relationship of short-term uses and long-term
29 productivity, irreversible and irretrievable commitments of resources, and
30 growth-inducing impacts of implementing the Settlement.

31 **Chapter 28.0, “Consultation, Coordination, and Compliance,”** summarizes public
32 involvement activities under NEPA and CEQA; Native American consultation and
33 consultation and coordination with other Federal, State, regional, and local agencies;
34 agencies and organizations consulted; and areas of controversy and unresolved issues.
35 This chapter also describes Federal laws and regulations that apply to program- and
36 project-level compliance. In addition, this chapter lists potential permits, regulatory
37 approvals, and needed authorizations.

1 **Chapter 29.0, “References,”** provides a bibliography of sources cited throughout this
2 Draft PEIS/R.

3 **Chapter 30.0, “List of Preparers,”** lists individuals who participated in preparing this
4 Draft PEIS/R and provides qualifications for those individuals, shown by organization
5 and agency.

6 **Chapter 31.0, “Index,”** lists key terms and topics discussed throughout this Draft
7 PEIS/R, and the location of the most relevant discussion or definition of the terms and
8 topics.

9 **Appendices** contain background information that supports this Draft PEIS/R. The
10 appendices include the Settlement; the Act; a glossary and reader’s guide; the Fish
11 Management Plan; the Physical Monitoring and Management Plan; discussion of plan
12 formulation; discussion of modeling methodology, assumptions, and interpretation; and
13 technical information relevant to the resource topics described in Chapters 4.0
14 through 25.0.

1 Chapter 2.0

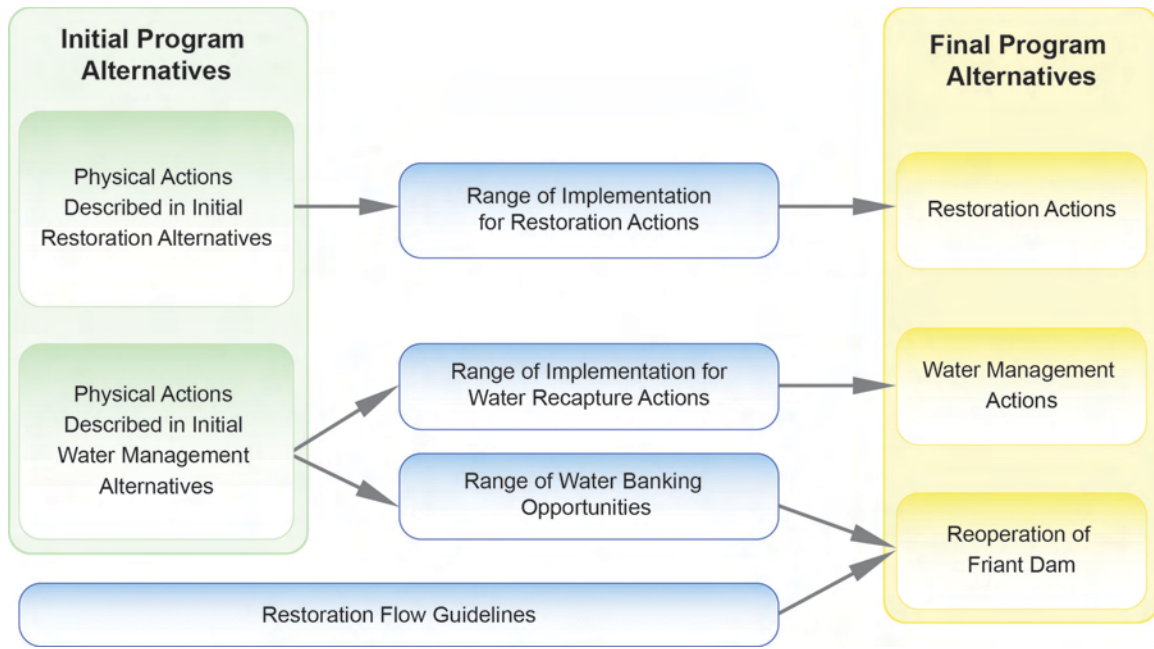
2 Description of Alternatives

3 This chapter describes alternatives considered and evaluated in this Draft PEIS/R,
4 consistent with the objectives identified in Chapter 1.0, “Introduction.” The chapter
5 begins with an overview of the alternatives formulation process, and describes
6 alternatives that were evaluated: the No-Action Alternative, which also constitutes the
7 “no-project” alternative under CEQA, and six action alternatives considered to
8 implement the Restoration and Water Management goals of the Settlement and the
9 purpose, need, and objectives of the proposed action. Although the alternatives have
10 advantages and disadvantages, each is considered feasible for the purpose of analysis
11 based on relevant economic, environmental, social, technological, and legal factors.

12 As described in Chapter 1.0, “Introduction,” this Draft PEIS/R provides program-level
13 NEPA/CEQA analysis for required actions identified in the Settlement, and project-level
14 NEPA/CEQA analysis for the reoperation of Friant Dam and other actions associated
15 with the release and recapture of Interim and Restoration flows using existing facilities.
16 Additional project-level NEPA/CEQA compliance will be required in the future for
17 actions analyzed at a program level in this Draft PEIS/R. Both the program- and project-
18 level actions described in this Draft PEIS/R reflect a range of potential implementation
19 actions to identify and disclose potential environmental effects. All action alternatives
20 analyzed in this Draft PEIS/R include the reoperation of Friant Dam, actions that
21 contribute to the Restoration Goal, and actions that contribute to the Water Management
22 Goal.

23 2.1 Alternatives Development

24 Development of program alternatives began on two parallel tracks. Figure 2-1 illustrates
25 the approach for formulating alternatives. One track focused on actions to address
26 reoperation of Friant Dam, and was developed in coordination with the Settling Parties
27 through preparation of Restoration Flow guidelines, as stipulated by the Settlement. The
28 other focused on defining the range of potential implementation of physical actions to
29 achieve the Restoration and Water Management goals. To accomplish the second track, a
30 broad range of actions to achieve the Restoration and Water Management goals was
31 packaged into initial program alternatives, as described in the *Initial Program*
32 *Alternatives Report* (IPAR) (SJRRP 2008), and in Appendix G, “Plan Formulation.”



1
2
3

Figure 2-1.
Approach for Formulating Program Alternatives

4 The IPAR evaluated numerous actions, and ultimately described eight initial alternatives
 5 for the Restoration Goal and eight initial alternatives for the Water Management Goal, all
 6 with a primary emphasis on ranges of physical actions. This approach was chosen to
 7 identify the possible range of physical actions that could be implemented through
 8 subsequent site-specific projects. Initial Restoration Alternatives were formulated by
 9 grouping potential Restoration actions based on various themes for river restoration.
 10 Initial Water Management Alternatives were formulated by grouping potential projects to
 11 recapture Interim and Restoration flows with facilities to convey or store water in the
 12 Friant Division water service areas. The potential range for each Restoration and Water
 13 Management action was represented within the range of Initial Restoration and Water
 14 Management alternatives presented in the IPAR. The initial physical actions presented in
 15 the IPAR provided a starting point for formulating a range of program alternatives that
 16 would achieve the purpose, need, and objectives of the proposed action. Actions to
 17 address reoperating Friant Dam for the release of Interim and Restoration flows and
 18 actions to address reintroducing Chinook salmon were not described in the IPAR (SJRRP
 19 2008).

20 A review of initial program alternatives presented in the IPAR revealed that the level of
 21 project specificity in the alternatives was greater than the level of certainty that can be
 22 determined at this time with limited available information. Because land access has not
 23 been granted to the Implementing Agencies for many key locations in the Restoration
 24 Area, despite continued efforts to obtain access, the Implementing Agencies could not
 25 initiate studies needed to collect more detailed information about site conditions for
 26 developing project-specific plans concurrent with preparation of this Draft PEIS/R. The
 27 Implementing Agencies recognize the need for a robust monitoring program to collect

1 information on physical and ecological responses to actions to guide site-specific project
2 requirements.

3 In recognition of the data limitations, and reliance on future monitoring data, final
4 program alternatives are defined more broadly and include provisions for flexibility in
5 implementation. Accordingly, program alternatives evaluated in this Draft PEIS/R
6 address large-scale system-wide variations, with flexibility for different methods of
7 implementation. The different methods of implementation represent key decision points,
8 including the ultimate extent of channel modifications and flow routing within the
9 Restoration Area, and the extent and location of long-term water recapture opportunities.
10 This approach is appropriate for identifying ranges of potential impacts that could result
11 from implementing the Settlement, and for developing appropriate mitigation strategies at
12 a program level of detail. This process is described in greater detail in Appendix G, “Plan
13 Formulation.”

14 The program alternatives evaluated in this Draft PEIS/R represent a range of reasonable
15 alternatives, consistent with the requirements of NEPA and CEQA. The action
16 alternatives under consideration were formulated to feasibly accomplish the primary
17 objectives of the Settlement, as discussed in Chapter 1.0, “Introduction” of this Draft
18 PEIS/R. The action alternatives include features that could avoid or substantially lessen
19 one or more significant effects. Alternatives considered but eliminated from further
20 consideration are described in Section 2.10 of this chapter.

21 CEQ Regulations and State CEQA Guidelines describe what is required for an
22 alternatives evaluation in an EIS and EIR, respectively. These requirements are
23 summarized below.

24 **2.1.1 NEPA Requirements**

25 CEQ Regulations (40 CFR 1502.14) require that an EIS include the following:

- 26 • Objective evaluation of reasonable alternatives
- 27 • Identification of alternatives considered but eliminated from detailed study, along
28 with a brief discussion of the reasons that these alternatives were eliminated
- 29 • Information that would allow reviewers to evaluate the comparative merits of the
30 proposed action (i.e., proposed project) and alternatives
- 31 • Consideration of the No-Action Alternative
- 32 • Identification of the agency’s preferred alternative, if any
- 33 • Appropriate mitigation measures not already included in a proposed action or
34 alternatives

35 NEPA requires analysis of the proposed action, and all alternatives considered, at a
36 substantial level of detail. CEQ Regulations (40 CFR 1502.14) require agencies to
37 rigorously explore and objectively evaluate all reasonable alternatives, and to devote

1 substantial treatment to each alternative considered, including the proposed action. All
2 alternatives considered must be evaluated compared to the No-Action Alternative (future
3 without project). As defined in 43 CFR Part 46.110, to be selected for implementation, a
4 consensus-based alternative must be fully consistent with the CEQ Regulations, and
5 applicable statutory and regulatory provisions.

6 **2.1.2 CEQA Requirements**

7 Section 15126.6(a) of the State CEQA Guidelines requires that an EIR includes the
8 following:

- 9 • Description of a range of reasonable alternatives to a proposed project, or to the
10 location of the project, that would feasibly attain most of the basic project
11 objectives but would avoid or substantially lessen any of the significant effects of
12 the project
- 13 • Evaluation of the comparative merits of the alternatives

14 An EIR need not consider every conceivable alternative to a proposed project but must
15 consider a range of reasonable potentially feasible alternatives that would foster informed
16 decision making and public participation.

17 The range of alternatives required to be evaluated in an EIR is governed by a “rule of
18 reason” that requires an EIR to set forth only those alternatives necessary to permit a
19 reasoned choice. The EIR needs to examine in detail only those alternatives that the lead
20 agency determines could feasibly attain the basic project objectives, taking into account
21 factors such as site suitability, economic viability, availability of infrastructure, general
22 plan consistency, other plans or regulatory limitations, jurisdictional boundaries, and
23 whether the proponent can reasonably acquire, control, or otherwise have access to the
24 alternative site (State CEQA Guidelines Section 15126.6(f)). CEQA does not require
25 alternatives to be evaluated at the same level of detail as the proposed project.

26 The State CEQA Guidelines recommend that an EIR should briefly describe the rationale
27 for selecting the alternatives to be discussed, identify any alternatives that were
28 considered by the lead agency but were eliminated as infeasible, and briefly explain the
29 reasons underlying the lead agency’s determination (State CEQA Guidelines Section
30 15126.6(c)).

31 An EIR must also evaluate a “no-project” alternative, which represents “what would be
32 reasonably expected to occur in the foreseeable future if the project were not approved,
33 based on current plans and consistent with available infrastructure and community
34 services” (State CEQA Guidelines Section 15126.6(e)(2)).

1 **2.2 Overview of Alternatives Evaluated**

2 This Draft PEIS/R evaluates a No-Action Alternative and six action alternatives to
3 implement the Settlement. Each action alternative includes the actions called for in the
4 Settlement. The action alternatives differ in two program-level ways:

- 5 • **Additional Restoration Actions** – The maximum peak Restoration Flow that
6 would be routed through Reach 4B1 (at least 475 cubic feet per second (cfs) or at
7 least 4,500 cfs), as shown in Table 2-1 and Figure 2-2.
- 8 • **Additional Water Management Actions on the San Joaquin River** – How
9 Restoration Flows would be recaptured (Delta only, or Delta plus existing San
10 Joaquin River diversions with or without new infrastructure to increase pumping
11 capacity below the Merced River), as shown in Table 2-1 and in Figure 2-3.

12 **Table 2-1.**
13 **Actions Included Under Action Alternatives**

Level of NEPA/CEQA Compliance	Actions ¹		Action Alternative					
			A1	A2	B1	B2	C1	C2
Project-Level	Reoperate Friant Dam and downstream flow control structures to route Interim and Restoration flows		✓	✓	✓	✓	✓	✓
	Recapture Interim and Restoration flows in the Restoration Area		✓	✓	✓	✓	✓	✓
	Recapture Interim and Restoration flows at existing CVP and SWP facilities in the Delta		✓	✓	✓	✓	✓	✓
Program-Level	Common Restoration actions ²		✓	✓	✓	✓	✓	✓
	Actions in Reach 4B1 to provide at least:	475 cfs capacity	✓	✓	✓	✓	✓	✓
		4,500 cfs capacity with integrated floodplain habitat		✓		✓		✓
	Recapture Interim and Restoration flows on the San Joaquin River downstream from the Merced River at:	Existing facilities on the San Joaquin River			✓	✓	✓	✓
		New pumping infrastructure on the San Joaquin River					✓	✓
	Recirculation of recaptured Interim and Restoration flows		✓	✓	✓	✓	✓	✓

Notes:

¹ All alternatives also include the Physical Monitoring and Management Plan and the Conservation Strategy, which include both project- and program-level actions intended to guide implementation of the Settlement.

² Common Restoration actions are physical actions to achieve the Restoration Goal that are common to all action alternatives and are addressed at a program level of detail.

Key:

CEQA = California Environmental Quality Act

cfs = cubic feet per second

CVP = Central Valley Project

Delta = Sacramento-San Joaquin Delta

NEPA = National Environmental Policy Act

PEIS/R = Program Environmental Impact Statement/Report

SWP = State Water Project

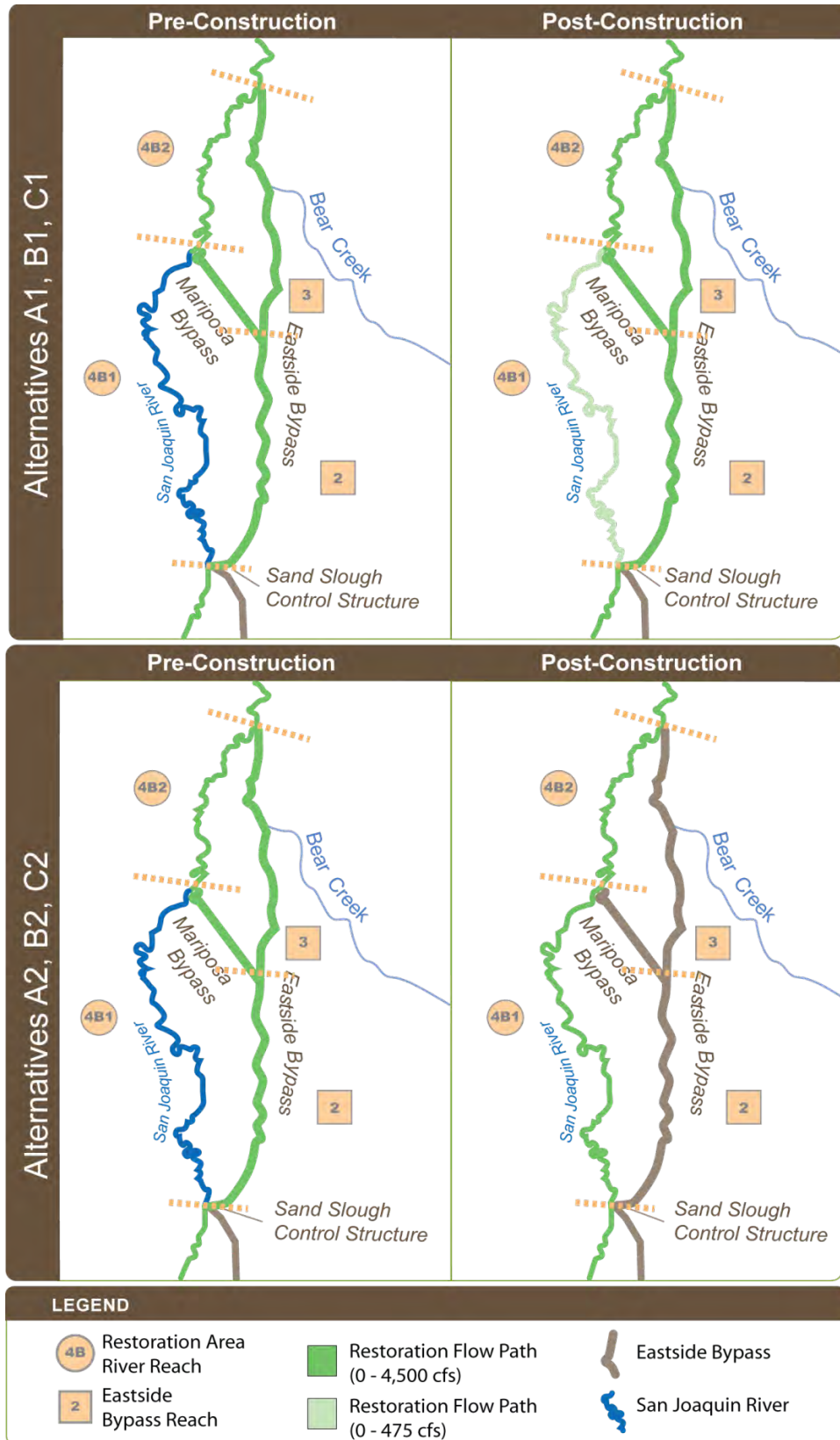
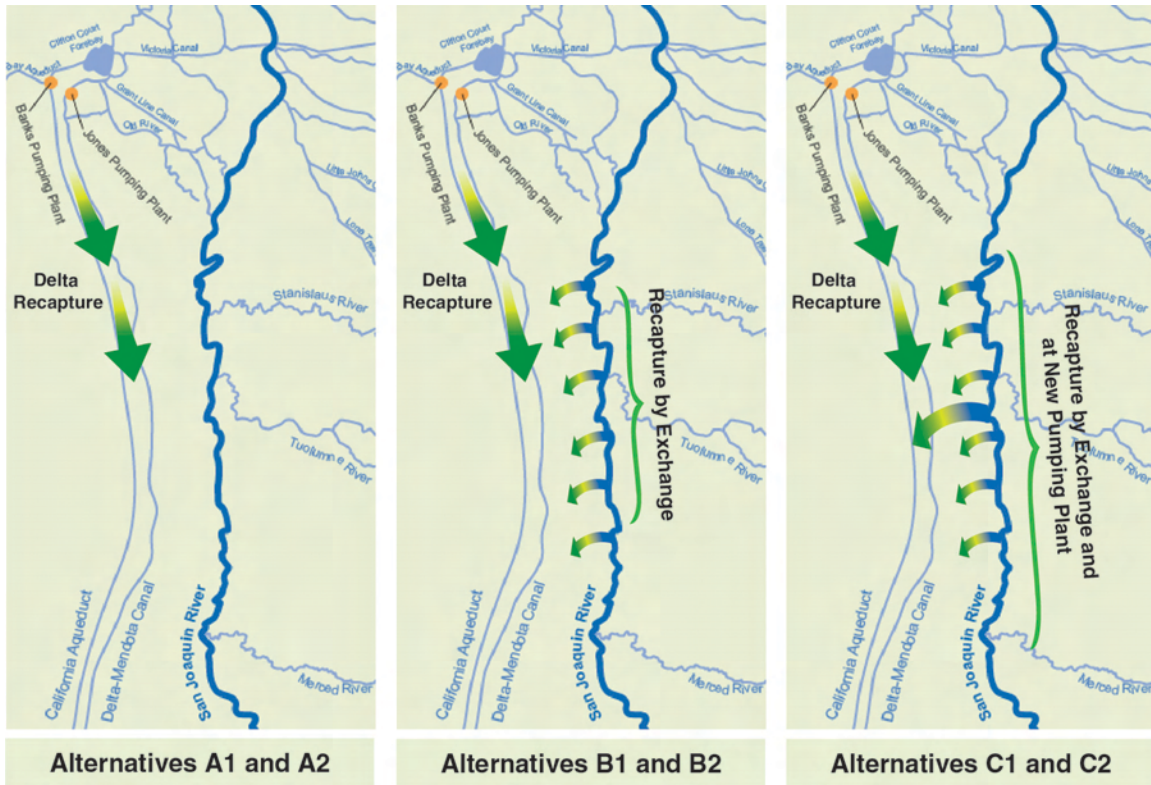


Figure 2-2.
Flow Routing in Reach 4B and Bypass System Under Action Alternatives

1
 2
 3
 4



Note: Water recapture approaches shown do not encompass potential recapture of Interim and Restoration flows at existing facilities within the Restoration Area.

Figure 2-3.
Water Recapture Approaches Downstream from Restoration Area Included in Action Alternatives

Program alternatives include the following:

- No-Action Alternative** – Under the No-Action Alternative (No-Project Alternative under CEQA), the Settlement would not be implemented. The No-Action Alternative includes projected conditions as they would exist in the study area at the end of the PEIS/R planning horizon (2030), including those projects and programs considered reasonably foreseeable by that time.
- Alternative A1: Reach 4B1 at 475 cfs, Delta Recapture** – Alternative A1 includes reoperation of Friant Dam, and a range of actions to achieve the Restoration and Water Management goals. Under Alternative A1, Reach 4B1 would convey at least 475 cfs, and the Eastside and Mariposa bypasses would convey any remaining Interim and Restoration flows. Alternative A1 includes the potential for recapture of Interim and Restoration flows in the Restoration Area and Interim and Restoration flows in the Delta using existing diversion facilities, and the potential for recirculation of all recaptured Interim and Restoration flows. A Physical Monitoring and Management Plan is included in Alternative A1 to provide guidelines for observing and adjusting to changes in conditions regarding flow, seepage, channel capacity, propagation of native vegetation, and suitability of spawning gravel. Alternative A1 also includes a conservation strategy

1 consisting of management actions necessary to provide a net increase in the extent
2 and quality of riparian and wetland habitats in the Restoration Area, to avoid
3 reducing the long-term viability of sensitive species, and to be consistent with
4 adopted conservation plans.

- 5 • **Alternative A2: Reach 4B1 at 4,500 cfs, Delta Recapture** – Alternative A2
6 includes the same Restoration and Water Management actions as Alternative A1,
7 plus additional Restoration actions to increase Reach 4B1 channel capacity to at
8 least 4,500 cfs, with integrated floodplain habitat. Under this alternative, the
9 Eastside Bypass would not convey Interim or Restoration flows after completion
10 of Reach 4B1 channel modifications.
- 11 • **Alternative B1: Reach 4B1 at 475 cfs, San Joaquin River Recapture** –
12 Alternative B1 includes the same Restoration and Water Management actions as
13 Alternative A1, plus additional Water Management actions for the recapture of
14 Interim and Restoration flows in the San Joaquin River below the confluence of
15 the Merced River, using existing facilities with potential in-district modifications.
- 16 • **Alternative B2: Reach 4B1 at 4,500 cfs, San Joaquin River Recapture** –
17 Alternative B2 includes the same Restoration and Water Management actions as
18 Alternative B1, plus the additional Restoration actions included in Alternative A2
19 to increase Reach 4B1 channel capacity to at least 4,500 cfs, with integrated
20 floodplain habitat. Under this alternative, the Eastside Bypass would not convey
21 Interim or Restoration flows after completion of Reach 4B1 channel
22 modifications.
- 23 • **Alternative C1: Reach 4B1 at 475 cfs, New Pumping Plant Recapture** –
24 Alternative C1 includes the same Restoration and Water Management actions as
25 Alternative B1, plus additional Water Management actions for recapture of
26 Interim and Restoration flows, through new infrastructure, to increase pumping
27 capacity on the San Joaquin River below the confluence of the Merced River.
- 28 • **Alternative C2: Reach 4B1 at 4,500 cfs, New Pumping Plant Recapture** –
29 Alternative C2 includes the same Restoration and Water Management actions as
30 Alternative C1, plus the additional Restoration actions included in Alternative A2
31 to increase Reach 4B1 channel capacity to at least 4,500 cfs, with integrated
32 floodplain habitat. Under this alternative, the Eastside Bypass would not convey
33 Interim or Restoration flows after completion of Reach 4B1 channel
34 modifications.

35 The NEPA/CEQA level of compliance supported by this Draft PEIS/R for individual
36 actions included in the action alternatives is shown in Table 2-2.

**Table 2-2.
NEPA/CEQA Level of Compliance for Actions Included Under Action Alternatives**

Category	Action	Action Alternative						Level of NEPA/CEQA Compliance
		A1	A2	B1	B2	C1	C2	
Reoperate Friant Dam and Downstream Flow Control Structures	Release Interim and Restoration flows from Friant Dam up to full Restoration Flows stipulated by Settlement, as constrained by then-existing channel capacities	✓	✓	✓	✓	✓	✓	Project
	Minimize increases in flood risk in the Restoration Area as a result of Interim and Restoration flows	✓	✓	✓	✓	✓	✓	
	Reoperate downstream flow control structures	✓	✓	✓	✓	✓	✓	
	Establish an RWA and manage Friant Dam to make water supplies available to Friant Division long-term contractors at a preestablished rate	✓	✓	✓	✓	✓	✓	
Recapture Interim and Restoration Flows	Recapture Interim and Restoration flows in Restoration Area at Mendota Pool and wildlife refuge	✓	✓	✓	✓	✓	✓	Program
	Recapture Interim and Restoration flows in Delta at existing CVP/SWP facilities	✓	✓	✓	✓	✓	✓	
	Recapture Interim and Restoration flows at existing facilities on San Joaquin River with potential in-district modifications to existing facilities			✓	✓	✓	✓	
	Construct and operate new pumping infrastructure on San Joaquin River					✓	✓	
Recirculate Recaptured Interim and Restoration Flows	Recirculate recaptured Interim and Restoration flows	✓	✓	✓	✓	✓	✓	
Common Restoration Actions	Construct Mendota Pool Bypass and modify Reach 2B to convey at least 4,500 cfs	✓	✓	✓	✓	✓	✓	Program
	Modify Reach 4B1 to convey at least 475 cfs	✓	✓	✓	✓	✓	✓	
	Modify San Joaquin River Headgate Structure to enable fish passage and flow routing	✓	✓	✓	✓	✓	✓	
	Modify Sand Slough Control Structure to enable fish passage	✓	✓	✓	✓	✓	✓	
	Screen Arroyo Canal and provide fish passage at Sack Dam	✓	✓	✓	✓	✓	✓	
	Modify Eastside and Mariposa Bypasses for fish passage	✓	✓	✓	✓	✓	✓	
	Enable deployment of seasonal barriers at Mud and Salt sloughs	✓	✓	✓	✓	✓	✓	
	Modify Chowchilla Bypass Bifurcation Structure	✓	✓	✓	✓	✓	✓	
	Fill or isolate gravel pits	✓	✓	✓	✓	✓	✓	
	Reintroduce salmon	✓	✓	✓	✓	✓	✓	
	Enhance spawning gravel	✓	✓	✓	✓	✓	✓	
	Reduce potential for redd superimposition and/or hybridization	✓	✓	✓	✓	✓	✓	
	Supplement the salmon population	✓	✓	✓	✓	✓	✓	
	Modify floodplain and side-channel habitat	✓	✓	✓	✓	✓	✓	
	Enhance in-channel habitat	✓	✓	✓	✓	✓	✓	
	Reduce potential for aquatic predation of juvenile salmonids	✓	✓	✓	✓	✓	✓	
	Reduce potential for fish entrainment	✓	✓	✓	✓	✓	✓	
Enable fish passage	✓	✓	✓	✓	✓	✓		
Modify flood flow control structures	✓	✓	✓	✓	✓	✓		

**Table 2-2.
NEPA/CEQA Level of Compliance for Actions Included Under Action Alternatives (contd.)**

Category	Action	Action Alternative						Level of NEPA/CEQA Compliance
		A1	A2	B1	B2	C1	C2	
Actions in Reach 4B1 to Provide at Least 4,500 cfs Capacity	Modify Reach 4B1 to convey at least 4,500 cfs		✓		✓		✓	Program
Physical Monitoring and Management Plan	Monitoring actions ¹	✓	✓	✓	✓	✓	✓	
	Immediate management actions	✓	✓	✓	✓	✓	✓	Program
	Long-term management actions	✓	✓	✓	✓	✓	✓	Project and Program
Conservation Strategy	Various conservation measures, applied to actions above	✓	✓	✓	✓	✓	✓	Project and Program

Note:

¹ Site-specific documentation has been prepared for monitoring actions completed or currently underway, and would be prepared, as necessary, for actions described at a program-level of detail in this Draft PEIS/R.

Key:

CEQA = California Environmental Quality Act

cfs = cubic feet per second

CVP = Central Valley Project

Delta = Sacramento-San Joaquin Delta

NEPA = National Environmental Policy Act

PEIS/R = Program Environmental Impact Statement/Report

Restoration Area = San Joaquin River from Friant Dam to the Merced river confluence

RWA = Recovered Water Account

Settlement = Stipulation of Settlement, *NRDC et al., v. Kirk Rodgers, et al.*

SWP = State Water Project

1 **2.3 No-Action and No-Project Alternatives**

2 This Draft PEIS/R evaluates a No-Action Alternative in compliance with NEPA no-
3 action and CEQA no-project requirements. The No-Action Alternative reflects projected
4 conditions in 2030 if the Settlement is not implemented. The No-Action Alternative
5 includes existing facilities, conditions, land uses, and reasonably foreseeable actions
6 expected to occur in the study area by 2030. Reasonably foreseeable actions include
7 actions with current authorization, complete funding for design and construction, and
8 complete environmental permitting and compliance (see Table 2-3) when the NOP for the
9 PEIS/R was published (August 22, 2007 (Reclamation)). Under the No-Action
10 Alternative, Reclamation would continue to release a base flow from Friant Dam to meet
11 existing holding contract obligations to maintain a 5 cfs flow at Gravelly Ford. The No-
12 Action Alternative and existing conditions serve as the basis of comparison for
13 determining potential effects of the action alternatives on the affected environment,
14 consistent with NEPA and CEQA requirements (for the purposes of this document,
15 existing conditions are defined as the conditions in place when the NOP was published in
16 August 2007).

17 The No-Action Alternative would not include implementing the Settlement. Although the
18 specific actions regarding *NRDC, et al., v. Kirk Rodgers, et al.* that would be taken under
19 the No-Action Alternative are too speculative for meaningful consideration, and cannot
20 be defined at this time, it is reasonable to assume that the Settlement would be voided and
21 litigation would resume.

22 Additional simulation is being prepared to assess projected conditions under the No-
23 Action Alternative with implementation of the USFWS 2008 *Biological Opinion (BO) on*
24 *the Coordinated Operations of the CVP and SWP* (2008 USFWS CVP/SWP Operations
25 BO) and the NMFS 2009 *Final Biological and Conference Opinion on the Long-Term*
26 *Operations of the CVP and SWP* (2009 NMFS CVP/SWP Operations BO). Results of
27 this assessment will change the anticipated effects of the No-Action Alternative;
28 however, relative impacts and overall impact mechanisms are not anticipated to change
29 with the results of this assessment. Results of this assessment will be provided in the
30 Final PEIS/R.

1
2

**Table 2-3.
Projects Included Under No-Action Alternative**

Project	Description	Reason for Inclusion in No-Action Alternative
City of Stockton Delta Water Supply Project	Develops a new supplemental water supply for the Stockton metropolitan area by diverting Delta water from a new intake. A raw water pipeline along Eight Mile Road would be built to convey Delta water to a new drinking water treatment plant.	Project is currently authorized, funded, and permitted for implementation
San Joaquin River Exchange Contractors Water Authority Water Transfer Program (2005 – 2014)	Allows the transfer of up to 130,000 acre-feet of substitute water from conservation actions (groundwater pumping and temporary land fallowing from the Exchange Contractors to other CVP contractors) to Reclamation for delivery to San Joaquin Valley wildlife refuges, and to Reclamation and/or DWR for use by the CALFED Environmental Water Account as replacement water for CVP contractors.	Project is currently authorized, funded, and permitted for implementation
Corps Policy on Levee Vegetation	Limits uncontrolled vegetation growth (brush, weeds, or trees) to smaller than 2 inches in diameter to reduce the risk of flood damage.	Flood system improvements are currently underway or will be initiated under this policy (USACE 2007)
Westside Regional Drainage Plan	Implementing the Westside Regional Drainage Plan is assumed to result in the elimination of salt discharges to the San Joaquin River from the Grassland Drainage Area. The Westside Regional Drainage Plan seeks to manage subsurface drainage and achieve a salt balance on productive lands through several mechanisms, including the application of drainage to salt-tolerant crops at a regional reuse facility to reduce the volume of water discharged into Mud Slough (North) and improve the water quality of that discharge.	Plan is currently being implemented
Grassland Bypass Project Extension (2010 – 2019)	Extends the San Luis Drain Use Agreement to allow time to acquire funds and develop feasible drainwater treatment technology to meet revised Basin Plan objectives and waste discharge requirements by December 30, 2019 (consistent with the Westside Regional Drainage Plan and San Luis Drainage Feature Reevaluation plan for drainage service); continues the separation of unusable agricultural drainage water discharged from the Grassland Drainage Area from wetland water supply conveyance channels for 2010 – 2019; facilitates drainage management that maintains the viability of agriculture in the Grassland Bypass Project Area and promotes continuous improvement of water quality in the San Joaquin River.	Final EIS/EIR issued August 2009 extending the project from 2009 to 2019 (Reclamation and SLDMWA 2009)

3

1
2

**Table 2-3.
Projects Included Under the No-Action Alternative (contd.)**

Project	Description	Reason for Inclusion in No-Action Alternative
Semitropic Water Storage District Groundwater Banking Project	Expands current groundwater banking facilities.	Project is currently authorized, funded, and permitted for implementation
Contra Costa Water District Alternative Intake Project	Seeks to reduce effects to Contra Costa WD customers from seasonal fluctuations and changing conditions in the Delta by altering diversion timing and location. The total amount of diversions will not change and no significant impacts to other Delta water users are anticipated.	Project was constructed in 2010; included in Future No-Action Condition of CalSim v.9
San Joaquin River Agreement and Vernalis Adaptive Management Program 1999 – 2011	Implements the SWRCB 1995 <i>Water Quality Control Plan</i> for the lower San Joaquin River and the Delta. VAMP, officially initiated in 2000 as part of SWRCB Water Right Decision 1641, is a large-scale, long-term experimental/management program designed to protect juvenile Chinook salmon migrating from the San Joaquin River through the Delta. VAMP is also a scientific experiment to determine how salmon survival rates change in response to alterations in San Joaquin River flows and CVP/SWP exports with installation of the Head of Old River Barrier. Although VAMP expires in 2011, the No-Action Alternative includes the continued operation of VAMP or a program with similar conditions.	Project is currently authorized, funded, and permitted for implementation; included in Existing Condition and Future No-Action Condition of CalSim v.9
Arvin-Edison Canal Expansion	Increases the capacity of Arvin-Edison WSD South Canal, giving Metropolitan WD of Southern California the ability to withdraw up to 75 TAF of water from Arvin-Edison WSD during dry years and to store up to a total of 350 TAF of SWP water.	Project is currently authorized, funded, and permitted for implementation
Sea level rise of 1 foot because of global warming ¹	Assumption incorporated into a 2006 DWR climate change study that was originally based on an IPCC (2001) investigation.	Included in Future No-Action Condition of CalSim v.9

Note:

¹ Potential future changes due to climate change are reflected in the No-Action Alternative through a sea level rise of 1 foot; other potential changes, such as changes in precipitation and temperature, are explored in the *Sensitivity of Future Central Valley Project and State Water Project Operations to Potential Climate Change and Associated Sea Level Rise* Attachment to Appendix I, "Supplemental Hydrologic and Water Operations Analyses."

Key:

CALFED = California Bay-Delta Program
 Corps = U.S. Army Corps of Engineers
 CVP = Central Valley Project
 Delta = Sacramento-San Joaquin Delta
 DWR = California Department of Water Resources
 EIR = Environmental Impact Report
 EIS = Environmental Impact Statement
 IPCC = International Panel on Climate Change
 Reclamation = U.S. Department of the Interior, Bureau of Reclamation
 SWP = State Water Project
 SWRCB = State Water Resources Control Board
 TAF = thousand acre-feet
 VAMP = Vernalis Adaptive Management Program
 WD = Water District
 WSD = Water Storage District

1 **2.4 Alternative A1**
2 **Reach 4B1 at 475 cfs, Delta Recapture**

3 Alternative A1 includes actions analyzed at both a project and program level. The
4 following discussion includes a subsection describing the project-level actions included
5 in Alternative A1, and a subsection describing program-level actions included in
6 Alternative A1 (see Table 2-2). Two additional subsections describe the Physical
7 Monitoring and Management Plan and the Conservation Strategy, which include both
8 project- and program-level actions intended to guide implementation of the Settlement
9 (see Table 2-2).

10 **2.4.1 Project-Level Actions**

11 Alternative A1 actions analyzed at a project level are described in greater detail below.
12 The Physical Monitoring and Management Plan (Appendix D) and the Conservation
13 Strategy, which include both project- and program-level actions, are described in separate
14 subsections (see Table 2-2).

15 Alternative A1 actions analyzed at a **project level** and described in more detail below are
16 as follows:

- 17 • **Reoperate Friant Dam and Downstream Flow Control Structures** – Actions
18 for reoperating Friant Dam and downstream flow control structures for the release
19 and conveyance of Interim and Restoration flows include the following:
 - 20 – Releasing Interim and Restoration flows from Friant Dam up to the
21 Restoration Flows stipulated by the Settlement, as constrained by then-
22 existing channel capacities
 - 23 – Minimizing increases in flood risk in the Restoration Area as a result of
24 Interim and Restoration flows
 - 25 – Reoperating downstream flow control structures, which includes modifying
26 operations of the San Joaquin River Flood Control Project (flood management
27 system) and other structures to convey Interim and Restoration flows
 - 28 – Establishing an RWA and managing Friant Dam to make water supplies
29 available to Friant Division long-term contractors at a preestablished rate

30

1 • **Recapture Interim and Restoration Flows** – Alternative A1 includes actions to
2 recapture Interim and Restoration flows within the Restoration Area and/or the
3 Delta using existing facilities, as shown in Figure 2-4 and in Table 2-2. Actions to
4 recapture Interim and Restoration flows in the Restoration Area, and Interim and
5 Restoration Flows in the Delta, are constrained by established regulatory and
6 institutional conditions, with no new facility construction, facility modifications,
7 or agreements. Recaptured water available for transfer to Friant Division long-
8 term contractors under all action alternatives would range from zero to 556
9 thousand acre-feet (TAF), as shown in Table 2-4. Actions to recapture Interim and
10 Restoration flows under Alternative A1 include the following:

- 11 – Recapture of Interim and Restoration flows in the Restoration Area at
12 Mendota Pool and the East Bear Creek Unit of the San Luis National Wildlife
13 Refuge (NWR) (East Bear Creek Unit)
- 14 – Recapture of Interim and Restoration flows in the Delta at existing CVP/SWP
15 facilities

16 The following sections describe these project-level actions in greater detail.

San Joaquin River Restoration Program

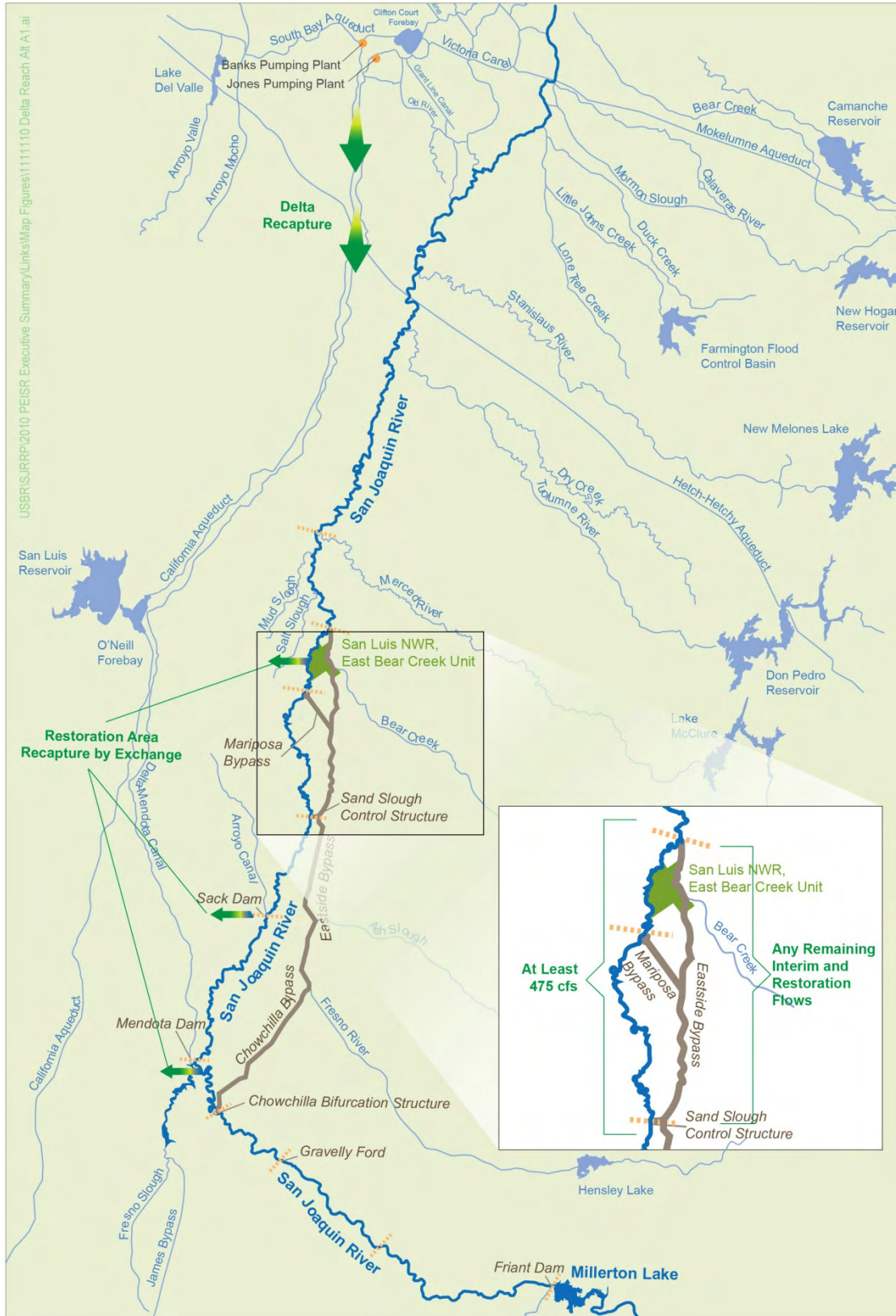


Figure 2-4.
Flow Routing and Water Recapture Under Alternative A1

1
 2
 3

1
2

**Table 2-4.
Estimated Maximum Water Available for Transfer Under Action Alternatives**

Begin Date	End Date	Friant Dam Releases According to Settlement		Reach 1 Holding Contract Diversions Estimated as in Exhibit B1	Friant Dam Releases Eligible for Recapture ¹	
		(cfs)	(TAF)	(cfs)	(cfs)	(TAF)
10/1	10/31	350	22	160	190	12
11/1	11/10	700	14	130	570	11
11/11	12/31	350	35	120	230	23
1/1	2/28	350	41	100	250	29
3/1	3/15	500	14	130	370	10
3/16	3/31	1,500	48	130	1,370	43
4/1	4/15	2,500	74	150	2,350	70
4/16	4/30	4,000	119	150	3,850	115
5/1	6/30	2,000	242	190	1,810	219
7/1	8/31	350	43	230	120	15
9/1	9/30	350	21	210	140	8
Total flows released (TAF)			673	Total available for transfer² (TAF)		556
Potential buffer flows (TAF)			67	Potential buffer flows (TAF)		67
Potential additional releases pursuant to Paragraph 13(c)			100	Potential additional releases pursuant to Paragraph 13(c), minus seepage ³		0
Maximum total volume released (TAF)			840	Maximum total volume available for transfer (TAF)		623

Notes:

¹ Under existing conditions, Reclamation makes deliveries to riparian water right holders in Reach 1 under "holding contracts." The amounts in the table are approximate based on recent historical deliveries, as provided in Exhibit B of the Settlement. Water delivered to riparian water right holders would not be eligible for recapture.

² Total eligible for recapture is a maximum potential total, and does not account for anticipated losses to seepage or other unanticipated losses.

³ Paragraph 13(c) requires the acquisition of purchased water to overcome seepage losses not anticipated in Exhibit B. Because these potential releases would only be made to overcome seepage, this water would not be available for transfer.

Key:

cfs = cubic feet per second
TAF = thousand acre-feet

3 **Reoperate Friant Dam and Downstream Flow Control Structures**

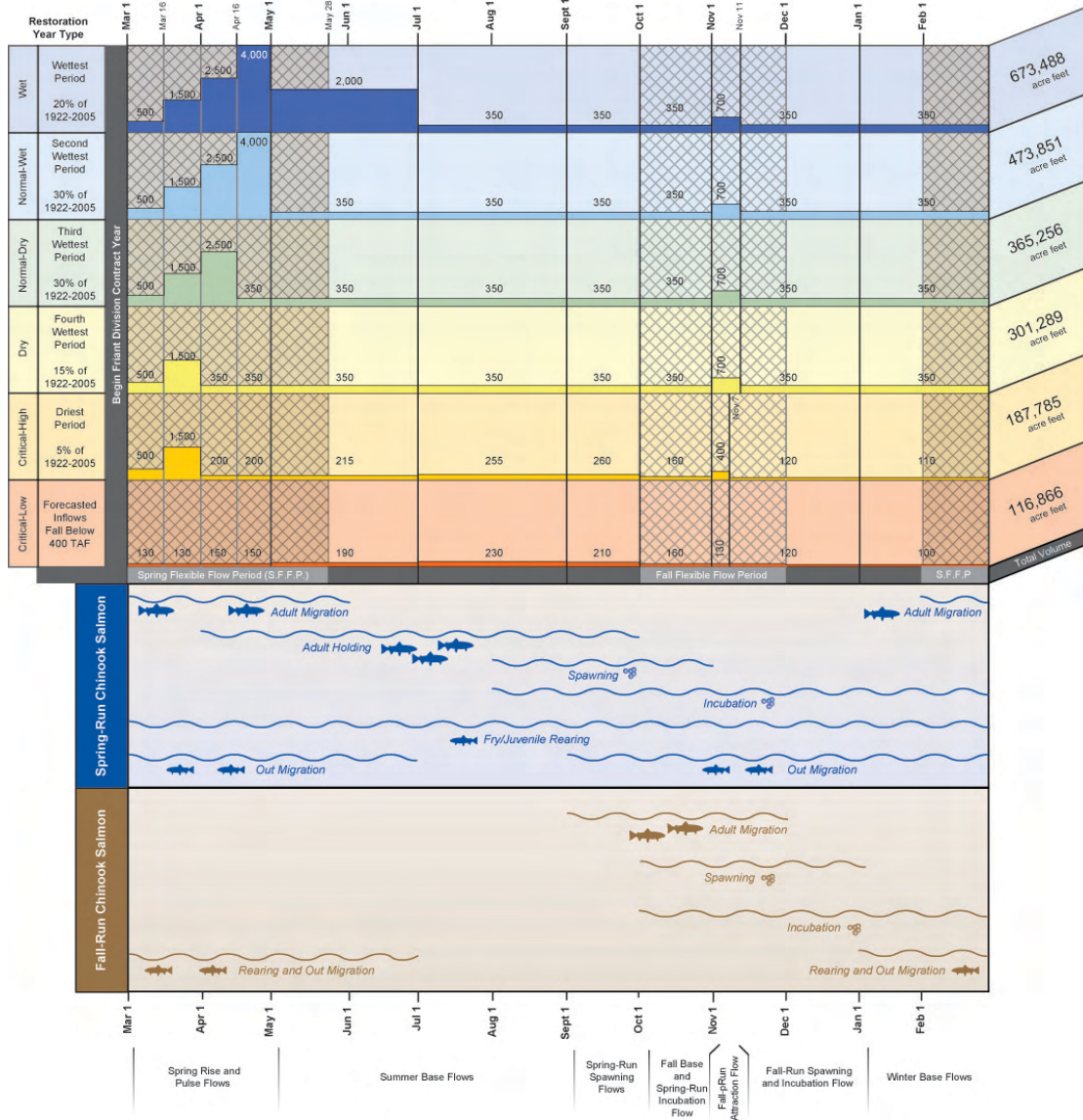
4 Reoperation of Friant Dam and downstream control structures includes the release of
5 Interim and Restoration flows, reoperating downstream flow control structures, and
6 establishing a RWA, as stipulated by the Settlement and described in the following
7 sections.

8 **Release Interim and Restoration Flows.** The release of Interim and Restoration flows
9 from Friant Dam, an action common to all action alternatives, is analyzed at a project
10 level in this Draft PEIS/R because enough project specificity is available. Operations at
11 Friant Dam would change to release Interim and Restoration flows to the San Joaquin
12 River, according to the six flow schedules specified in Exhibit B of the Settlement, as
13 shown in Figure 2-5. The flow schedules are specified in Exhibit B of the Settlement
14 according to six year types: Critical-Low, Critical-High, Dry, Normal-Dry, Normal-Wet,
15 and Wet. The total annual unimpaired runoff at Friant Dam for a water year is the index
16 by which the water year type is determined (based on water years 1922 through 2004).

San Joaquin River Restoration Program

1 The Settlement includes an annual allocation of Interim and Restoration flows using
 2 either the Restoration Flow schedules included in Exhibit B of the Settlement, or a more
 3 continuous hydrograph, as shown in Figure 2-6, in consideration of recommendations to
 4 be made by the RA. Potential alternate pathways for the transformation of allocated
 5 Restoration Flows between flow schedules are described in Appendix G, "Plan
 6 Formulation." Table 2-5 contains the Settlement-recommended release schedule for
 7 Interim and Restoration flows.

8

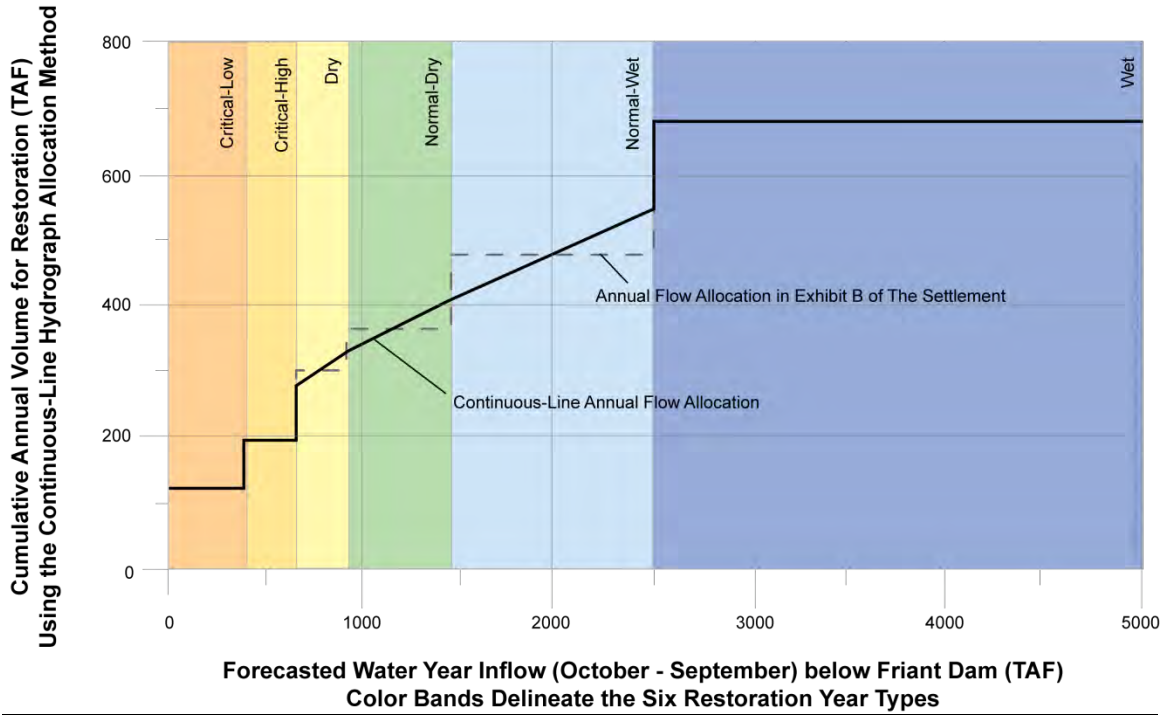


9

10

11

Figure 2-5.
Restoration Flow Schedules Specified in Exhibit B of Settlement



1

Forecasted Water Year Inflow (October – September) Below Friant Dam (TAF)	Annual Flow Allocation in Exhibit B of Settlement ¹ (TAF)	Continuous-Line Annual Flow Allocation (TAF)	Restoration Year Type
Less than 400	116.7	116.9	Critical-Low
Greater than 400 to 670	187.5	187.8	Critical-High
Greater than 670 to 930	300.8	272.3 to 330.3	Dry
Greater than 930 to 1,450	364.6	Greater than 330.3 to 400.3	Normal-Dry
Greater than 1,450 to 2,500	473.0	Greater than 400.3 to 574.4	Normal-Wet
Greater than 2,500	672.3	673.5	Wet

Note:

¹ Friant Dam releases include deliveries to riparian water right holders in Reach 1 under “holding contracts,” and releases for the Restoration Goal.

Key:

TAF = thousand acre-feet

2

3

Figure 2-6.
Continuous Annual Restoration Flow Allocation in Alternatives

4

1
2

**Table 2-5.
Schedule for Release of Interim and Restoration Flows**

Year(s)	Days	Release Flows
2009	October 1 through November 20	Of a timing and magnitude, as defined in the appropriate year type release schedule specified in Exhibit B of the Settlement, and without exceeding then-existing channel capacities ¹
2010	February 1 through December 1	Of a timing and magnitude, as defined in the appropriate year type release schedule specified in Exhibit B of the Settlement, and without exceeding then-existing channel capacities ¹
2011 – 2012	February 1 through May 1	Of a timing and magnitude, as defined in the appropriate year type release schedule specified in Exhibit B of the Settlement, and without exceeding then-existing channel capacities
	May 1 through December 1	To wet the channel down to the Chowchilla Bypass Bifurcation Structure to collect information regarding seepage losses ²
2012 – 2014	January 1 through December 31	Of a timing and magnitude, as defined in the appropriate year type release schedule specified in Exhibit B of the Settlement, and without exceeding then-existing channel capacities or interfering with any remaining in-channel construction activities; continues until modifications identified in Paragraph 11(a) of the Settlement are completed and full Restoration Flows begin
2014 and later	January 1 through December 31	Of a timing and magnitude, as defined in the appropriate year type release schedule specified in Exhibit B of the Settlement, and without exceeding then-existing channel capacities or interfering with any remaining in-channel construction activities

Notes:

¹ Interim Flows during Water Year 2010 (October 1, 2009, through September 30, 2010) are described in the *Water Year 2010 Interim Flows Project Environmental Assessment/Initial Study* released by Reclamation and DWR in September 2009. Interim Flows during Water Year 2011 (October 1, 2010, through September 30, 2011) are described in the *Water Year 2011 Interim Flows Project Supplemental Environmental Assessment* released by Reclamation in September 2010.

² This period is intended to correspond to construction activities in Paragraph 11(a). Actual time period of these releases would be coincident with these activities.

3 Paragraph 15 of the Settlement describes an interim research program that includes the
 4 release of Interim Flows beginning in October 2009 and continuing until full Restoration
 5 Flows begin (anticipated January 1, 2014), as constrained by then-existing channel
 6 capacities). The RA, in consultation with the Technical Advisory Committee, the
 7 Secretary, and other appropriate Federal, State, and local agencies, will develop and
 8 recommend to the Secretary implementation of a program of Interim Flows. The Interim
 9 Flows are intended to allow collection of relevant data concerning flows, temperatures,
 10 fish needs, seepage losses, and water recirculation, recapture, and reuse. The Interim
 11 Flows include flow releases identified in Exhibit B of the Settlement for the appropriate
 12 water year type, including the flexible flow provisions of Exhibit B, to the extent that
 13 such releases would not impede or delay completion of actions specified in Paragraph
 14 11(a) of the Settlement, or exceed downstream channel capacities.

15 The Settlement states that the “Secretary shall commence the Restoration Flows at the
 16 earliest possible date...provided, however, that the full Restoration Flows shall
 17 commence on a date certain no later than January 1, 2014. If, for any reason, full

1 Restoration Flows are not released in any year beginning January 1, 2014, the Secretary,
2 in consultation with the RA, shall release as much of the Restoration Flows as possible
3 in light of then-existing channel capacity and without delaying completion of the Phase 1
4 improvements.” Paragraph 13(c) of the Settlement identifies procedures to address
5 unexpected seepage losses, including acquiring water or options on water from willing
6 sellers to be utilized for additional releases from Friant Dam.

7 According to Paragraph 13(i), the RA is responsible for recommending to the Secretary
8 the date for commencing full Restoration Flows in consideration of the completion of
9 Phase 1 improvements (as subsequently described for common Restoration actions).
10 Several Federal and State actions, including channel capacity modifications, are
11 necessary before full Restoration Flows are released. The release of full Restoration
12 Flows is subject to the provisions for flexible flow periods, buffer flows, and purchased
13 water, as well as the provisions described above for Interim Flows. The release and
14 conveyance of full Restoration Flows is defined as meeting Restoration Flow targets at
15 six locations in the Restoration Area identified in Exhibit B of the Settlement, and in
16 consultation with the RA, the six locations are as follows:

- 17 • **Friant Dam** – At or immediately below Friant Dam; designated as “Friant
18 Release” in Exhibit B of the Settlement
- 19 • **Head of Reach 2A** – At Gravelly Ford; designated as “Reach 2” in Exhibit B of
20 the Settlement
- 21 • **Head of Reach 3** – Immediately below the Chowchilla Bypass Bifurcation
22 Structure; designated as “Reach 3” in Exhibit B of the Settlement
- 23 • **Head of Reach 4A** – Downstream from Sack Dam; designated as “Reach 4” in
24 Exhibit B of the Settlement
- 25 • **Head of Reach 4B** – Designated as “Reach 5” in Exhibit B of the Settlement
- 26 • **Confluence of Merced River** – Designated as “Confluence” in Exhibit B of the
27 Settlement

28 Flow targets vary by Restoration Year Type, and range from zero cfs (in Reaches 3, 4A,
29 and 4B in Critical-Low years) to 4,055 cfs (at the confluence of the Merced River in Wet
30 and Normal-Wet years). In some years, the flow targets could be met partially or entirely
31 by flood control releases or by local runoff or return flows.

32 If, for any reason, full Restoration Flows are not released in any year, beginning
33 January 1, 2014, the Secretary, in consultation with the RA, would bank, store, exchange,
34 transfer, or sell the water through mutually acceptable agreements with Friant Division
35 long-term contractors or third parties (with proceeds deposited into the Restoration Fund
36 established under the Settlement), or release the water from Friant Dam during times of
37 the year other than those specified in the applicable flow schedule. In addition, the
38 Settlement includes provisions for the release of pulse flows in Normal-Wet and Wet
39 Years to perform several geomorphic functions such as flushing spawning gravels, unless

1 the Secretary, in consultation with the RA, determines that such flows are not needed.
2 Flushing flows would be accomplished with a quantity of water based on an average flow
3 of 4,000 cfs from April 16 to 30, and include a peak release as close to 8,000 cfs as
4 possible for several hours, within the constraints of channel capacity. The Settlement also
5 includes the following provisions to modify Restoration Flows, in consideration of
6 recommendations to be made by the RA: application of flexible flow periods, as
7 described in Exhibit B of the Settlement; the use of a 10 percent buffer flow to help meet
8 the Restoration Goal; and the release of acquired water for unanticipated river seepage
9 losses for Restoration Flows.

10 Reclamation and the San Joaquin River Exchange Contractors have entered into a Second
11 Amended Contract for Exchange of Waters (Contract I1r-1144) (San Joaquin River
12 Exchange Contract), dated February 14, 1968. Under the terms and conditions of that
13 contract, Reclamation is obligated to make available required deliveries from the
14 Delta-Mendota Canal (DMC) or releases from Millerton Reservoir. If Reclamation makes
15 deliveries to the San Joaquin River Exchange Contractors via the San Joaquin River,
16 these water deliveries would have a higher priority for channel capacity over Interim or
17 Restoration flows. Therefore, Interim and Restoration flows would be reduced, as
18 necessary, to provide channel capacity for water delivery to the San Joaquin River
19 Exchange Contractors via the San Joaquin River. However, it is important to note that
20 under Article 3(n) of the Friant Division long-term water service contracts and the
21 recently executed Friant Division repayment contracts, "The United States agrees that it
22 will not deliver to the Exchange Contractors thereunder waters of the San Joaquin River
23 unless and until required by the terms of said contract, and the United States further
24 agrees that it will not voluntarily and knowingly determine itself unable to deliver to the
25 Exchange Contractors entitled thereto from water that is available or that may become
26 available to it from the Sacramento River and its tributaries or the Sacramento-San
27 Joaquin Delta those quantities required to satisfy the obligations of the United States
28 under said Exchange Contract and under Schedule 2 of the Contract for Purchase of
29 Miller and Lux Water Rights (Contract I1r-1145, dated July 27, 1939)."

30 **Minimize Flood Risk from Interim and Restoration Flows.** Throughout Settlement
31 implementation, the maximum downstream extent and rate of Interim and Restoration
32 flows to be released would be limited to then-existing channel capacities. As channel or
33 structure modifications are completed with additional environmental compliance,
34 maximum Interim Flow releases would be correspondingly increased in accordance with
35 then-existing channel capacities and with the release schedule. Consistent with the Act,
36 Interim Flows would be reduced, as needed, to address material seepage impacts, as
37 identified through the monitoring program (see Appendix D, "Physical Monitoring and
38 Management Plan"). If release of water from Friant Dam is required for flood control
39 purposes, concurrent Interim and Restoration flows would be reduced by an amount
40 equivalent to the required flood control release. If flood control releases from Friant
41 exceed the concurrent scheduled Interim and Restoration flows, no additional releases
42 above those required for flood control would be made for SJRRP purposes.

43

1 Then-existing channel capacities within the Restoration Area correspond to flows that
2 would not significantly increase flood risk from Interim and Restoration flows in the
3 Restoration Area. The action to release Interim and Restoration flows includes measures
4 that would achieve the following objectives: (1) commit Reclamation to implementing
5 actions that would meet performance standards that minimize increases in flood risk as a
6 result of Interim or Restoration flows, (2) limit the release and conveyance of Interim and
7 Restoration flows to those flows that would remain in-channel until adequate data are
8 available to apply the performance standards and until the performance standards are
9 satisfied, and (3) enable the Settlement to be implemented in coordination with other
10 ongoing and future actions outside of the Settlement that could address channel capacity
11 issues identified in the Settlement or through the SJRRP or other programs.
12 Implementation of measures that achieve these objectives would allow for the safe
13 release and conveyance of Interim and Restoration flows throughout the duration of
14 Settlement implementation. Reclamation would implement the following three integrated
15 measures that collectively minimize increases in flood risk as a result of Interim or
16 Restoration flows during Settlement implementation:

- 17 • **Establish a Channel Capacity Advisory Group and Determine and Update**
18 **Estimates of Then-Existing Channel Capacities as Needed** – The establishment
19 and administration of a Channel Capacity Advisory Group to provide independent
20 review of estimated then-existing channel capacities, monitoring results, and
21 management actions to address vegetation and sediment transport within the
22 system as identified by Reclamation.
- 23 • **Maintain Interim and Restoration Flows Below Estimates of Then-Existing**
24 **Channel Capacities** – The process for limiting Interim and Restoration flows to
25 reduce the risk of levee failure due to underseepage, through-seepage, and
26 associated levee stability issues to less-than-significant levels.
- 27 • **Closely Monitor Erosion and Perform Maintenance and/or Reduce Interim**
28 **and Restoration Flows as Necessary to Avoid Erosion-Related Impacts** – The
29 commitment by Reclamation to implement erosion monitoring and management,
30 including monitoring potential erosion sites, reducing Interim and Restoration
31 flows as necessary, and reporting ongoing results of monitoring and management
32 actions to the Channel Capacity Advisory Group.

33 Only limited data are currently available on San Joaquin River channel capacities and
34 levee conditions. The levee design criteria developed by U.S. Army Corps of Engineers
35 (USACE) and presented in *Design and Construction of Levees Engineering and Design*
36 *Manual* (Manual No. 1110-2-1913) (USACE 2000) would be applied throughout the
37 Restoration Area to identify the Interim or Restoration flows that would not cause the
38 “Factor of Safety” to be reduced below 1.4, as calculated using USACE levee criteria
39 shown in Table 2-6. The application of the Factor of Safety of 1.4 is required for
40 federally authorized flood control projects. As defined by USACE, the Factor of Safety is
41 equal to one over the exit gradient, as measured at the toe of the levee (2000).

1
2

**Table 2-6.
Minimum Factors of Safety - Levee Slope Stability**

Type of Slope	Applicable Stability Conditions and Required Factors of Safety			
	End-of-Construction	Long-Term (Steady Seepage)	Rapid Drawdown ^a	Earthquake ^b
New Levees	1.3	1.4	1.0 to 1.2	(see below)
Existing Levees	--	1.4 ^c	1.0 to 1.2	(see below)
Other Embankments and Dikes ^d	1.3 ^{e,f}	1.4 ^{c,f}	1.0 to 1.2 ^f	(see below)

Source: U.S. Army Corps of Engineers. 2000. Design and Construction of Levees Engineering and Design Manual. Manual No. 1110-2-1913. April. Table 6-1b, page 6-5.

Notes:

^a Sudden drawdown analyses. F. S. = 1.0 applies to pool levels prior to drawdown for conditions where these water levels are unlikely to persist for long periods preceding drawdown. F. S. = 1.2 applies to pool level, likely to persist for long periods prior to drawdown.

^b See ER 1110-2-1806 for guidance. An EM for seismic stability analysis is under preparation.

^c For existing slopes where either sliding or large deformation have occurred previously and back analyses have been performed to establish design shear strengths lower factors of safety may be used. In such cases probabilistic analyses may be useful in supporting the use of lower factors of safety for design.

^d Includes slopes which are part of cofferdams, retention dikes, stockpiles, navigation channels, breakwater, river banks, and excavation slopes.

^e Temporary excavated slopes are sometimes designed for only short-term stability with the knowledge that long-term stability is not adequate. In such cases higher factors of safety may be required for end-of-construction to ensure stability during the time the excavation is to remain open. Special care is required in design of temporary slopes, which do not have adequate stability for the long-term (steady seepage) condition.

^f Lower factors of safety may be appropriate when the consequences of failure in terms of safety, environmental damage and economic losses are small.

3 Until adequate data are available to determine the Factor of Safety, Reclamation would
 4 limit the release of Interim and Restoration flows to those which would remain in-
 5 channel. In-channel flows are flows that maintain a water surface elevation at or below
 6 the elevation of the landside levee toe (i.e., the base of the levee). When sufficient data
 7 are available to determine the Factor of Safety, Reclamation would limit Interim and
 8 Restoration flows to levels that would correspond to a Factor of Safety of 1.4 or higher at
 9 all times. Observation of levee erosion, seepage, boils, impaired emergency levee access,
 10 or other indications of increased flood risk identified through ongoing monitoring at
 11 potential erosion sites would indicate that the minimum Factor of Safety is not met and
 12 would trigger immediate reductions in Interim and Restoration flows at the site. Such
 13 observations would supersede channel capacity estimates, and Interim and Restoration
 14 flows would be reduced in areas where these conditions occur. Potential immediate
 15 responses to reduce, redirect, or divert Interim or Restoration flows to reduce flow in
 16 downstream reaches is described in Section 2.4.3.

17 Detailed discussion of these three measures to reduce flood risk from the release and
 18 conveyance of Interim and Restoration flows is presented below.

19 *Establish a Channel Capacity Advisory Group, and Determine and Update Estimates of*
 20 *Channel Capacities as Needed.* In coordination with DWR and prior to releasing
 21 Interim Flows in Water Year 2013, Reclamation would establish a Channel Capacity
 22 Advisory Group to provide independent review of then-existing channel capacities
 23 estimated by Reclamation in accordance with standard USACE levee performance

1 criteria. The Channel Capacity Advisory Group would be responsible for providing
2 timely independent review of data, analytical methodology, and results used to estimate
3 then-existing channel capacities. The Channel Capacity Advisory Group would be
4 comprised of the following:

- 5 • One member from the U.S. Bureau of Reclamation
- 6 • One member from the California Department of Water Resources
- 7 • One member from the U.S. Army Corps of Engineers
- 8 • One member from the Lower San Joaquin Levee District
- 9 • One member from the Central Valley Flood Protection Board

10 Reclamation would prepare a report annually or whenever Reclamation contemplates
11 increasing the upper limit of releases for Interim or Restoration flows, which would
12 include data and methods used to develop estimates of then-existing channel capacities.
13 A draft report would be provided to the Channel Capacity Advisory Group for its review
14 and comment for a period of 60 days. In the event that comments or recommendations are
15 received from the Advisory Group within 60 days, Reclamation would be required to
16 consider and respond to such comments and prepare a final report for distribution to the
17 Channel Capacity Advisory Group within 60 days of the close of the draft report review
18 period. Reclamation would not increase Interim or Restoration flows above the
19 previously determined then-existing channel capacities until 10 days after the final report
20 is prepared and distributed to the Channel Capacity Advisory Group. The first draft report
21 shall be completed within 1 year of signing the PEIS/R Record of Decision. Draft reports
22 would include the data, methods, and estimated channel capacities; flow limits and any
23 maintenance activities; and monitoring efforts and management actions as described in
24 this project description. Draft and final reports would be made available to the public
25 concurrent with their distribution to the Channel Capacity Advisory Group.

26 Reclamation would convene the Channel Capacity Advisory Group as required until
27 2030, but may stop earlier, provided that then-existing channel capacities are determined
28 to equal or exceed the maximum proposed Restoration Flows throughout the Restoration
29 Area. If after 2030 then-existing channel capacities decrease such that full Restoration
30 Flows cannot be conveyed, the Channel Capacity Advisory Group would be reconvened
31 and function as described above until such time that the then-existing channel capacities
32 are determined to equal or exceed the full Restoration Flows.

33 *Maintain Interim and Restoration Flows at or Below Estimated Then-Existing Channel*
34 *Capacities.* Until sufficient data are available to determine the Factor of Safety,
35 Reclamation would limit initial Interim and Restoration flow releases to those flows
36 which would remain in-channel, as described below. When sufficient data are available to
37 determine the Factor of Safety, Reclamation would limit the release of Interim and
38 Restoration Flows to those flows which would maintain standard USACE levee
39 performance criteria (i.e., a Factor of Safety of at least 1.4) at all times.

40

1 In coordination with DWR, Reclamation would apply standard USACE levee
2 performance criteria for levees under a steady state of saturation and consider past
3 performance and hydrologic and hydraulic modeling to determine and update estimates
4 of channel capacities. The resulting estimated channel capacities would be used to
5 establish limits for Interim and Restoration flows throughout the Restoration Area.
6 Reclamation would be required to provide this estimate to the Channel Capacity
7 Advisory Group for review, as previously described.

8 In the event that insufficient information is available to develop an estimate of channel
9 capacities that maintain a minimum Factor of Safety for levees under saturated conditions
10 by Water Year 2013, Reclamation would limit initial Interim and Restoration flows to
11 those flows which would remain in-channel, as determined by DWR using one-
12 dimensional HEC-RAS hydraulic modeling and described in Appendix I of this Draft
13 PEIS/R. In-channel flows would have less-than-significant effects on flood risk as
14 explained in the PEIS/R impact assessment of in-channel flows.

15 Factors of Safety are inversely related to the exit gradient, and describe the potential for
16 unsafe conditions to occur. The exit gradient is the hydraulic gradient at which water
17 leaves the soil surface under saturated conditions, and is a function of both structural
18 design and hydrogeologic conditions. At a critical exit gradient, soil particles may move
19 with water, resulting in unsafe conditions such as piping and boils (Craig 1997, USACE
20 2000). USACE recommends a Factor of Safety of 1.4 or greater for levees under a steady
21 state of saturation for a prolonged time, such as occurs during flood conditions or with
22 prolonged flows. Maintaining the USACE levee performance criteria for levees under a
23 steady state of saturation would be the key levee performance criterion for maintaining
24 flood risks at less-than-significant levels.

25 Systematic levee condition monitoring would be implemented as described in more detail
26 in Appendix D, "Physical Monitoring and Management Plan." Observation of seepage or
27 boils at the landside levee toe or evidence of levee erosion would indicate that the
28 minimum Factor of Safety is not met. Such observations would supersede channel
29 capacity estimates, and Interim and Restoration flows would be immediately reduced,
30 redirected, or diverted in areas where these conditions occur (see Section 2.3.4).

31 *Closely Monitor Erosion and Perform Maintenance and/or Reduce Interim or*
32 *Restoration Flows as Necessary to Avoid Erosion-Related Impacts.* As part of the draft
33 reports prepared by Reclamation and submitted to the Channel Capacity Advisory Group
34 (as described previously), Reclamation would describe the monitoring and management
35 actions taken within the Restoration Area over the prior year and the monitoring and
36 management actions planned for the following year. The draft reports would identify
37 those monitoring and management actions that are a result of implementing the
38 Settlement and those that are a result of regular operations and maintenance and capital
39 improvements to flood control facilities of the Lower San Joaquin River Flood Control
40 Project. The draft reports would be submitted to the Channel Capacity Advisory Group
41 for review as previously described.

1 Reclamation would implement the flood-related monitoring and management actions
2 included in the project description and in the draft reports to the Channel Capacity
3 Advisory Group, and would work with the appropriate agency(ies) to implement these
4 actions to meet the performance standards as previously described. As previously
5 described, systematic levee condition monitoring would be implemented as described in
6 more detail in Appendix D, “Physical Monitoring and Management Plan,” and could lead
7 to the immediate reduction of Interim or Restoration flows in areas where these
8 conditions occur.

9 Erosion monitoring would be conducted by Reclamation using several standard
10 methodologies and protocols commonly employed by DWR, reclamation districts, and/or
11 USACE to monitor levee erosion. Aerial photography and/or ground surveys would be
12 compared to identify changes in bank line over time, indicating potential erosion. True
13 color aerial photographs would be inspected and compared to previous aerial photographs
14 to identify areas of sediment mobilization, bar formation, and bank erosion. After these
15 areas have been initially identified using aerial photography, they would be visited and
16 inspected. If inspections indicate that erosion-related impacts exist or are imminent,
17 management actions would be taken to address the issue.

18 Field surveys of potential erosion sites on the San Joaquin River between Friant Dam and
19 the Merced River confluence would be conducted by Reclamation annually. These
20 surveys would assess the condition of potential erosion sites, and could include a variety
21 of techniques such as aerial photography and topographic surveys. Previous information
22 documents the existing sediment and geomorphology conditions within the Restoration
23 Area. Existing information developed by Reclamation includes preliminary analyses
24 conducted to identify locations susceptible to potential erosion through comparison of
25 present-day channel positions (2004) and historical channel positions (1937, 1938).
26 Reclamation identified areas that may be susceptible to future erosion using the following
27 criteria:

- 28 • Areas of channel change between 1937 and 2004 or between 1983 and 2004
29 where the channel has shown lateral erosion along an outer bend or where it has
30 the potential to reoccupy an old channel position and laterally erode banks along
31 an outer bend, and that also have low topography (for instance, several outer
32 bends in Reach 1A are located adjacent to high bluffs, which would be considered
33 an area of slower erosion and are thus not identified).
- 34 • Meander necks where channel sinuosity is high and could create a cutoff.
- 35 • Areas along outer bends where excavated gravel pits are located close to the
36 active channel, regardless of whether any historical channel change has occurred.
- 37 • Areas along outer bends that are located adjacent to developed areas (such as at
38 Firebaugh).

39

- 1 • Areas with the potential for future erosion identified through this process and
2 prioritized for monitoring based on potential impacts to infrastructure. The
3 highest priorities were those with residential developments, buildings, and
4 bridges. Other high-priority areas included those containing levees, irrigation
5 canals, and roads with an apparent high potential to experience some lateral
6 migration or bank erosion.

7 Sediment mobilization monitoring during these annual surveys would focus on specific
8 potential erosion sites identified through this process, and would evaluate current and
9 potential future erosion at these sites. Channel bed deposition would be evaluated as
10 necessary by analyzing changes identified in topographic survey data and LIDAR
11 surveys.

12 The Lower San Joaquin Levee District (LSJLD) and the Central Valley Flood Protection
13 Board (CVFPB) currently have responsibility for implementing routine operations and
14 maintenance or capital improvements to the Lower San Joaquin River Flood Control
15 Project.

16 Erosion management actions identified through monitoring as described above may fall
17 under the routine maintenance of the Lower San Joaquin River Flood Control Project
18 currently performed by LSJLD. If increased maintenance activities and costs are required
19 as a result of implementing the Settlement, including additional erosion management
20 actions identified through the monitoring activities described in this section, Reclamation
21 would conduct or enter into an agreement with others to conduct such additional
22 maintenance activities. Currently, Reclamation is working with LSJLD to develop and
23 implement an agreement to provide financial assistance for additional costs incurred by
24 LSJLD. The financial assistance agreement is intended to assist LSJLD in adapting to
25 changes in operations and maintenance activities, as needed to maintain the existing level
26 of flood management under release of Interim and Restoration flows.

27 **Reoperate Downstream Flow Control Structures.** In addition to management of
28 Interim and Restoration flows at Friant Dam, Alternative A1 includes modifications to
29 the existing operation of the Lower San Joaquin River Flood Control Project (flood
30 management system) and the Hills Ferry Barrier, but without physical, construction-
31 related activities to modify the channels, to address the following:

- 32 • **Reoperate Chowchilla Bypass Bifurcation Structure to convey Restoration**
33 **Flows into Reach 2B** – Currently, the structure is operated as part of the flood
34 management system to direct flood flows and irrigation deliveries based on
35 several factors, including flows in Reach 2A, the capacity of Reach 2B, flows
36 from the Kings River system via Fresno Slough, and water demands in the
37 Mendota Pool. Modifications to the operating criteria would incorporate the
38 routing of Interim and Restoration flows during nonflood operations to meet flow
39 targets in Reach 2B. If flood releases are made from Friant Dam in excess of the
40 Interim or Restoration flows called for, Interim and Restoration flows would not
41 be released and standard operation of the flood management system would apply.
42 Interim and Restoration flows would have a lower priority for downstream

1 channel capacity than flood flows or irrigation deliveries to the San Joaquin River
2 Exchange Contractors.

3 • **Reoperate San Joaquin River Headgate Structure to convey Restoration**

4 **Flows into Reach 4B1** – The current conveyance capacity of Reach 4B1 is
5 unknown and could be as low as zero in some locations. Currently, the San
6 Joaquin River Headgate Structure, part of the flood management system, is
7 maintained in a closed position whereby all flows in the river are routed into the
8 bypass system. The San Joaquin River Headgate Structure would be operated to
9 release Interim and Restoration flows to Reach 4B1 after completion of
10 modifications to provide for increased capacity in Reach 4B1, and modifications
11 to the headgate structure are completed. These releases would be limited by then-
12 existing channel capacity in Reach 4B1.

13 • **Reoperate the Eastside and Mariposa bypass bifurcation structures to**
14 **convey Interim and Restoration flows into Reach 4B2** – Modifications to the
15 operating criteria for these structures, which are part of the flood management
16 system, would include the routing Interim and Restoration flows to the Eastside or
17 Mariposa bypasses. Interim and Restoration flows would have a lower priority for
18 downstream channel capacity than flood flows.

19 • **Operate and monitor Hills Ferry Barrier** – The main purpose of the Hills Ferry
20 Barrier is to redirect upstream-migrating adult fall-run Chinook salmon into
21 suitable spawning habitat in the Merced River and prevent migration into the
22 main stem San Joaquin River upstream, where conditions are currently considered
23 unsuitable for Chinook salmon and Central Valley steelhead. The adult Central
24 Valley steelhead migration period overlaps with fall-run Chinook salmon, and
25 typically occurs between October and December in the San Joaquin River basin.
26 Because their body type is similar to salmon, Central Valley steelhead would be
27 expected to be redirected by the barrier in a similarly effective manner.
28 Operations and maintenance of the Hills Ferry Barrier would continue for the
29 purpose of redirecting Chinook salmon and, incidentally, Central Valley steelhead
30 until sufficient habitat and channel improvements to support salmonids are
31 complete.

32 **Establish Recovered Water Account and Program.** The release of Interim and
33 Restoration flows would reduce annual water deliveries to Friant Division long-term
34 contractors. Consistent with Paragraph 16(b) of the Settlement, Reclamation would
35 identify delivery reductions to Friant Division long-term contractors associated with the
36 release of Interim and Restoration flows, as part of the RWA stipulated for
37 implementation under Paragraph 16(b). Paragraph 16(b) also provides for the delivery of
38 water during wet hydrologic conditions to Friant Division long-term contractors at a cost
39 of \$10 per acre-foot. Implementing Paragraph 16(b) actions could affect the amount of
40 water that is released to the San Joaquin River in excess of Restoration Flow
41 requirements during wet periods. The diversion of water from Friant Dam pursuant to
42 Paragraph 16(b) would be based on the following conditions:

- 1 • Water at Friant Dam would be eligible for delivery to Friant Division long-term
2 contractors, pursuant to Paragraph 16(b), in wet hydrologic conditions when water
3 is not needed for Interim and Restoration flows.
- 4 • Paragraph 16(b) water would be conveyed through the Friant-Kern and Madera
5 canals only when capacity is available, without impacting requirements to meet
6 existing contract deliveries to Friant Division long-term contractors.
- 7 • Potential future demand for Paragraph 16(b) water in all action alternatives is
8 based in part on the implementation of actions by Friant Division long-term
9 contractors or other water users to increase surface water conveyance or
10 groundwater recharge capacity.

11 It is anticipated that Friant Division long-term contractors would be able to accept
12 delivery of some Paragraph 16(b) water using existing water conveyance and storage
13 facilities. Because Paragraph 16(b) water would likely be available predominantly during
14 periods when irrigation demand is limited, it is expected that Friant Division and non-
15 Friant Division water users could develop additional local conveyance and storage
16 capacity to increase their ability to receive Paragraph 16(b) water supplies. The program
17 alternatives are evaluated in consideration of the range of potential changes in water
18 diversions that could result from implementing water facility improvements in the Friant
19 Division to increase delivery capability. Facility improvements to increase delivery
20 capability would require separate environmental compliance documentation, and are not
21 included as actions under the program alternatives. Pursuant to Part III of the Omnibus
22 Public Land Management Act of 2009 (Public Law 111-11), the Secretary is developing
23 proposed guidelines for projects designed to reduce, avoid, or offset the quantity of
24 expected water supply impacts to Friant Division long-term contractors caused by Interim
25 and Restoration flows. This process is occurring parallel to and separate from
26 development of this Draft PEIS/R.

27 Reclamation is currently working with the Friant Division long-term contractors and
28 appropriate agencies to develop procedures for identifying delivery reductions to Friant
29 Division long-term contractors associated with the release of Interim and Restoration
30 flows as part of the RWA stipulated for implementation under Paragraph 16(b).

31 ***Recapture Interim and Restoration Flows***

32 Water recapture actions in Alternative A1 include recapturing Interim and Restoration
33 flows using existing facilities in the Restoration Area and in the Delta. These actions are
34 analyzed at a project level in this Draft PEIS/R. As described previously, action
35 alternatives presented in this Draft PEIS/R are differentiated, in part, by the actions for
36 recapturing Interim and Restoration flows. Recaptured water available for transfer to
37 Friant Division long-term contractors would range from zero to 556 TAF, as shown in
38 Table 2-4. Reclamation would identify actual delivery reductions to Friant Division long-
39 term contractors associated with the release of Interim and Restoration flows.

40

1 **Recapture in the Restoration Area.** Alternative A1, and all other action alternatives,
2 includes potential recapture of up to the total quantity of Interim and Restoration flows
3 (556 TAF, as shown in Table 2-4) within the Restoration Area using existing facilities.
4 As previously described, the Settlement includes flow targets in six locations to
5 determine achievement of the Restoration Goal. Paragraph 16(a)(1) of the Settlement
6 provides that recapture and recirculation of Interim and Restoration Flows “shall have no
7 adverse impact on the Restoration Goal, downstream water quality or fisheries.” Because
8 recapture within the Restoration Area could prevent the flow targets from being met,
9 recapture within the Restoration Area would occur only if necessary to avoid interfering
10 with in-channel construction activities associated with the Restoration Goal, or to avoid
11 potential material adverse impacts from groundwater seepage (as described in Appendix
12 D, “Physical Monitoring and Management Plan”) or for other emergency actions to avoid
13 immediate adverse impacts. Interim and Restoration flows would be recaptured
14 consistent with Federal, State, and local laws, and future agreements with downstream
15 agencies, entities, and landowners. Potential locations within the Restoration Area for
16 recapture of Interim and Restoration flows include the Mendota Pool, and the East Bear
17 Creek Unit located in Eastside Bypass Reach 3. Only diversion facilities that have
18 potential to recirculate Interim and Restoration flows to the Friant Division would be
19 used for recapture locations.

20 No change in operational requirements would be required to recapture Interim and
21 Restoration flows in the Restoration Area or in the Delta under the regulatory compliance
22 standards in place at the time water is recaptured. Any increase in Restoration Area or
23 Delta exports directly resulting from the Interim or Restoration flows would be available
24 for recirculation to the Friant Division; however, recirculation of recaptured water to the
25 Friant Division could require subsequent exchange agreements between Reclamation,
26 DWR, Friant Division long-term contractors, and other south-of-Delta CVP/SWP
27 contractors who are not included in the action alternatives. As previously described,
28 recirculation would be subject to available capacity and existing operational constraints
29 within CVP/SWP storage and conveyance facilities.

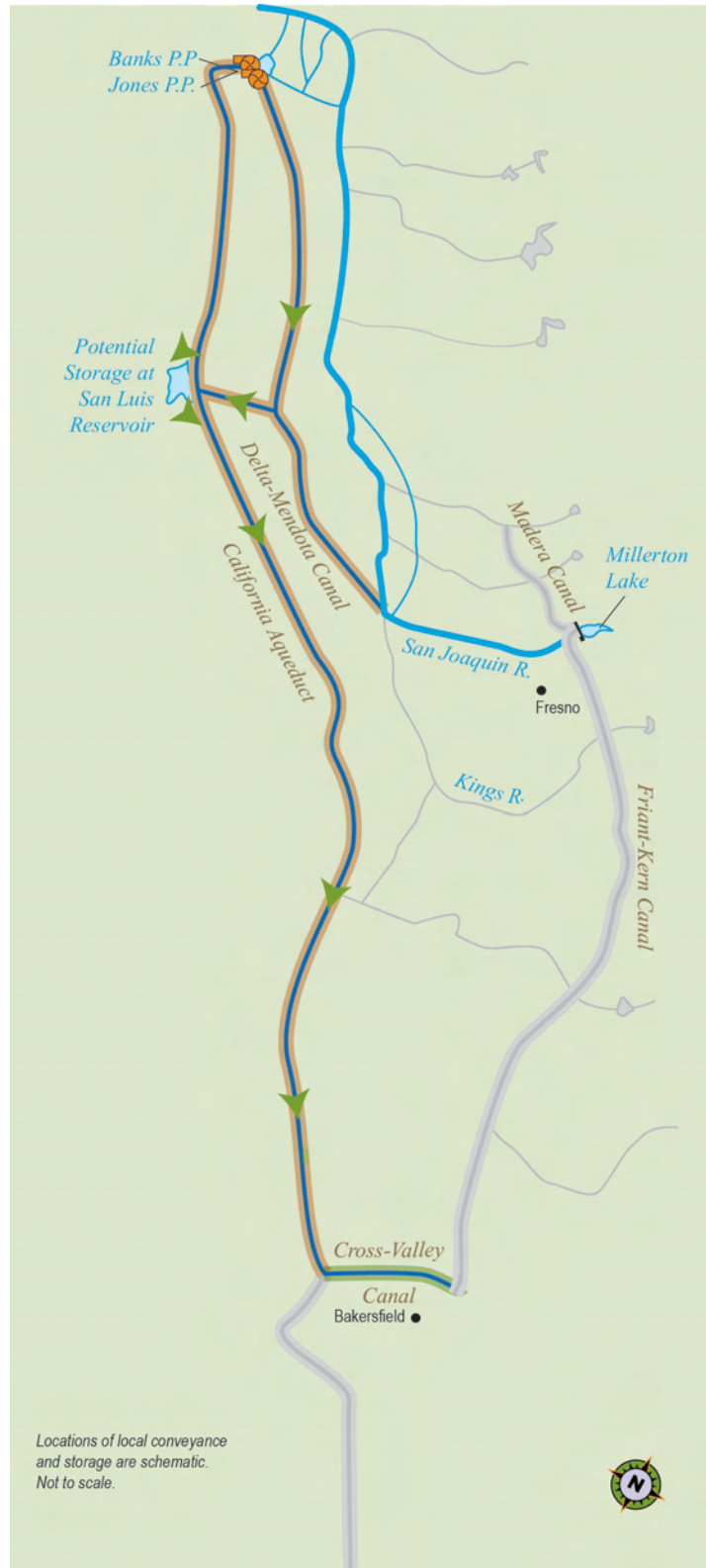
30 Locations available for recapture of Interim and Restoration flows within the Restoration
31 Area include the following:

- 32 • **Recapture at Mendota Pool** – Interim and Restoration flows could be diverted
33 from the Mendota Pool to the extent that these flows would meet demands,
34 replacing CVP water supplies that would otherwise be delivered via the DMC.
35 The DMC carries water from the Delta to the Mendota Pool, where the water is
36 diverted through several existing pumps and canals with a combined capacity that
37 exceeds upstream channel capacity. Interim and Restoration flows diverted by
38 CVP contractors at the Mendota Pool would be in lieu of supplies typically
39 delivered via the DMC. Therefore, CVP water supplies that would have been
40 delivered via the DMC would be made available for delivery to the Friant
41 Division, subject to existing contractual obligations and existing and any future
42 agreements. In such cases, Delta exports would not change compared to the No-
43 Action Alternative. Exported water, up to the amount diverted at the Mendota
44 Pool, would be available for recirculation to the Friant Division using existing

1 south-of-Delta facilities, including the C.W. “Bill” Jones Pumping Plant (Jones
2 Pumping Plant) and Harvey O. Banks Pumping Plant (Banks Pumping Plant),
3 California Aqueduct, DMC, San Luis Reservoir and related pumping facilities,
4 and other facilities operated by CVP/SWP contractors, as shown on Figure 2-7.

5 • **Recapture at wildlife refuge** – If considerations in Reach 5 or in downstream
6 reaches (such as channel capacity or potential take of listed species that could not
7 be avoided) require that less (or no) flow enters those reaches, Interim and
8 Restoration flows could be diverted to the East Bear Creek Unit in Eastside
9 Bypass Reach 3, to the extent that these flows would meet water supply demands.
10 The East Bear Creek Unit has a pump lift station in the Eastside Bypass with a
11 diversion capacity of 60 cfs. This pump station includes a 48-inch-diameter intake
12 structure and four 125-horsepower electric motors driving 15 cfs pumps.
13 Deliveries of Interim and/or Restoration Flows to the East Bear Creek Unit would
14 be further constrained by actual demand for water supplies at the units. Currently,
15 the East Bear Creek Unit receives CVP water supplies from the DMC.

16 **Recapture in Delta.** Interim and Restoration flows reaching the Delta would be
17 recaptured at existing facilities within the Delta consistent with applicable laws,
18 regulations, BOs, and court orders in place at the time the water is recaptured. Alternative
19 A1 includes recapture of Interim and Restoration flows in the Delta at the Jones and
20 Banks pumping plants (Figures 2-2 and 2-4), operated consistent with applicable laws,
21 regulations, BOs, and court orders in place at the time the water is recaptured.



Key: P.P. = Pumping Plant

Figure 2-7.
Major Facilities That May Be Used in Recapture and Recirculation of Interim and Restoration Flows

1
2
3
4
5

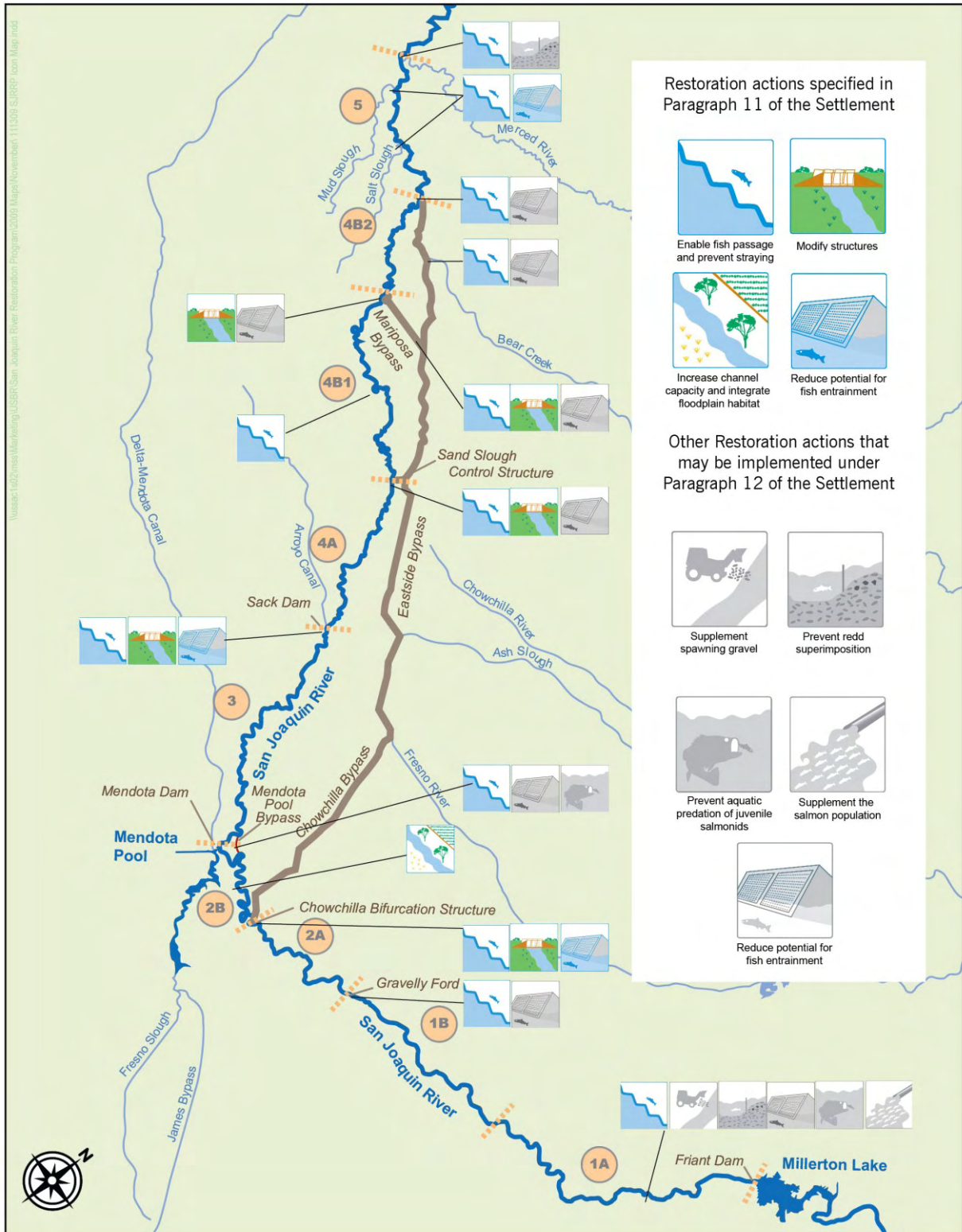
1 **2.4.2 Program-Level Actions**

2 Alternative A1 actions analyzed at a program level are described below, and include
3 recirculating recaptured Interim and Restoration flows, and common Restoration actions.
4 The Physical Monitoring and Management Plan (Appendix D) and the Conservation
5 Strategy, which include both project- and program-level actions, are described in a
6 separate subsection.

7 Alternative A1 actions analyzed in this Draft PEIS/R at a program level and described in
8 more detail below are as follows:

- 9 • **Recirculate recaptured Interim and Restoration flows** – Alternative A1
10 includes recirculating up to the full amount of recaptured Interim and Restoration
11 flows to the Friant Division to minimize water supply impacts to Friant Division
12 long-term contractors caused by Interim and Restoration flows.

- 13 • **Common Restoration actions** – Common Restoration actions are potential
14 physical actions to achieve the Restoration Goal that are common to all action
15 alternatives, and which would be implemented within the Restoration Area, as
16 shown in Figure 2-8. These include actions to modify Reach 4B1 to convey at
17 least 475 cfs of Interim and Restoration flows. Modifications in the Eastside and
18 Mariposa bypasses to convey Interim and Restoration flows in excess of flows
19 routed through Reach 4B1 are common to all alternatives, as shown in Figure 2-2,
20 and are described as part of the common Restoration actions.



1
2
3

Figure 2-8.
Location of Common Restoration Actions Included in Action Alternatives

1 ***Recirculate Recaptured Interim and Restoration Flows***

2 Paragraph 16(a) of the Settlement stipulates that the Secretary, in consultation with the
3 Settling Parties, is to develop and implement "...a plan for recirculation, recapture, reuse,
4 exchange, or transfer of the Interim and Restoration flows for the purpose of reducing or
5 avoiding impacts to water deliveries to all of the Friant Division long-term contractors
6 caused by the Interim Flows and Restoration Flows," provided "...that any recirculation,
7 recapture, reuse, exchange or transfer of the Interim and Restoration flows shall have no
8 adverse impact on the Restoration Goal, downstream water quality or fisheries." The
9 quantity of water available for recirculation to the Friant Division long-term contractors
10 would be up to the amount of water recaptured at existing facilities (under all
11 alternatives) or new or modified facilities (Alternatives C1 and C2). Water recaptured
12 and recirculated to the Friant Division in this manner could require exchange agreements
13 between Reclamation, DWR, Friant Division long-term contractors, and other south-of-
14 Delta CVP/SWP contractors. The details of the plan for recirculation would be
15 determined through future negotiations between affected parties, and this action is
16 therefore described at a program level in this Draft PEIS/R.

17 Recirculation would be subject to available capacity within CVP/SWP storage and
18 conveyance facilities. Available capacity is capacity that is left after satisfying all
19 statutory and contractual obligations to existing water service or supply contracts,
20 exchange contracts, settlement contracts, transfers, or other agreements involving or
21 intended to benefit CVP/SWP contractors served water through CVP/SWP facilities. No
22 additional agreements would be required to recapture Interim and Restoration flows in
23 the Restoration Area. However, recirculation of recaptured water to the Friant Division
24 could require mutual agreements between Reclamation, DWR, Friant Division long-term
25 contractors, and other south-of-Delta CVP/SWP contractors. Reclamation would develop
26 these agreements in close coordination with Friant Division long-term contractors. Any
27 mutual agreements negotiated to facilitate delivery of water to Friant Division contractors
28 using CVP/SWP facilities would be negotiated so as not to impact CVP/SWP deliveries
29 or operation of the CVP/SWP; such agreements may require additional environmental
30 documentation. In addition, Paragraph 13(i) of the Settlement provides guidance on how
31 to manage any unreleased Restoration Flows starting in 2014, including but not limited
32 options to enter into mutually acceptable agreements with Friant Division long-term
33 contractors or third parties, "...to (A) bank, store, or exchange such water for future use
34 to supplement future Restoration Flows, or (B) transfer or sell such water and deposit the
35 proceeds of such transfer or sale into the Restoration Fund created by this Settlement."
36 Paragraph 13(i) also specifies the release the water from Friant dam during times of the
37 year other than those specified in the applicable hydrograph. Any mutual agreements
38 negotiated to facilitate the actions under Paragraph 13(i) would be negotiated so as not to
39 increase water supply reductions to Friant Division long-term contractors beyond what
40 would have been caused by releases in accordance with the hydrograph releases in
41 Exhibit B of the Settlement. Such agreements may require additional environmental
42 documentation.

43

1 **Common Restoration Actions**

2 Common Restoration actions require program-level coverage to address cumulative and
3 system-wide effects, and include actions stipulated in Paragraphs 11 and 14 of the
4 Settlement, as well as additional structural or channel improvements that may further
5 enhance the success of achieving the Restoration Goal under Paragraph 12 of the
6 Settlement.

- 7 • **Paragraph 11(a).** Common Restoration actions stipulated in Paragraph 11 of the
8 Settlement include channel modifications to be completed in two phases. Phase 1
9 actions are the 10 actions stipulated in Paragraph 11(a) of the Settlement that are
10 considered the highest priority channel improvements. The Settlement stipulates
11 that those actions be completed by December 31, 2013. Two potential actions
12 require subsequent decisions to determine their necessity: (1) modifications to the
13 San Joaquin River Headgate Structure at the head of Reach 4B1, and (2)
14 modifications in the Eastside and Mariposa bypasses to provide fish passage
15 under low flows. In the following sections, these 10 Phase 1 actions are grouped
16 by common location and/or other linkages, and include the following:

- 17 – **Paragraphs 11(a)(1) and 11(a)(2)** – Construct Mendota Pool Bypass and
18 Modify Reach 2B to convey at least 4,500 cfs
- 19 – **Paragraph 11(a)(3)** – Modify Reach Reach 4B1 to convey at least 475 cfs
- 20 – **Paragraph 11(a)(4)** – Modify San Joaquin River Headgate Structure to
21 enable fish passage
- 22 – **Paragraph 11(a)(5)** – Modify Sand Slough Control Structure to enable fish
23 passage and flow routing
- 24 – **Paragraphs 11(a)(6) and 11(a)(7)** – Screen Arroyo Canal and provide fish
25 passage at Sack Dam
- 26 – **Paragraphs 11(a)(8) and 11(a)(9)** – Modify Eastside and Mariposa bypasses
27 to enable fish passage
- 28 – **Paragraph 11(a)(10)** – Enable deployment of seasonal barriers at Mud and
29 Salt sloughs

- 30 • **Paragraph 11(b).** The four Phase 2 actions stipulated in Paragraph 11(b) of the
31 Settlement also are considered high priority channel improvements that may
32 contribute to achieving the Restoration Goal. The Settlement stipulates that these
33 projects be completed by December 31, 2016, in a manner that does not delay
34 completion of Phase 1 actions. Subsequent decisions would be required to
35 determine whether the Phase 2 actions are necessary and, if so, to define the scope
36 of the actions. Phase 2 actions not included in Alternative A1 involve
37 modifications to enable routing of up to 4,500 cfs into and through Reach 4B1, as

1 described for Alternative A2. The following Phase 2 actions included in
2 Alternative A1 are described in the following sections:

3 – **Paragraph 11(b)(2)** – Modify Chowchilla Bypass Bifurcation Structure

4 – **Paragraph 11(b)(3)** – Fill or isolate gravel pits

5 • **Paragraph 14.** Paragraph 14 of the Settlement stipulates that spring-run and
6 fall-run Chinook salmon reintroduction occur by December 31, 2012.

7 • **Paragraph 12.** Paragraph 12 states that additional structural or channel
8 improvements that may further enhance the success of achieving the Restoration
9 Goal may be recommended by the RA to the Secretary for implementation.
10 Potential actions under Paragraph 12 are not assigned a date for completion under
11 the Settlement. Site-specific studies and subsequent implementation of future
12 potential Restoration actions under Paragraph 12 of the Settlement would be
13 based on information collected through monitoring, as identified in the Physical
14 Monitoring and Management Plan (Appendix D), during implementation of
15 Settlement-stipulated actions. Potential Restoration actions pursuant to Paragraph
16 12 that could be identified by the RA at a future date range from no modifications
17 to the level of implementation described below. Appendix E, “Fisheries
18 Management Plan,” addresses specific actions, including those described below,
19 and evaluates their merits (including uncertainty) in an action routing process.
20 The following potential Paragraph 12 actions included in Alternative A1 are
21 described in the following sections:

22 – Enhance Spawning Gravel

23 – Reduce Potential for Redd Superimposition and/or Hybridization

24 – Supplement Salmon Population

25 – Modify Floodplain and Side-Channel Habitat

26 – Enhance In-Channel Habitat

27 – Reduce Potential for Aquatic Predation of Juvenile Salmonids

28 – Reduce Potential for Fish Entrainment

29 – Enable Fish Passage

30 – Modify Flood Flow Control Structures

31 All alternatives include the anticipated range of potential implementation for common
32 actions under Paragraphs 11, 14, and 12 of the Settlement, as described below and shown
33 in Figure 2-8. All common Restoration actions would require future, separate project-
34 specific planning studies and NEPA and/or CEQA documentation analyzing the effects

1 of implementation. The details described below for these actions are based on initial
2 engineering concepts and information from the Fishery Management Plan (Appendix E).
3 These details are subject to change as additional project-specific information is
4 developed.

5 Common Restoration actions include modifications to the channel and flow control
6 structures, including levees and other portions of the Lower San Joaquin Flood Control
7 Project. As part of any modifications that could affect operation of the Lower San
8 Joaquin Flood Control Project, the lead agencies would conduct a study to determine
9 needed conveyance modifications, including modifications to levees and other related
10 hydraulic features, to maintain existing levels of flood protection. Channel and facility
11 modifications would be designed to not adversely affect flood conveyance capacity or
12 functionality of existing channels and facilities.

13 **Construct Mendota Pool Bypass and Modify Reach 2B.** Paragraph 11(a)(1) of the
14 Settlement stipulates the creation of a bypass channel around the Mendota Pool to convey
15 at least 4,500 cfs from Reach 2B downstream to Reach 3. Paragraph 11(a)(2) of the
16 Settlement stipulates modifications in channel capacity, and incorporation of new
17 floodplain habitat and related riparian habitat, to convey at least 4,500 cfs between the
18 Chowchilla Bypass Bifurcation Structure and new Mendota Pool Bypass. Because the
19 functions of these channels are related, they are described together in this section:

20 • **Construct Mendota Pool Bypass** – Constructing Mendota Pool Bypass includes
21 building a bypass around the Mendota Pool to convey at least 4,500 cfs from
22 Reach 2B to Reach 3 downstream from Mendota Dam. Riparian habitat in the
23 Mendota Pool Bypass is expected to be similar to new floodplain habitat in Reach
24 2B. Constructing the Mendota Pool Bypass also includes constructing a
25 bifurcation structure in Reach 2B to convey at least 4,500 cfs to the bypass. The
26 bifurcation structure would include a fish screen or other positive fish barrier to
27 direct fish into the bypass channel and minimize or avoid fish passage from Reach
28 2B to the Mendota Pool. Additionally, the Mendota Pool Bypass would include
29 one or more grade control structures to control bedform and create stable and
30 suitable habitat conditions for fish in the vicinity.

31 • **Modify Reach 2B to convey at least 4,500 cfs** – Modifying Reach 2B to convey
32 at least 4,500 cfs includes expanding the capacity of the reach to convey at least
33 4,500 cfs, with integrated floodplain habitat. New levees would be constructed,
34 potentially along either or both sides of Reach 2B, to create an average floodplain
35 width of between 500 feet and 3,700 feet, an associated levee system width of
36 between 700 feet and 3,900 feet, and levee heights of an average 4 feet to 5 feet,
37 depending on the level of floodplain habitat modifications incorporated. Specific
38 levee alignments and modifications would be determined through a separate,
39 project-specific study that would consider a variety of factors, including, but not
40 limited to, fisheries and other environmental requirements, flood risk reduction,
41 land uses, subsurface conditions, topography, and the condition of existing levees.
42 Because of uncertainty regarding the life history behavior of introduced salmon,
43 modifications to Reach 2B may or may not emphasize floodplain habitat for

1 rearing juvenile Chinook salmon, and any modifications would be determined
2 from results of subsequent site-specific studies.

3 The San Mateo Road, which crosses the river in Reach 2B, may cause backwater effects
4 and downstream scour, and may act as a barrier to upstream salmon migration during low
5 flows. Subsequent, project-specific technical studies of this crossing would identify the
6 type of modifications that would be necessary for flow and fish passage.

7 Depending on the final, constructed channel capacity of Reach 2B above the new
8 Mendota Pool Bypass Bifurcation Structure, simultaneous release of 4,500 cfs
9 Restoration Flows to the Mendota Pool Bypass and delivery of San Joaquin River flows
10 to the Mendota Pool may not be possible. Similarly, because Reach 3 is anticipated to
11 have a long-term capacity of 4,500 cfs, simultaneous release of 4,500 cfs of Restoration
12 Flows to the Mendota Pool Bypass and conveyance of flood flows from the James
13 Bypass would not be possible. The Secretary would prioritize flood control and water
14 right delivery obligations over meeting flow targets for Restoration Flows, reducing
15 Restoration Flows in these reaches if channel capacity is insufficient to meet conveyance
16 of flood control or water delivery obligations in combination with Restoration Flows.

17 **Modify Reach 4B1 to Convey at Least 475 cfs.** Paragraph 11(a)(3) of the Settlement
18 stipulates required channel modifications in Reach 4B to convey at least 475 cfs. The Act
19 (Section 10009(f)(2)(B)) requires that a determination be made on increasing the channel
20 capacity to 4,500 cfs before undertaking any “substantial construction” in Reach 4B1.
21 Therefore, modifications in Reach 4B1 to convey at least 475 cfs would not include
22 substantial construction, such as changes to existing levees in Reach 4B1. Based on
23 preliminary studies, these modifications are anticipated to include removing in-channel
24 vegetation and modifying road crossings within Reach 4B1. Modifying Reach 4B1 could
25 also include modifications to establish a low-flow channel to support fish migration,
26 ranging from a single low-flow channel to a series of terraced channels to convey
27 incremental low flows of up to 475 cfs or more.

28 Five road crossings are present in Reach 4B1 that could require modification. These
29 include crossings at Washington Road, Turner Island Road, and three unnamed crossings.
30 It is not known if modifications would be required at the Washington Road or Turner
31 Island Road crossings to allow conveyance of at least 475 cfs or to provide fish passage.
32 Currently, all three unnamed crossings are configured with culverts that may be
33 insufficient to convey 475 cfs and/or may present barriers to upstream migrating adult
34 salmon. Modifying Reach 4B1 could include modifying these road crossings to provide
35 flow capacity and fish passage, as necessary. These modifications could include installing
36 culverts, restructuring the channel, and/or constructing clear span bridges. Project-
37 specific technical studies of these crossings would identify the type of modifications that
38 would be necessary for flow and fish passage, and such modifications would be evaluated
39 in subsequent environmental documents, as needed.

1 **Modify San Joaquin River Headgate Structure to Enable Fish Passage and Flow**
2 **Routing.** Paragraph 11(a)(4) stipulates modifications to the San Joaquin River Headgate
3 Structure to enable fish passage and flow routing of between 500 and 4,500 cfs into
4 Reach 4B1. The Settlement stipulates that these modifications are to be made consistent
5 with the decision on whether to route 4,500 cfs through Reach 4B1. Under all action
6 alternatives, these modifications would be made sufficient to convey at least 475 cfs into
7 Reach 4B1. Modifications to this structure are closely related to Restoration actions in
8 Reach 4B1, described previously.

9 **Modify Sand Slough Control Structure to Enable Fish Passage.** The Sand Slough
10 Control Structure could present a barrier to upstream migration of adult salmon.
11 Modifications to the Sand Slough Control Structure for fish passage are stipulated in
12 Paragraph 11(a)(5) of the Settlement. Modifying the Sand Slough Control Structure could
13 include modifying the structure for fish passage pursuant to Paragraph 11(a)(5) of the
14 Settlement by removing the existing flume and replacing it with a gated structure. These
15 modifications would be designed to not adversely affect flood conveyance capacity or
16 functionality of the existing structure. Modifications to this structure are closely related to
17 Restoration actions in Reach 4B1, described in a following section.

18 **Screen Arroyo Canal and Provide Fish Passage at Sack Dam.** Paragraph 11(a)(6) of
19 the Settlement stipulates required modifications to Arroyo Canal to prevent entrainment
20 of anadromous fish. Paragraph 11(a)(7) of the Settlement stipulates required
21 modifications at Sack Dam for fish passage. Sack Dam currently provides the water
22 surface elevation necessary for diversion at Arroyo Canal.

23 Diversions to Arroyo Canal range from zero to 800 cfs, and typically do not exceed 600
24 cfs. This action could include installing a screening device at the entrance to Arroyo
25 Canal. The screen could be designed to operate with flows of up to 4,500 cfs in the river,
26 while conveying flows into Arroyo Canal, to prevent entrainment of juvenile Chinook
27 salmon in the canal. It also could include constructing a fish ladder at Sack Dam to allow
28 flow and fish passage for a range of flows of up to 4,500 cfs.

29 **Modify Eastside and Mariposa Bypasses to Enable Fish Passage.** Paragraph 11(a)(8)
30 of the Settlement stipulates modifications to structures in the Eastside and Mariposa
31 bypass channels to provide anadromous fish passage on an interim basis until completion
32 of Phase 2 actions described below. Paragraph 11(a)(9) of the Settlement stipulates
33 modifications to the Eastside and Mariposa bypass channels to establish a suitable low-
34 flow channel if the Secretary, in consultation with the RA, determines that such
35 modifications are necessary to support anadromous fish migration through these
36 channels. Because the function of the structures and the channel in these bypasses are
37 related, modifications are described together in this section. Potential actions include the
38 following:

- 39 • **Modify structures in Eastside and Mariposa bypasses to provide fish passage**
40 –The Mariposa Bypass Bifurcation Structure at the head of the Mariposa Bypass
41 would be modified to allow fish passage for a range of flows of up to 4,500 cfs.
42 The Mariposa Bypass Drop Structure, at the downstream end of the Mariposa

1 Bypass, presents a barrier to fish passage. Modifying the Mariposa Bypass Drop
2 Structure could include constructing a fish ladder to allow upstream and
3 downstream fish passage for a range of flows of up to 4,500 cfs. Modifications
4 would allow the structure to handle 8,500 cfs while not increasing upstream water
5 levels from existing conditions.

- 6 • **Modify Eastside and Mariposa bypasses to provide fish passage under low**
7 **flows** – The Eastside and Mariposa bypass channels were constructed with flat
8 channel bottoms. Although scouring flows since construction have incised low-
9 flow channels in some areas of the bypasses, some areas may not be passable by
10 fish during low flows. The range of potential actions to provide fish passage under
11 low flows could include no modifications, modifications to develop a single low-
12 flow channel to convey at least 475 cfs, and a series of terraced channels to
13 convey incremental low flows of up to 475 cfs.

14 **Enable Deployment of Seasonal Barriers at Mud and Salt Sloughs.** Potential false
15 migration pathways to migrating adult salmon may be present in Mud and Salt sloughs,
16 tributaries to Reach 5. Modifications to Mud and Salt sloughs would be made to enable
17 the deployment of barriers on these sloughs to prevent adult salmon from entering these
18 potentially false migration pathways, consistent with Paragraph 11(a)(10) of the
19 settlement.

20 **Modify Chowchilla Bypass Bifurcation Structure.** Paragraph 11(b)(2) of the
21 Settlement stipulates modifications to the Chowchilla Bypass Bifurcation Structure to
22 provide fish passage and prevent fish entrainment, if such modifications are necessary to
23 achieve the Restoration Goal, as determined by the Secretary in consultation with the RA,
24 and with the concurrence of NMFS and USFWS. Gaps between the gates of the
25 Chowchilla Bypass Bifurcation Structure allow some flow to leak through the gates,
26 when closed. The gaps may be large enough to allow fish to pass through into the bypass,
27 leaving them stranded. To address potential stranding of fish in the Chowchilla Bypass,
28 modifying the Chowchilla Bypass Bifurcation Structure could include a range of
29 potential actions, such as no modifications, monitoring and management of fish stranding
30 under flood conditions, ranges of flows for screening the Chowchilla Bypass to prevent
31 fish from entering the bypass, retrofitting the gates to prevent fish from passing through
32 gaps between the closed gates, and/or adding an additional, screened gate to the structure.
33 Modifications to this structure would be designed to not adversely affect the flood
34 conveyance capacity or functionality of the existing structure.

35 **Fill or Isolate Gravel Pits.** Paragraph 11(b)(3) of the Settlement stipulates filling
36 and/or isolating the highest priority gravel pits in Reach 1, based on their relative
37 potential for reducing juvenile salmon mortality, as determined by the Secretary in
38 consultation with the RA. Gravel pits could contribute to juvenile salmon mortality
39 through effects on water temperatures and by providing habitat for predator species such
40 as largemouth bass. A project-specific technical study would be necessary to identify the
41 highest priority pits; therefore, this action has a potential range of actions, including no
42 modifications, filling or isolating some or all pits, and regrading the floodplain to fill pits.

1 Modifications to gravel pits could be implemented in connection with other potential
2 Restoration actions described later in this chapter.

3 **Salmon Reintroduction.** Paragraph 14 of the Settlement addresses reintroducing
4 spring-run and fall-run Chinook salmon between Friant Dam and the confluence of the
5 San Joaquin River with the Merced River by December 31, 2012. Paragraph 14 states
6 that, “in the event that competition, inadequate spatial or temporal segregation, or other
7 factors beyond the control of the Settling Parties make restoring spring-run and fall-run
8 Chinook salmon infeasible, then priority shall be given to restoring self-sustaining
9 populations of wild spring run Chinook salmon.” The Secretary, through USFWS, and in
10 consultation with the Secretary of Commerce, DFG, and the RA, will reintroduce spring-
11 and fall-run Chinook salmon “at the earliest practical date after commencement of
12 sufficient flows and the issuance of necessary permits.” To help facilitate reintroduction
13 of salmon, a management plan has been developed to help guide implementation of
14 Restoration actions. The range of potential actions for salmon reintroduction spans from
15 reintroducing only spring-run Chinook salmon to reintroducing both fall-run and spring-
16 run Chinook salmon, and could include one or more life stages. Broodstocks would be
17 identified through subsequent studies, and because of the uncertainty associated with
18 broodstock life history, behavioral, and adaptive traits of potential broodstock in the
19 Central Valley, it is most likely that broodstocks would be acquired from a variety of
20 watersheds.

21 The range of potential actions for salmon reintroduction could also include the use of the
22 existing San Joaquin Hatchery, another existing hatchery, or a new hatchery. Although
23 the design and capacity of a new hatchery would be determined in part by management
24 plans, a new hatchery could potentially provide for initial reintroduction of spring-run
25 Chinook salmon, fall-run Chinook salmon, and/or other native fish. Hatchery use would
26 be phased out over time as the fish population is reestablished. The Restoration Goal and
27 Paragraph 14 of the Settlement emphasize the need to restore self-sustaining fish
28 populations. Therefore, hatchery populations alone would not fulfill the Restoration Goal,
29 and naturally reproduced individuals would need to be distinguished from hatchery-
30 produced individuals.

31 This Draft PEIS/R identifies potential system effects associated with reintroducing
32 salmon. USFWS submitted a 10(a)(1)(a) Enhancement of Species Permit application to
33 NMFS on September 30, 2010, for introducing an experimental population of spring-run
34 Chinook salmon, consistent with the schedule identified in the Settlement. NMFS will
35 issue a final rule pursuant to Section 10(j) of the Federal Endangered Species Act of 1973
36 (ESA), as amended, by April 30, 2012. Specific environmental effects related to the
37 reintroduction of spring-run Chinook salmon would be addressed in the subsequent
38 project-specific NEPA analysis, and possibly CEQA analysis, in compliance with an
39 associated Special Rule authorizing the experimental population.

1 **Enhance Spawning Gravel.** Adult Chinook salmon require suitable gravels, refuge,
2 water depths, and velocities for spawning. The range of potential actions to provide for
3 adequate spawning gravel could include no modifications, augmenting and/or
4 conditioning gravel at existing riffles, or establishing new riffles, as described below:

5 • **No modifications** – No actions would be taken to modify, augment, or condition
6 gravel either at existing riffles or through establishing new riffles.

7 • **Augment existing riffles** – This action consists of augmenting existing riffles
8 with clean, spawning-sized gravel at some, or a portion of, the existing spawning
9 areas in Reach 1.

10 • **Establish new riffles** – This action consists of establishing new riffles to increase
11 and enhance salmonid spawning habitat in Reach 1.

12 **Reduce Potential for Redd Superimposition and/or Hybridization.** Spring-run
13 Chinook salmon typically spawn earlier than fall-run Chinook salmon, creating the
14 potential for redd superimposition, when fall-run Chinook salmon construct their redds
15 on top of spring-run redds and dislodge or smother some of the spring-run eggs. In
16 addition, a small percentage of fall-run Chinook salmon may spawn at the same time and
17 location as spring-run Chinook salmon; therefore, potential may exist for hybridization.
18 Hybridization may result in fish with migratory behaviors that are not viable in the San
19 Joaquin River basin. The range of potential actions to reduce redd superimposition or
20 hybridization includes no modifications, the deployment of seasonal barriers, and
21 separate runs of salmon, and also could include potential operation and monitoring of the
22 Hills Ferry Barrier on a seasonal basis.

23 The ability to control run timing via additional structures to separate spring- and fall-run
24 Chinook salmon, as well as the ability to manage flows to prevent run overlap and
25 hybridization, is unknown. The location and design of barriers has yet to be determined;
26 evaluation of spawning habitat availability and quality would likely guide this decision.

27 **Supplement Salmon Population.** Additional actions not identified in the Settlement
28 could be necessary to supplement the naturally reproducing population, particularly in the
29 years immediately following salmon reintroduction. The Settlement does not stipulate
30 any actions to supplement the salmon population; therefore, a subsequent decision would
31 be required before any such actions could be implemented. The range of potential actions
32 to supplement the salmon population could include no supplementation, the release of
33 hatchery fish to supplement the natural population for monitoring and management of the
34 natural population, and/or release of hatchery fish to supplement the natural population
35 when natural production is low. These actions are described in greater detail below.
36 Subsequent studies would identify stock for hatchery populations and, as described for
37 salmon reintroduction according to Paragraph 14 of the Settlement, stock for hatchery
38 populations would likely come from a Central Valley population with behavioral and life
39 history characteristics compatible with anticipated conditions on the San Joaquin River.
40 As previously discussed, hatchery populations alone would not fulfill the Restoration

1 Goal, and naturally reproduced individuals would need to be distinguished from
2 hatchery-produced individuals.

3 • **No supplementation** – No actions would be undertaken to release fish into the
4 San Joaquin River.

5 • **Release of hatchery salmon to supplement the natural population for**
6 **monitoring and management** – This action consists of releasing study fish to
7 support evaluations during implementation and monitoring, as needed.

8 • **Release of hatchery salmon to supplement the natural population for survival**
9 – This action could consist of using hatchery fish to supplement the population in
10 years when monitoring determines that the natural production of juvenile salmon
11 is too low. This could occur during the relatively dry water year types (e.g.,
12 Settlement Critical-Low, Critical-High year types) when spring flows are either
13 absent or inadequate to sustain Chinook salmon populations.

14 **Modify Floodplain and Side-Channel Habitat.** Additional actions not identified in the
15 Settlement could be necessary to modify the floodplain or side-channel habitat beyond
16 Reaches 2B or 4B1. Such modifications could benefit migrating salmon and other native
17 fishes by providing additional food sources, increased protection from stranding, and
18 other habitat improvements. The range of potential actions to modify floodplain and side-
19 channel habitat outside Reaches 2B and 4B1 could include no modifications; creating
20 and/or enhancing additional floodplain habitat; creating, enhancing, or isolating side
21 channels; and/or reducing sand transport.

22 • **No modifications** – No modifications would be undertaken to modify the
23 floodplain and side-channel habitat.

24 • **Create and/or enhance additional floodplain habitat** – This action could
25 consist of creating and/or enhancing additional floodplain habitat outside Reaches
26 2B and 4B1 (floodplain modifications in these reaches are described previously as
27 actions stipulated by the Settlement) to provide flexibility to accommodate
28 variable life history strategies of future salmon populations, which may vary
29 spatially and temporally. Modifications would be confined within the existing
30 levee alignment. This action also includes floodplain modifications in reaches
31 other than Reach 2B and Reach 4B1 to provide for the maintenance of floodplain
32 vegetation at a level to be determined based on the associated contribution toward
33 achieving the Restoration Goal.

34 • **Create, enhance, or isolate side channels** – Side channels occur throughout the
35 river, some with perennial connectivity to the main channel, but most with
36 connectivity only under high-flow conditions, as described in Chapter 3.0. In
37 some cases, side channels could provide suitable rearing habitat for juvenile
38 salmon, or serve as holding habitat for adult salmon, while other side channels
39 may foster conditions that are unsuitable for salmon, including high temperatures
40 and habitat for predatory species such as largemouth bass. Side-channel

1 enhancement activities could include dredging or widening side channels. Side-
2 channel isolation could consist of filling a channel or constructing berms across
3 the mouth of a channel. Additionally, new side channels could be created to
4 provide additional habitat, if necessary. Creation of new side channels could
5 likely be accomplished through dredging new channels or removing sediment
6 blocking the connectivity of former channels.

7 • **Reduce sand transport** – The quantity of sand in Reaches 1 and 2 may present
8 challenges to channel stability, and the function of hydraulic control structures
9 and road crossings. This sand has the potential to be mobilized by Interim and
10 Restoration flows to lower reaches that do not currently have sediment transport
11 issues. This action would control sources of sand in Reach 1, and transport of
12 sand in downstream river and bypass reaches, to prevent hydraulic and facilities
13 challenges arising from channel migration, aggradation, or degradation. Control
14 of sediment at tributary sources could include settling basins, bed stabilization
15 (such as floodplain widening to reduce sediment transport potential) in areas
16 where the bed is degrading, and bank stabilization in meandering reaches. In-
17 channel sand could be removed by dredging or by constructing instream sediment
18 detention basins, or sand traps, to capture sand. Accumulated sand would need to
19 be removed periodically to maintain the functionality of sand traps. As previously
20 described, portions of Reach 1 may benefit from modifications to gravel
21 quantities and mobility.

22 **Enhance In-Channel Habitat.** This action could incorporate channel modifications to
23 provide salmon habitat, including instream cover such as undercut banks, overhanging
24 vegetation, boulders, large wood, surface turbulence, and features providing refuge from
25 predation. The range of potential actions to enhance in-channel habitat could include no
26 modifications, augmenting existing, and/or creating new, in-channel habitat. Enhancing
27 in-channel habitat could also include modifications such as constructing pools, or
28 dredging and grading to develop or maintain more desirable water temperatures. Deep
29 pools remain cooler during warm summer months, and provide refuge from avian and
30 terrestrial predators. Additional assessments would be conducted to identify the potential
31 for groundwater influence on instream temperatures, and whether water temperature
32 requirements may be met under different conditions and/or different timing of flow
33 releases from Friant Dam.

34 **Reduce Potential for Aquatic Predation of Juvenile Salmonids.** Additional actions
35 not identified in the Settlement could be necessary to prevent aquatic predation of
36 juvenile salmonids. Additional potential actions to prevent aquatic predation of juvenile
37 salmonids could include capturing and removing nonnative aquatic predatory species.

38 **Reduce Potential for Fish Entrainment.** Unscreened and poorly screened small
39 diversions can entrain migrating juvenile fish. The Settlement does not stipulate actions
40 to screen these small diversions. The range of potential actions to prevent fish
41 entrainment at small diversions could include not screening diversions, or installing or
42 modifying screens at small diversions throughout the Restoration Area. The number of

1 screens installed would be determined through future studies, but could be based on the
2 relative impact of individual diversions to fisheries.

3 **Enable Fish Passage.** Obstacles to the successful migration of anadromous fish in the
4 Restoration Area could include hydraulic conditions at road crossings; small San Joaquin
5 River tributaries with unsuitable habitat for salmon spawning and rearing; hydraulic
6 conditions in the river channel at low flow; and other physical features within the river.
7 The range of potential actions to enable fish passage beyond the actions stipulated in the
8 Settlement could include no modifications, establishing and/or maintaining low-flow
9 channels, trapping and hauling juveniles and adults, modifying road crossings, and
10 installing barriers to prevent straying.

- 11 • **No modifications** – No actions would be undertaken to enable fish passage.
- 12 • **Establish and/or maintain low-flow channels** – This action consists of
13 modifying the channel in reaches outside the Eastside and Mariposa bypasses and
14 Reach 4B1 to provide passage during low-flow conditions, as needed. As
15 described above for the action to enhance in-channel habitat through reducing
16 sand transport, establishing and/or maintaining low-flow channels could include
17 bed stabilization in areas where the bed is degrading, and bank stabilization in
18 meandering reaches. Removing in-channel sand to maintain a low-flow channel
19 could be accomplished by dredging or grading. The range of actions described
20 above for modifications to floodplain and side-channel habitat, such as managing
21 invasive vegetation and creating and/or enhancing additional floodplain habitat,
22 could also be applied to establish and/or maintain low-flow channels through bed
23 and bank stabilization.
- 24 • **Trap and haul** – It may be necessary to implement a trap-and-haul operation to
25 sustain Chinook salmon within the Restoration Area if protective features are not
26 completed in time to reintroduce fish, if it is determined that entrainment and
27 physical barriers exist that could hinder reintroducing and managing fish
28 populations, or if river connectivity is disrupted (i.e., in critical water years).
29 Implementing a trap-and-haul program could consist of trapping salmon smolts in
30 upper reaches (likely Reach 1 or Reach 2) to transport smolts to downstream
31 reaches for release, thereby avoiding temporary undesirable habitat conditions
32 (such as high temperatures or discontinuous flow). In addition, implementing a
33 trap-and-haul program could include trapping adult salmon in downstream
34 reaches and transporting them to Reach 1, thereby avoiding temporary
35 undesirable habitat conditions in intermediate reaches. Several trapping
36 mechanisms could be applied under this action, including passive and active
37 capture techniques. Trapped fish could be transported under controlled conditions
38 by truck to suitable habitat areas and released. Trap-and-haul operations are not
39 envisioned as a long-term management strategy, and would only be used as
40 temporary measure if protective features are not completed in time to reintroduce
41 fish, if it is determined that entrainment and physical barriers exist that could
42 hinder reintroducing and managing fish populations, or if river connectivity is
43 disrupted.

- 1 • **Modify road crossings** – This action consists of modifying road crossings to
2 provide for fish passage in Reach 1. These crossings could be modified through
3 installing culverts, restructuring the channel, and/or constructing clear span
4 bridges to enable the crossings to be used during Restoration Flows while
5 providing fish passage. Road crossings in Reaches 2B and 4B that pose potential
6 barriers to fish passage are discussed as possible actions to address Settlement
7 Paragraphs 11(a)(2) and 11(a)(3), respectively.

- 8 • **Install barriers to prevent straying** – This action could consist of installing
9 temporary or permanent barriers in the channel to prevent fish from straying into
10 tributaries, flood bypasses, or river reaches with undesirable habitat conditions.
11 The primary categories of permanent fish barrier structures are picket barriers,
12 velocity barriers, and vertical drop structures. Tributaries, flood bypasses, and
13 river reaches that could be screened under this action depend in part on the
14 flow-routing decision made consistent with Paragraph 11(b)(1) of the Settlement,
15 but could include, but may not be limited to, Dry and Cottonwood creeks in
16 Reach 1; Deadmans, Bear, and Owens creeks in the Eastside Bypass; the
17 downstream end of Eastside Bypass Reach 2; the downstream end of Reach 4B;
18 and the downstream end of Eastside Bypass Reach 3.

19 **Modify Flood Flow Control Structures.** Additional actions not identified in the
20 Settlement could be necessary to improve fish passage and flow conveyance at flood
21 control structures within the Restoration Area, including modifications to the Chowchilla
22 Bypass Bifurcation Structure, Sand Slough Control Structure, and structures in the
23 Eastside and Mariposa bypasses. The range of potential additional actions to modify
24 flood control structures could include no modifications, retrofitting gates at flood control
25 structures to prevent flow loss, and installing grade control structures to address
26 backwater effects of the Chowchilla Bypass Bifurcation Structure.

- 27 • **No modifications** – No actions would be undertaken to modify flood flow control
28 structures.

- 29 • **Retrofit gates** – As described for the range of actions to address Paragraph
30 11(b)(2) of the Settlement, gaps between the gates of the Chowchilla Bypass
31 Bifurcation Structure allow some flow to leak through the gates, when closed.
32 Because of the current function of the structure in routing relatively large flows
33 under flood conditions, the small amount of water lost through closed gates at this
34 and other gated flood control structures in the system (including the San Joaquin
35 River Headgates, Eastside Bypass Bifurcation Structure, and Mariposa Bypass
36 Bifurcation Structure) is not a concern under current operations. However, during
37 the release of Interim and Restoration flows, the loss of water from the main stem
38 San Joaquin River through the closed gates to the bypass channel could inhibit
39 success of the Restoration Goal by reducing the amount of water flowing to
40 downstream reaches. Potential actions to address flow loss range from no retrofit
41 implementation to retrofitting the gates on the existing flood control structures to
42 prevent flow from passing the closed gates.

- 1 • **Install grade control structures** – Local backwater effects caused by the
2 Chowchilla Bypass Bifurcation Structure may be contributing to the accumulation
3 of sand in Reach 2A (McBain and Trush 2002), which could mobilize under
4 Interim or Restoration flows, thereby compromising the ability to convey Interim
5 or Restoration flows through downstream reaches. The Settlement does not
6 stipulate any actions to modify the Chowchilla Bypass Bifurcation Structure to
7 address flow loss or sediment deposition due to backwater effects; therefore, a
8 subsequent decision would be required before any such actions could be
9 implemented. Potential actions to address sediment deposition upstream from the
10 Chowchilla Bypass Bifurcation Structure range from no implementation to
11 installing grade control structures to prevent sediment mobilization.

12 **2.4.3 Physical Monitoring and Management Plan**

13 The Physical Monitoring and Management Plan is included in this Draft PEIS/R as
14 Appendix D, and is summarized here. The Physical Monitoring and Management Plan
15 provides guidelines for observing and adjusting to changes in physical conditions within
16 the Restoration Area. The Physical Monitoring and Management Plan consists of five
17 component plans, addressing interrelated physical conditions including flow,
18 groundwater seepage, channel capacity, propagation of native vegetation, and suitability
19 of spawning gravel. Each component plan identifies objectives for the physical conditions
20 within the Restoration Area, and provides guidelines for the monitoring and management
21 of those conditions. The plans identify potential actions that could be taken to further
22 enhance the achievement of the objectives. The component plans include immediate
23 actions that could be taken, which are analyzed at a project level in this Draft PEIS/R.
24 The component plans also include long-term actions that are analyzed at a program level
25 of detail in this Draft PEIS/R. Finally, this Plan includes a description of monitoring
26 activities which apply to one or more of the component plans. The five component plans
27 include the following:

- 28 • **Flow** – To ensure compliance with the hydrograph releases in Exhibit B of the
29 Settlement and any other applicable flow releases (e.g., Buffer Flows)
- 30 • **Seepage** – Reduce or avoid adverse or undesirable seepage impacts
- 31 • **Channel capacity** – Maintain flood conveyance capacity
- 32 • **Native vegetation** – Establish and maintain native riparian habitat
- 33 • **Spawning gravel** – Maintain gravels for spawning

34 The Physical Monitoring and Management Plan includes monitoring activities and a set
35 of immediate (project level) responses that would be implemented, as needed, to attain
36 the management objectives. The plan also identifies potential long-term (program level)
37 responses that could be implemented to attain the management objectives, if necessary.
38 Monitoring activities and responses are described below. Monitoring and management
39 guidelines related to biological conditions for fish are separately described in Appendix
40 F, “Fisheries Management Plan.”

1 **Monitoring Activities**

2 Monitoring activities include past, present, and future physical and nonphysical activities
3 within the Restoration Area. Site-specific documentation has been completed for those
4 actions completed or currently underway, and would be completed as necessary for those
5 actions described at a program level of detail in this Draft PEIS/R. Monitoring activities,
6 as described in the Physical Monitoring and Management Plan, are guidelines for
7 monitoring and could change as part of implementation of the Settlement. These
8 activities include the following:

- 9 • **Flow monitoring** – Flow, cross sections, and surface water stage at six gaging
10 stations, and at additional locations during high-flow events
- 11 • **Groundwater level monitoring** – Groundwater elevation in monitoring wells
- 12 • **Aerial and topographic surveys** – True color aerial photographs and topographic
13 surveys to assess river stage, hydraulic roughness, river width, bed elevation, and
14 vegetation conditions
- 15 • **Vegetation surveys** – Surveys of seed dispersal start and peak times, and native
16 riparian vegetation establishment
- 17 • **Sediment mobilization monitoring** – Sediment mobilization, bar formation, and
18 bank erosion through aerial and topographic surveys of areas with elevated
19 erosion potential
- 20 • **Spawning gravel monitoring** – Pebble count or photographic surveys of riffles
21 following Normal-Wet or Wet years

22

1 **Immediate Management Actions – Project Level**

2 Potential immediate responses have been identified to contribute to attaining the seepage,
3 channel capacity, and spawning gravel management objectives. No immediate responses
4 have been identified to contribute to attaining the flow or vegetation management
5 objectives. Potential immediate responses to attain the groundwater seepage, channel
6 capacity, and spawning gravel management objectives include the following:

- 7 • **Seepage** – Reduce, redirect, or redivert Interim or Restoration flows to reduce
8 flow in downstream reaches. This could include the following:
- 9 – **Reductions of Interim or Restoration Flow Releases at Friant Dam** –
10 Reductions in the release rate from Friant Dam to limit the potential for
11 seepage impacts to occur downstream. Planned thresholds for reductions at
12 Friant would need to consider travel time and associated response delays.
- 13 – **Redirection of Interim or Restoration Flows at Chowchilla Bypass**
14 **Bifurcation Structure** – Directing flow into the bypass system at the
15 Chowchilla Bypass Bifurcation Structure would reduce flow in Reach 2B and
16 downstream reaches.
- 17 – **Delivery of Interim or Restoration Flows at Mendota Pool** – Delivery of
18 water to Mendota Pool would reduce flows in Reach 3 and downstream
19 reaches.
- 20 – **Delivery of Interim or Restoration Flows at Arroyo Canal** – When San Luis
21 Canal Company is not diverting at the full capacity of Arroyo Canal,
22 additional water diversions to the canal would reduce flows in Reach 4A and
23 downstream reaches.
- 24 – **Redirection of Interim or Restoration Flows at Sand Slough Control**
25 **Structure** – During the first year of Interim Flows, water would not be
26 directed into Reach 4B. In subsequent years, diverting flows into the bypass
27 system at Sand Slough Control Structure would reduce flows in Reach 4B.
- 28 • **Channel capacity** – Removal of vegetation and debris that would cause Interim
29 or Restoration flows to exceed channel capacity. Vegetation would be removed by
30 mechanical or chemical means. Nonnative plant removal would receive priority
31 over removal of native species.
- 32 • **Spawning gravel** – Modify releases from Friant Dam to adjust flows to flush or
33 mobilize based on monitoring reports and recommendations of spawning gravel
34 conditions (including potential modifications to Restoration Flow Guidelines to
35 improve the success of Flushing Flows).

36

1 **Long-Term Management Actions – Program Level**

2 Potential long-term responses have been identified to contribute to attaining the flow,
3 groundwater seepage, channel capacity, native vegetation, and spawning gravel
4 management objectives. Potential long-term responses to attain the management
5 objectives may require additional environmental documentation, and include the
6 following:

- 7 • **Flow** – Paragraph 13(c) of the Settlement provides for adjusting releases due to
8 unexpected seepage losses. These actions could include but would not be limited
9 to acquisition and release of purchased water from willing sellers. The procedures
10 for purchasing and releasing additional water are under development and would
11 be detailed in the Restoration Flow Guidelines, a document that would be
12 attached to the Friant Operation Guidelines.

- 13 • **Seepage** – Long-term management actions for seepage may include, but would
14 not be limited to, purchasing easements and/or compensation for seepage effects,
15 construction of slurry walls to reduce seepage flows, construction of seepage
16 berms to protect against levee failure, construction of drainage interceptor ditches
17 to protect affected lands, or installation of tile drains on affected lands.

- 18 • **Channel capacity** – Long-term management actions for channel capacity may
19 include, but would not be limited to, providing a larger floodplain between levees
20 through the acquisition of land and construction of setback levees, regrading of
21 land between levees, construction of sediment traps, construction of grade control
22 structures, or channel grading.

- 23 • **Native vegetation** – Long-term management actions for native vegetation may
24 include, but would not be limited to, active plantings and irrigation of desired
25 native plants.

- 26 • **Spawning gravel** – Long-term management actions for spawning gravel may
27 include, but would not be limited to gravel augmentation and/or conditioning at
28 existing riffles, establishment of new riffles, engineered channel modifications,
29 construction of sediment traps on the San Joaquin River or tributaries with high
30 sediment loads, or construction of grade control structures.

31 **2.4.4 Conservation Strategy**

32 As part of Settlement implementation, a comprehensive strategy for the conservation of
33 listed and sensitive species and habitats has been prepared, and would be implemented in
34 coordination with USFWS, NMFS, and DFG. The strategy’s purpose is to serve as a tool
35 built into the project description to minimize and avoid potential impacts to sensitive
36 species and habitats. This Conservation Strategy guides development and implementation
37 of specific conservation measures for project- and program-level actions. The
38 Conservation Strategy includes conservation goals and measures for species and
39 communities (such as avoidance, minimization, monitoring, and management measures)
40 consistent with adopted recovery plans, as described below. If avoidance and
41 minimization measures are impractical or infeasible, then further consultation actions and

1 mitigation measures will be pursued and developed in coordination with the appropriate
2 regulatory agency.

3 To achieve the Restoration Goal, a number of actions that are proposed to be
4 implemented may substantially alter not only the aquatic ecosystem of the San Joaquin
5 River, but also the river's riparian and wetland ecosystems, and some adjacent upland
6 ecosystems. Riparian, wetland, and upland ecosystems of the Central Valley, such as
7 those along the San Joaquin River, provide habitat for a large number of species,
8 including several Federally listed and State-listed species. Therefore, the action
9 alternatives include this Conservation Strategy, which would be implemented in a manner
10 that is consistent with adopted conservation plans for sensitive species, and for wetland
11 and riparian ecosystems of the Restoration Area.

12 The Conservation Strategy consists of management actions that would result in a net
13 benefit for riparian and wetland habitats in the Restoration Area, to avoid reducing the
14 long-term viability of sensitive species, and to be consistent with adopted conservation
15 plans. The goals of the strategy are described below:

- 16 • **Conserve riparian vegetation and waters of the United States, including**
17 **wetlands** – It is anticipated that implementing the Settlement would result in a net
18 increase in the acreage of riparian and wetland vegetation in the Restoration Area.
19 However, several program actions may disturb or eliminate riparian vegetation or
20 waters of the United States (including wetlands). If impacts to waters of the
21 United States (including wetlands), navigable waters, or the Federal levee system
22 cannot be avoided, a USACE Section 404, Section 408, and/or Section 10 permit
23 and Central Valley Regional Water Quality Control Board (RWQCB) Section 401
24 water quality certification would be obtained. Increased acreage of wetlands
25 resulting from Interim and Restoration flows may be considered a means of
26 replacing, restoring, or enhancing wetlands. However, the acreage, location, and
27 methods of replacing, restoring, or enhancing wetlands would be determined
28 during these permitting processes.
- 29 • **Control and manage invasive species** – Because of their adverse effects on
30 aquatic and riparian ecosystems, the spread of invasive plant species as a result of
31 release of Interim and Restoration flows would be controlled and managed. For
32 each invasive plant species with known infestations, thresholds for management
33 responses and specific management responses would be established and
34 implemented (including species-specific control methods).
- 35 • **Conserve special-status species** – Populations of special-status species would
36 benefit from restoring and sustaining riparian and wetland habitat, and controlling
37 invasive species, as described previously. However, during the initiation of
38 Interim and Restoration flows, and the construction of related actions, a variety of
39 special-status species of upland, wetland, and riparian habitats could experience
40 adverse effects. Therefore, this strategy includes measures to prevent or reduce
41 impacts that could result from loss of habitat within project footprints or from
42 impacts on adjacent habitat or species. In addition, this strategy includes

1 coordination with appropriate regulatory agencies to provide mitigation or
2 compensation, consistent with applicable conservation plans, to avoid or
3 minimize effects when actions would result in a net loss of habitat or other
4 substantial adverse effects, if the implementation of avoidance and minimization
5 measures is infeasible or impractical.

6 These measures address all potentially affected Federally listed and/or State-listed
7 species, and all other species identified by USFWS, NMFS, or DFG as candidates,
8 sensitive, or special-status in local or regional plans, policies, or regulations. For
9 individual project- and program-level actions under each of the action alternatives, the
10 applicable, feasible measures would guide development of action-specific conservation
11 strategies. Table 2-7 presents the Conservation Strategy.

**Table 2-7.
Conservation Measures for Biological Resources That May Be Affected by Settlement Actions**

Conservation Measure and Identifier	Applicable Habitat and/or Species, and Conservation Measure Description	Level of Compliance	Regulatory Agency
VP	Vernal pool habitats, fleshy (succulent) owl's clover, Hoover's spurge, Bogg's Lake hedge-hyssop, Colusa grass, San Joaquin Valley Orcutt grass, hairy Orcutt grass, Conservancy fairy shrimp, longhorn fairy shrimp, vernal pool fairy shrimp, vernal pool tadpole shrimp, and western spadefoot toad		
VP-1. Avoid effects to species	<p>a) If vernal pools or vernal pool species are anticipated within a project area, a qualified biologist will identify and map vernal pool and seasonal wetland habitat potentially suitable for listed vernal pool plants, invertebrates, and western spadefoot toad within the project footprint.</p> <p>b) Facility construction and other ground-disturbing activities will be sited to avoid core areas identified in the <i>Vernal Pool Recovery Plan</i> (USFWS 2005) because conservation of these areas is a high priority for recovering listed vernal pool species.</p>	Project and Program	USFWS DFG
VP-2. Minimize effects to species	<p>a) If vernal pools are present, a buffer around the microwatershed or a 250-foot-wide buffer, whichever is greater, will be established before ground-disturbing activities around the perimeter of vernal pools and seasonal wetlands that provide suitable habitat for vernal pool crustaceans or vernal pool plants. This buffer will remain until ground-disturbing activities in that area are completed. Suitable habitat and buffer areas will be clearly identified in the field by staking, flagging, or fencing.</p> <p>b) Appropriate fencing will be placed and maintained around all preserved vernal pool habitat buffers during ground-disturbing activities to prevent impacts from vehicles and other construction equipment.</p> <p>c) Worker awareness training and on-site biological monitoring will occur during ground-disturbing activities to ensure buffer areas are being maintained.</p>	Program	Lead Agency

**Table 2-7.
Conservation Measures for Biological Resources That May Be Affected by Settlement Actions (contd.)**

Conservation Measure and Identifier	Applicable Habitat and/or Species, and Conservation Measure Description	Level of Compliance	Regulatory Agency
VP-3. Compensate for temporary or permanent loss of habitat	<p>a) If activities occur within the microwatershed or 250-foot-wide buffer for vernal pool habitat will be affected by the SJRRP, the project proponent will develop and implement a compensatory mitigation plan, consistent with the USACE and EPA April 10, 2008, Final Rule for Compensatory Mitigation for Losses of Aquatic Resources (33 CFR Parts 325 and 332 and 40 CFR Part 230) and other applicable regulations and rules at the time of implementation, that will result in no net loss of acreage, function, and value of affected vernal pool habitat. Unavoidable effects will be compensated through a combination of creation, preservation, and restoration of vernal pool habitat or purchase of credits at a mitigation bank approved by the applicable regulatory agency/agencies.</p> <p>b) Project effects and compensation will be determined in consideration of the <i>Vernal Pool Recovery Plan</i> goals for core areas, which call for 95 percent preservation for habitat in the Grasslands Ecological Area and Madera core areas, and 85 percent habitat preservation in the Fresno core area (USFWS 2005).</p> <p>c) Appropriate compensatory ratios for loss of habitat both in and out of core areas will be determined during coordination and consultation with USFWS and/or DFG, as appropriate.</p> <p>d) If off-site compensation includes dedication of conservation easements, purchase of mitigation credits, or other off-site conservation measures, the details of these measures will be and developed as part of the USFWS and/or DFG coordination and consultation process. The plan will include information on responsible parties for long-term management, holders of conservation easements, long-term management requirements, and other details, as appropriate, for the preservation of long-term viable populations. Any impacts that result in a compensation purchase will require an endowment for land management in perpetuity before any project groundbreaking activities.</p>	Project and Program	USFWS DFG

**Table 2-7.
Conservation Measures for Biological Resources That May Be Affected by Settlement Actions (contd.)**

Conservation Measure and Identifier	Applicable Habitat and/or Species, and Conservation Measure Description	Level of Compliance	Regulatory Agency
CH	Critical habitat		
CH-1. Avoid and minimize effects to critical habitat	a) Designated critical habitats shall be identified and mapped. b) All SJRRP actions will be designed to avoid direct and indirect adverse modifications to these areas. c) Minimization measures, such as establishing and maintaining buffers around areas of designated critical habitat, shall be implemented if avoidance is not feasible.	Project and Program	USFWS
CH-2. Compensate for unavoidable adverse effects on Federally designated critical habitat	a) If critical habitat may be adversely modified by the implementation of SJRRP actions, the area to be modified will be evaluated by a qualified biologist to determine the potential magnitude of the project effects (i.e., description of primary constituent elements present and quantification of those affected) at a level of detail necessary to satisfy applicable environmental compliance and permitting requirements. b) Compensatory conservation measures developed through Section 7 consultation with USFWS will be implemented. If off-site compensation includes dedication of conservation easements, purchase of mitigation credits, or other off-site conservation measures, the details of these measures will be included in and developed as part of the USFWS consultation process. The plan will include information on responsible parties for long-term management, holders of conservation easements, long-term management requirements, and other details, as appropriate, for the preservation of long-term viable populations. Any impacts that result in a compensation purchase require an endowment for land management in perpetuity before any project groundbreaking activities.	Project and Program	USFWS
CTS	California tiger salamander		
CTS-1. Avoid and minimize effects to species	a) If potential California tiger salamander habitat or species are anticipated within the project area, within 1 year before project construction activities, a qualified biologist shall identify and map potential California tiger salamander habitat (areas within 1.3 miles of known or potential California tiger salamander breeding habitat) within the project footprint. One week before ground-disturbing activities, a qualified biologist will survey for and flag the presence of ground squirrel and gopher burrow complexes. Where burrow complexes are present, a 250-foot-wide buffer shall be placed to avoid and minimize disturbance to the species. b) Facility construction and other ground-disturbing activities shall be sited to avoid areas of known California tiger salamander habitat and avoidance buffers. c) To eliminate an attraction to predators of the California tiger salamander, all food-related trash items such as wrappers, cans, bottles, and food scraps, must be disposed of in closed containers and removed at least once every day from the entire project site.	Program	USFWS DFG

**Table 2-7.
Conservation Measures for Biological Resources That May Be Affected by Settlement Actions (contd.)**

Conservation Measure and Identifier	Applicable Habitat and/or Species, and Conservation Measure Description	Level of Compliance	Regulatory Agency
<p>CTS-2. Minimize effects to species</p>	<p>a) Before and during construction activities, construction exclusion fencing will be installed just outside the work limit or around vernal pools where California tiger salamander may occur. This fencing shall be maintained throughout construction and will be removed at the conclusion of ground-disturbing activities. No vehicles will be allowed beyond the exclusion fencing. A USFWS-approved biological monitor shall be present on site, during intervals recommended by USFWS, to inspect the fencing.</p> <p>b) The biological monitor will be on site each day during any wetland restoration or construction, and during initial site grading or development of sites where California tiger salamanders have been found.</p> <p>c) Before the start of work each day, the biological monitor will check for animals under any equipment to be used that day, such as vehicles or stockpiles of items such as pipes. If California tiger salamanders are present, they will be allowed to leave on their own, before the initiation of construction activities for the day. To prevent inadvertent entrapment of California tiger salamanders during construction, all excavated, steep-walled holes or trenches more than 1 foot deep shall be covered, by plywood or similar materials, at the close of each working day or provided with one or more escape ramps constructed of earth fill or wooden planks. Before such holes or trenches are filled, they must be thoroughly inspected for trapped animals.</p> <p>d) Plastic monofilament netting (erosion control matting) or similar material shall not be used at the project site because California tiger salamanders may become entangled or trapped. Acceptable substitutes include coconut coir matting or tackified hydroseeding compounds.</p> <p>e) All ground-disturbing work shall occur during daylight hours. Clearing and grading will be conducted between April 15 and October 15, in coordination with USFWS and DFG, and depending on the level of rainfall and site conditions.</p> <p>f) Revegetation of project areas temporarily disturbed by construction activities will be conducted with locally occurring native plants.</p>	<p>Program</p>	<p>USFWS</p>
<p>CTS-3. Compensate for temporary or permanent loss of habitat</p>	<p>a) If California tiger salamander, or areas within 1.3 miles of known or potential California tiger salamander breeding habitat, would be affected by the SJRRP, the project proponent will develop and implement a compensatory mitigation plan in coordination with USFWS and DFG, as appropriate. Unavoidable effects will be compensated through a combination of creation, preservation, and restoration of habitat or purchase of credits at a mitigation bank approved by the regulatory agencies.</p> <p>b) If off-site compensation includes dedication of conservation easements, purchase of mitigation credits, or other off-site conservation measures, the details of these measures will be included in and developed as part of the USFWS and/or DFG coordination and consultation process. The plan will include information on responsible parties for long-term management, holders of conservation easements, long-term management requirements, and other details, as appropriate, for the preservation of long-term viable populations. Any impacts that result in a compensation purchase will require an endowment for land management in perpetuity before any project groundbreaking activities.</p>	<p>Program</p>	<p>USFWS DFG</p>

**Table 2-7.
Conservation Measures for Biological Resources That May Be Affected by Settlement Actions (contd.)**

Conservation Measure and Identifier	Applicable Habitat and/or Species, and Conservation Measure Description	Level of Compliance	Regulatory Agency
DBC	Delta button-celery		
DBC-1. Avoid and minimize loss of habitat and individuals	<p>a) Historically, Delta button celery was known to exist in the Eastside and Mariposa bypasses (CNDDDB). In most areas of the bypasses, local flows up to 1,500 cfs remain in the main channel, and do not inundate the floodplain. Maintaining flows at or below 1,500 will not impact Delta button celery populations. In general, historical Delta button celery populations have been located below the 2,500 cfs inundation area (CNDDDB). If these historical populations are still thriving in these areas, flows between 1,500 cfs and 2,500 cfs will most likely impact these populations. Potential areas of impact within the Eastside Bypass from the Sand Slough Bypass to the Mariposa Bypass are approximately 400 acres, and for the Mariposa Bypass, approximately 100 acres. Before increasing flows above 1,500 cfs in these specific areas, comprehensive surveys will be conducted. Surveys will include remapping and recensus of the documented occurrences during at least 2 consecutive or nonconsecutive years when habitat conditions are favorable to detect the species to determine the population trend. Status updates for these occurrences will be provided to DFG.</p> <p>b) A Delta button-celery conservation plan will be developed and implemented that includes a preservation and adaptive management strategy for existing occurrences within the Restoration Area. The conservation plan will be developed in collaboration with DFG and other species experts, and be supported by review of the existing literature, including information on species' life history characteristics, historic and current distribution, and microhabitat requirements.</p>	Project and Program	DFG
DBC-2. Avoid and minimize loss of habitat and risk of take for implementation of construction activities	<p>a) If direct impacts to Delta button celery could occur, DFG and the appropriate State lead agency will coordinate to determine specific minimization and mitigation measures</p>	Program	Lead Agency

**Table 2-7.
Conservation Measures for Biological Resources That May Be Affected by Settlement Actions (contd.)**

Conservation Measure and Identifier	Applicable Habitat and/or Species, and Conservation Measure Description	Level of Compliance	Regulatory Agency
<p>DBC-3. Compensate for temporary or permanent loss of habitat</p>	<p>a) Compensatory mitigation for Delta button-celery will be developed in consultation with DFG. Mitigation may include the development and implementation of habitat creation and enhancement designs to incorporate habitat features for Delta button-celery (e.g., depressions within seasonally inundated areas) into floodplains with potentially suitable habitat conditions. Compensatory mitigation may also include efforts to establish additional populations in the Restoration Area or to enhance existing populations on or off site. Mitigation sites will avoid areas where future SJRRP activities are likely. The project proponent will obtain site access through a conservation easement or in-lieu fee title and will provide adequate funding to implement the required compensation measures, and to monitor compliance with and success of the conservation measures.</p> <p>b) Establishment of new occurrences will be attempted by transplanting seed and plants from affected locations to created habitat or suitable, but unoccupied, existing habitat.</p> <p>c) Monitoring, performance criteria, and protective measures will be applied to compensatory mitigation sites. The replacement requirements, and any additional conservation and mitigation measures will be determined in coordination with DFG.</p>	<p>Project and Program</p>	<p>DFG</p>
PALM			
<p>PALM-1. Avoid and minimize effects to species</p>	<p>Palmate-bracted bird's beak</p> <p>a) If palmate-bracted bird's beak is anticipated within the project area, a qualified botanist will identify and map the location of palmate-bracted bird's beak plants within the project footprint, within 1 year before the start of activities that may cause disturbance from either release of flows over 1,660 cfs or from ground-disturbing actions.</p> <p>b) A minimum 500-foot-wide buffer shall be placed around occurrences of palmate-bracted bird's beak during construction activities, consistent with recommendations in the <i>Recovery Plan for Upland Species of the San Joaquin Valley, California</i> (USFWS 1998). The 500-foot-wide buffer will be clearly identified in the field by staking, flagging, or fencing. Project activity will avoid buffer areas, and work awareness training and biological monitoring will be conducted to ensure that the buffer area is not encroached on and that effects are being avoided.</p>	<p>Project and Program</p>	<p>USFWS DFG</p>

**Table 2-7.
Conservation Measures for Biological Resources That May Be Affected by Settlement Actions (contd.)**

Conservation Measure and Identifier	Applicable Habitat and/or Species, and Conservation Measure Description	Level of Compliance	Regulatory Agency
PALM-2. Compensate for temporary or permanent loss of occupied habitat	<p>a) A compensatory conservation plan shall be developed in coordination with USFWS and DFG, as appropriate. The conservation plan will require the project proponent to maintain viable plant populations in the Restoration Area and will identify compensatory measures for any populations affected. The conservation plan shall include monitoring and reporting requirements for populations to be preserved in or adjacent to construction areas, or populations to be protected or enhanced off site.</p> <p>b) If relocation efforts are part of the conservation plan, the plan will include details on the methods to be used: collection, relocation/transplant potential, storage, propagation, preparation of receptor site, installation, long-term protection and management, monitoring and reporting requirements, and remedial action responsibilities should the initial effort fail to meet compensation requirements.</p> <p>c) If off-site compensation includes dedication of conservation easements, purchase of mitigation credits, or other off-site conservation measures, the details of these measures will be included in the conservation plan and must occur with full endowment for management in perpetuity before groundbreaking. The plan will include information on responsible parties for long-term management, holders of conservation easements, long-term management requirements, and other details, as appropriate, for the preservation of long-term viable populations.</p>	Project and Program	USFWS DFG
VELB	Valley elderberry longhorn beetle		
VELB-1. Avoid and minimize effects to species	<p>a) If elderberry shrubs and valley elderberry longhorn beetle are anticipated within the project area, within 1 year before the commencement of ground-disturbing activities, a qualified biologist shall identify any elderberry shrubs in the project footprint. Qualified biologist(s) will survey potentially affected shrubs for valley elderberry longhorn beetle exit holes in stems greater than 1 inch in diameter.</p> <p>b) If elderberry shrubs are found on or adjacent to the construction project site, a 100-foot-wide avoidance buffer – measured from the dripline of the plant – will be established around all elderberry shrubs with stems greater than 1 inch in diameter at ground level and will be clearly identified in the field by staking, flagging, or fencing. No activities will occur within the buffer areas and worker awareness training and biological monitoring will be conducted to ensure that avoidance measures are being implemented.</p>	Project and Program	USFWS
VELB -2. Compensate for temporary or permanent loss of habitat	<p>a) The project proponent will consult with USFWS to determine appropriate compensation ratios. Compensatory mitigation measures will be consistent with the <i>Conservation Guidelines for Valley Elderberry Longhorn Beetle</i> (USFWS 1999a), or current guidance.</p> <p>b) Compensatory mitigation for adverse effects may include transplanting elderberry shrubs during the dormant season (November 1 to February 15), if feasible, to an area protected in perpetuity, as well as required additional elderberry and associated native plantings and approved by USFWS.</p> <p>c) If off-site compensation includes dedication of conservation easements, purchase of mitigation credits, or other off-site conservation measures, the details of these measures will be included in the mitigation plan and must occur with full endowments for management in perpetuity. The plan will include information on responsible parties for long-term management, holders of conservation easements, long-term management requirements, and other details, as appropriate, for the preservation of long-term viable populations.</p>	Project and Program	USFWS

**Table 2-7.
Conservation Measures for Biological Resources That May Be Affected by Settlement Actions (contd.)**

Conservation Measure and Identifier	Applicable Habitat and/or Species, and Conservation Measure Description	Level of Compliance	Regulatory Agency
BNLL Blunt-nosed leopard lizard			
BNLL-1. Avoid and minimize effects to species	a) Three areas have been identified as having potential blunt-nosed leopard lizard habitat based on aerial maps. These areas include approximately 2,460 acres along the southwest side of the San Joaquin River in Reach 2, approximately 490 acres in a portion of the Eastside Bypass and adjacent lands near Reach 4A of the San Joaquin River, and approximately 2,938 acres encompassing the northern side of the Mariposa Bypass and parcels north of the Mariposa Bypass and west of the Eastside Bypass. Within 1 year before the commencement of the proposed project, focused site visits and habitat assessment will be conducted on these lands. Based on focused assessment, and discussions with the USFWS and DFG, protocol-level surveys may be conducted. If blunt-nosed leopard lizard are detected within or adjacent to the project site, measures that will avoid direct take of this species will be developed in cooperation with USFWS and DFG and implemented before ground disturbing activities. (DWR 2010).	Project and Program	USFWS DFG
BNLL-2. Compensate for temporary or permanent loss of habitat or species	a) Compensation for impacts to the species, if needed, will be determined in coordination with USFWS and DFG as appropriate.	Program	USFWS DFG

**Table 2-7.
Conservation Measures for Biological Resources That May Be Affected by Settlement Actions (contd.)**

Conservation Measure and Identifier	Applicable Habitat and/or Species, and Conservation Measure Description	Level of Compliance	Regulatory Agency
PLANTS Other special-status plants			
<p>PLANTS-1. Avoid and minimize effects to special-status plants</p>	<p>a) Within 1 year before the commencement of ground-disturbing activities, habitat assessment surveys for the special-status plants listed in Table 1 of Appendix L of this Draft PEIS/R, "Biological Resources – Vegetation and Wildlife," will be conducted by a qualified botanist, in accordance with the most recent USFWS and DFG guidelines and at the appropriate time of year when the target species would be in flower or otherwise clearly identifiable.</p> <p>b) Locations of special-status plant populations will be clearly identified in the field by staking, flagging, or fencing a minimum 100-foot-wide buffer around them before the commencement of activities that may cause disturbance. No activity shall occur within the buffer area, and worker awareness training and biological monitoring will be conducted to ensure that avoidance measures are being implemented.</p> <p>c) Some special-status plant species are annual plants, meaning that a plant completes its entire life cycle in one growing season. Other special-status plant species are perennial plants that return year after year until they reach full maturity. Because of the differences in plant life histories, all general conservation measures will be developed on a case-by-case basis and will include strategies that are species- and site-specific to avoid impacts to special-status plants.</p>	<p>Program</p>	<p>USFWS DFG</p>
<p>PLANTS-2. Compensate for temporary or permanent loss of special-status plants</p>	<p>a) USFWS and/or DFG will be consulted to determine appropriate compensation measures for the loss of special-status plants, as appropriate.</p> <p>b) Appropriate mitigation measures may include the creation of off-site populations through seed collection or transplanting, preservation and enhancement of existing populations, restoration or creation of suitable habitat, or the purchase of credits at a regulatory-agency-approved mitigation bank. If off-site compensation includes dedication of conservation easements, purchase of mitigation credits, or other off-site conservation measures, the details of these measures will be included in the mitigation plan and must occur with full endowments for management in perpetuity. The plan will include information on responsible parties for long-term management, holders of conservation easements, long-term management requirements, and other details, as appropriate, for the preservation of long-term viable populations.</p>	<p>Program</p>	<p>USFWS DFG</p>

**Table 2-7.
Conservation Measures for Biological Resources That May Be Affected by Settlement Actions (contd.)**

Conservation Measure and Identifier	Applicable Habitat and/or Species, and Conservation Measure Description	Level of Compliance	Regulatory Agency
GGS	Giant garter snake		
GGS-1. Avoid and minimize loss of habitat for giant garter snake	<p>a) If giant garter snake habitat is anticipated to be present within the project area, preconstruction surveys will be completed by a qualified biologist approved by USFWS and DFG within a 24-hour period before any ground disturbance of potential giant garter snake habitat. If construction activities stop on the project site for a period of 2 weeks or more, a new giant garter snake survey will be completed no more than 24 hours before the restart of construction activities. Avoidance of suitable giant garter snake habitat, as defined by USFWS (USFWS 1993) and DFG, will occur by demarcating and maintaining a 300-foot-wide buffer around these areas.</p> <p>b) For projects within potential giant garter snake habitat, all activity involving disturbance of potential giant garter snake habitat will be restricted to the period between May 1 and October 1, the active season for giant garter snakes. The construction site shall be reinspected if a lapse in construction activity of 2 weeks or greater has occurred.</p> <p>c) Clearing will be confined to the minimal area necessary to facilitate construction activities. Giant garter snake habitat within or adjacent to the project will be flagged, staked, or fenced and designated as an Environmentally Sensitive Area. No activity shall occur within this area, and USFWS-approved worker awareness training and biological monitoring will be conducted to ensure that avoidance measures are being implemented. Construction activities shall be minimized within 200 feet of the banks of giant garter snake habitat. Movement of heavy equipment will be confined to existing roadways to minimize habitat disturbance.</p> <p>d) Vegetation shall be hand-cleared in areas where giant garter snakes are suspected to occur. Exclusionary fencing with one-way exit funnels shall be installed at least 1 month before activities to allow the species to passively leave the area and to prevent reentry into work zones, per USFWS and/or DFG guidance.</p> <p>e) If a giant garter snake is found during construction activities, USFWS, DFG, and the project's biological monitor will immediately be notified. The biological monitor, or his/her assignee, will stop construction in the vicinity of the find and allow the snake to leave on its own. The monitor will remain in the area for the remainder of the work day to ensure the snake is not harmed. Escape routes for giant garter snake should be determined in advance of construction and snakes will be allowed to leave on their own. If a giant garter snake does not leave on its own within 1 working day, USFWS and DFG will be consulted.</p> <p>f) All construction-related holes shall be covered to prevent entrapment of individuals. Where applicable, construction areas shall be dewatered 2 weeks before the start of activities to allow giant garter snakes and their prey to move out of the area before any disturbance.</p>	Program	Lead Agency USFWS DFG

**Table 2-7.
Conservation Measures for Biological Resources That May Be Affected by Settlement Actions (contd.)**

Conservation Measure and Identifier	Applicable Habitat and/or Species, and Conservation Measure Description	Level of Compliance	Regulatory Agency
<p>GGGS-2. Compensate for temporary or permanent loss of habitat</p>	<p>a) Temporarily affected giant garter snake aquatic habitat will be restored in accordance with criteria listed in the USFWS <i>Mitigation Criteria for Restoration and/or Replacement of Giant Garter Snake Habitat</i> (Appendix A to Programmatic Formal Consultation for U.S. Army Corps of Engineers 404 Permitted Projects with Relatively Small Effects on the Giant Garter Snake Within Butte, Colusa, Glenn, Fresno, Merced, Sacramento, San Joaquin, Solano, Stanislaus, Sutter, and Yolo Counties, California (USFWS 1997)), or the most current criteria from USFWS or DFG.</p> <p>b) Permanent loss of giant garter snake habitat will be compensated at a ratio and in a manner consulted on with USFWS and DFG. Compensation may include preservation and enhancement of existing populations, restoration or creation of suitable habitat, or purchase of credits at a regulatory-agency-approved mitigation bank in sufficient quantity to compensate for the effect. Credit purchases, land preservation, or land enhancement to minimize effects to giant garter snakes should occur geographically close to the impact area. If off-site compensation is chosen, it shall include dedication of conservation easements, purchase of mitigation credits, or other off-site conservation measures, and the details of these measures will be included in the mitigation plan and must occur with full endowments for management in perpetuity. The plan will include information on responsible parties for long-term management, holders of conservation easements, long-term management requirements, and other details, as appropriate, for the preservation of long-term viable populations.</p>	<p>Program</p>	<p>USFWS DFG</p>
WPT	Western pond turtle		
<p>WPT-1. Avoid and minimize loss of individuals</p>	<p>a) A qualified biologist will conduct surveys in aquatic habitats to be dewatered and/or filled during project construction. Surveys will be conducted immediately after dewatering and before fill of aquatic habitat suitable for western pond turtles. If western pond turtles are found, the biologist will capture them and move them to nearby USFWS- and/or DFG-approved areas of suitable habitat that will not be disturbed by project construction.</p>	<p>Program</p>	<p>DFG</p>

**Table 2-7.
Conservation Measures for Biological Resources That May Be Affected by Settlement Actions (contd.)**

Conservation Measure and Identifier	Applicable Habitat and/or Species, and Conservation Measure Description	Level of Compliance	Regulatory Agency
EAGLE Bald eagle and golden eagle			
<p>EAGLE-1. Avoid and minimize effects to bald and golden eagles (as defined in the Bald and Golden Eagle Protection Act)</p>	<p>a) Surveys for bald and golden eagle nests will be conducted within 2 miles of any proposed project within areas supporting suitable nesting habitat and important eagle roost sites and foraging areas. These surveys will be conducted in accordance with the USFWS <i>Protocol for Evaluating Bald Eagle Habitat and Populations in California</i> and DFG <i>Bald Eagle Breeding Survey Instructions</i> or current guidance (<i>USFWS Draft Project Design Criteria and Guidance for Bald and Golden Eagles</i>).</p> <p>b) If an active eagle's nest is found, project disturbance will not occur within ½ mile of the active nest site during the breeding season (typically December 30 to July 1) or any project disturbance if it is shown to disturb the nesting birds. A no-disturbance buffer will be established around the nest site for construction activities in consultation with USFWS and DFG, and will depend on ecological factors, including topography, surrounding vegetation, nest height, and distance to foraging habitat, as well as the type and magnitude of disturbance.</p> <p>c) Project activity will not occur within the ½-mile-buffer areas, and worker awareness training and biological monitoring will be conducted to ensure that avoidance measures are being implemented.</p>	Program	USFWS DFG
SWH Swainson's hawk			
<p>SWH-1. Avoid and minimize impacts to Swainson's Hawk</p>	<p>a) Preconstruction surveys for active Swainson's hawk nests will be conducted in and around all potential nest trees within 0.5 miles of project-related disturbance (including construction-related traffic)..</p> <p>b) If known or active nests are identified through preconstruction surveys or other means, a ½ mile no-disturbance buffer shall be established around all active nest sites if construction cannot be limited to occur outside the nesting season (February 15 through September 15).</p> <p>c) Worker awareness training and biological monitoring will be conducted to ensure that avoidance measures are being implemented.</p>	Program	DFG

**Table 2-7.
Conservation Measures for Biological Resources That May Be Affected by Settlement Actions (contd.)**

Conservation Measure and Identifier	Applicable Habitat and/or Species, and Conservation Measure Description	Level of Compliance	Regulatory Agency
SWH-2. Compensate for loss of nest trees and foraging habitat	<p>a) If foraging habitat for Swainson's hawk is removed in association with project implementation, foraging habitat compensation will occur in coordination with DFG. Foraging habitat mitigation may consist of planting and establishing alfalfa, row crops, pasture, or fallow fields.</p> <p>b) If potential nesting trees are to be removed during construction activities, removal will take place outside of Swainson's hawk nesting season, and the project proponent will develop a plan to replace known Swainson's hawk nest trees with a number of equivalent native trees that were previously determined to be impacts through consultation with DFG. Compensation shall include dedication of conservation easements, purchase of mitigation credits, or other off-site conservation measures, and the details of these measures will be included in the mitigation plan and must occur with full endowments for management in perpetuity. The plan will include information on responsible parties for long-term management, holders of conservations easements, long-term management requirements, and other details, as appropriate, for the preservation of long-term viable populations.</p>	Program	DFG
RAPTOR	Other nesting raptors		
RAPTOR-1. Avoid and minimize loss of individual raptors	<p>a) Construction activity, including vegetation removal, will only occur outside the typical breeding season for raptors (September 1 to February 14), if raptors are determined to be present.</p> <p>b) Preconstruction surveys will be conducted by a qualified biologist in areas of suitable habitat to identify active nests in the project footprint.</p> <p>c) If active nests are located in the project footprint, a no-disturbance buffer will be established until a qualified biologist determines that the nest is no longer active. The size of the buffer shall be established by a qualified biologist in coordination with DFG based on the sensitivity of the resource, the type of disturbance activity, and nesting stage. No activity shall occur within the buffer area, and worker awareness training and biological monitoring will be conducted to ensure that avoidance measures are being implemented.</p>	Program	DFG
RAPTOR-2. Compensate for loss of nest trees	<p>a) Native trees removed during project activities will be replaced with an appropriate number of native trees, in coordination with DFG.</p>	Program	DFG
MBTA	Other birds protected by the Migratory Bird Treaty Act		
MBTA-1. Avoid and minimize effects to species	<p>a) Native nesting birds will be avoided by not conducting project activity, including vegetation removal, during the typical breeding season (February 1 to September 1), if species covered under the Migratory Bird Treaty Act and Fish and Game Code Sections 3503, 3503.5, and 3513 are determined to be present.</p> <p>b) An Avian Protection Plan shall be established in coordination with USFWS and DFG. Any overhead utility companies within the project area, whose lines, poles, or towers may be moved in association with the project, will also be consulted as part of the Avian Protection Plan.</p>	Program	USFWS DFG

**Table 2-7.
Conservation Measures for Biological Resources That May Be Affected by Settlement Actions (contd.)**

Conservation Measure and Identifier	Applicable Habitat and/or Species, and Conservation Measure Description	Level of Compliance	Regulatory Agency
BRO	Burrowing owl		
BRO-1. Avoid loss of species	<p>a) Preconstruction surveys for burrowing owls will be conducted in areas supporting potentially suitable habitat and within 30 days before the start of construction activities. If ground-disturbing activities are delayed or suspended for more than 30 days after the preconstruction survey, the site should be resurveyed.</p> <p>b) Occupied burrows shall not be disturbed during the breeding season (February 1 through August 31). A minimum 160-foot-wide buffer shall be placed around occupied burrows during the nonbreeding season (September 1 through January 31), and a 250-foot-wide buffer shall be placed around occupied burrows during the breeding season. Ground-disturbing activities shall not occur within the designated buffers.</p>	Program	DFG
BRO-2. Minimize impacts to species	<p>a) If a DFG-approved biologist can verify through noninvasive methods that owls have not begun egg-laying and incubation, or that juveniles from occupied burrows are foraging independently and are capable of independent survival, a plan shall be coordinated with DFG to offset burrow habitat and foraging areas on the project site if burrows and foraging areas are taken by SJRRP actions.</p> <p>b) If destruction of occupied burrows occurs, existing unsuitable burrows should be enhanced (enlarged or cleared of debris) or new burrows created. This should be done in consultation with DFG.</p> <p>c) Passive owl relocation techniques must be implemented. Owls should be excluded from burrows in the immediate impact zone within a 160-foot-wide buffer zone by installing one-way doors in burrow entrances. These doors shall be in place at least 48 hours before excavation to insure the owls have departed.</p> <p>d) The project area shall be monitored daily for 1 week to confirm owl departure from burrows before any ground-disturbing activities.</p> <p>e) Where possible, burrows should be excavated using hand tools and refilled to prevent reoccupation. Sections of flexible plastic pipe should be inserted into the tunnels during excavation to maintain an escape route for any animals inside the burrow.</p>	Program	DFG

**Table 2-7.
Conservation Measures for Biological Resources That May Be Affected by Settlement Actions (contd.)**

Conservation Measure and Identifier	Applicable Habitat and/or Species, and Conservation Measure Description	Level of Compliance	Regulatory Agency
BAT	Special-status bats		
BAT-1. Avoid and minimize loss of species	<p>a) If suitable roosting habitat for special-status bats will be affected by project construction (e.g., removal of buildings, modification of bridges), surveys for roosting bats on the project site will be conducted by a qualified biologist. The type of survey will depend on the condition of the potential roosting habitat and may include visual surveys or use of acoustic detectors. Visual surveys may consist of a daytime pedestrian survey for evidence of bat use (e.g., guano) and/or an evening emergence survey for the presence or absence of bats. The type of survey will depend on the condition of the potential roosting habitat. If no bat roosts are found, then no further study is required.</p> <p>b) If evidence of bat use is observed, the number and species of bats using the roost will be determined. Bat detectors may be used to supplement survey efforts.</p> <p>c) If roosts are determined to be present and must be removed, the bats will be excluded from the roosting site before the facility is removed. A mitigation program addressing compensation, exclusion methods, and roost removal procedures will be developed in consultation with DFG before implementation. Exclusion methods may include use of one-way doors at roost entrances (bats may leave, but not reenter), or sealing roost entrances when a site can be confirmed to contain no bats. Exclusion efforts may be restricted during periods of sensitive activity (e.g., during hibernation or while females in maternity colonies are nursing young).</p>	Program	DFG
BAT-2. Compensate for loss of habitat	<p>a) The loss of each roost will be replaced, in consultation with DFG, and may include construction and installation of bat boxes suitable to the bat species and colony size excluded from the original roosting site. Roost replacement will be implemented before bats are excluded from the original roost sites. Once the replacement roosts are constructed and it is confirmed that bats are not present in the original roost sites, the structure may be removed.</p>	Program	DFG

**Table 2-7.
Conservation Measures for Biological Resources That May Be Affected by Settlement Actions (contd.)**

Conservation Measure and Identifier	Applicable Habitat and/or Species, and Conservation Measure Description	Level of Compliance	Regulatory Agency
SJAS	San Joaquin antelope squirrel		
SJAS-1. Avoid and minimize loss of individuals	<p>a) A 50-foot-wide minimum buffer shall be maintained from all small mammal burrows of suitable size for San Joaquin antelope squirrel.</p> <p>b) If work is to occur within the 50-foot-wide buffer, a qualified, permitted biologist shall conduct focused visual surveys for San Joaquin antelope squirrel within a 500-foot-wide buffer of the work area. These surveys shall coincide with the squirrels' most active season, April 1 to September 30, and shall be conducted only when air temperatures are between 20° to 30° C (68° to 86° F). Surveys should be conducted using daytime line transects with 10- to 30-meter spacing. Focused live trapping may also be required, in coordination with DFG. If San Joaquin antelope squirrels are observed during surveys, no vegetation or soil disturbance will be allowed within 50 feet of occupied burrows or burrow systems until the individuals are determined to no longer be occupying the area, as determined by a qualified biologist.</p> <p>c) Focused surveys, which may involve live trapping, may be required, in coordination with DFG, as appropriate. Additional conservation measures may developed pending the results of surveys, and in consultation with DFG.</p> <p>d) Construction activities shall be conducted when they are least likely to affect the species (i.e., after the normal breeding season). This timing shall be coordinated with USFWS and DFG.</p>	Program	DFG
SJAS-2: Compensate for temporary or permanent loss of habitat or species	<p>a) Compensation for impacts to the species, if needed, will be determined in coordination with DFG, as appropriate.</p>	Program	DFG

**Table 2-7.
Conservation Measures for Biological Resources That May Be Affected by Settlement Actions (contd.)**

Conservation Measure and Identifier	Applicable Habitat and/or Species, and Conservation Measure Description	Level of Compliance	Regulatory Agency
FKR	Fresno kangaroo rat		
FKR-1. Avoid and minimize effects to species	<p>a) Preconstruction surveys will be conducted by a qualified biologist per USFWS and DFG survey methodology to determine if potential burrows for Fresno kangaroo rat are present in the project footprint. Surveys will be conducted within 30 days before ground-disturbing activities. The biologist will conduct burrow searches by systematically walking transects, which shall be adjusted based on vegetation height and topography, and in coordination with USFWS and DFG. Transects shall be used to identify the presence of kangaroo rat burrows. When burrows are found within 100 feet of the proposed project footprint, focused live trapping surveys shall be conducted by a qualified and permitted biologist, following a methodology approved in advance by USFWS and DFG. Additional conservation measures may be developed pending the results of surveys, and in consultation with USFWS and DFG.</p> <p>b) Construction activities shall be conducted when they are least likely to affect the species (i.e., after the normal breeding season). This timing shall be coordinated with USFWS and DFG.</p>	Program	USFWS DFG
FKR-2. Avoid disturbance of designated critical habitat	a) Facility construction and modification and other restoration projects shall be sited to avoid primary constituent elements of designated critical habitat for Fresno kangaroo rat.	Program	USFWS DFG
FKR-3: Compensate for temporary or permanent loss of habitat or species	a) Compensation for impacts to the species, if needed, will be determined in coordination with DFG and USFWS, as appropriate.	Program	USFWS DFG

**Table 2-7.
Conservation Measures for Biological Resources That May Be Affected by Settlement Actions (contd.)**

Conservation Measure and Identifier	Applicable Habitat and/or Species, and Conservation Measure Description	Level of Compliance	Regulatory Agency
SJKF	San Joaquin kit fox		
SJKF-1. Avoid and minimize effects to species	<p>a) A qualified biologist will conduct preconstruction surveys no less than 14 days and no more than 30 days before the commencement of activities to identify potential dens more than 5 inches in diameter. The project proponent shall implement USFWS' (1999b) <i>Standardized Recommendations for Protection of San Joaquin Kit Fox Prior to or During Ground Disturbance</i>. The project proponent will notify USFWS and DFG in writing of the results of the preconstruction survey within 30 days after these activities are completed.</p> <p>b) If dens are located within the proposed work area, and cannot be avoided during construction activities, a USFWS-approved biologist will determine if the dens are occupied.</p> <p>c) If occupied dens are present within the proposed work, their disturbance and destruction shall be avoided. Exclusion zones will be implemented following the latest USFWS procedures (currently USFWS 1999b).</p> <p>d) The project proponent will notify USFWS and DFG immediately if a natal or pupping den is found in the survey area. The project proponent will present the results of preactivity den searches within 5 days after these activities are completed and before the start of construction activities in the area.</p> <p>e) Construction activities shall be conducted when they are least likely to affect the species (i.e., after the normal breeding season). This timing shall be coordinated with USFWS and DFG.</p>	Program	USFWS DFG
SJKF-2. Compensate for loss of habitat	<p>a) The project proponent, in coordination with USFWS and DFG, will determine if kit fox den removal is appropriate. If unoccupied dens need to be removed, the USFWS-approved biologist shall remove these dens by hand-excavating them in accordance with USFWS procedures (USFWS 1999b).</p> <p>b) Additional conservation measures will be coordinated with USFWS and DFG, and may include replacing dens, installing off-site artificial dens, acquiring compensation habitat, or other options to be determined. Compensation may include dedicating conservation easements, purchasing mitigation credits, or other off-site conservation measures, and the details of these measures will be included in the mitigation plan and must occur with full endowments for management in perpetuity. The plan will include information on responsible parties for long-term management, holders of conservations easements, long-term management requirements, and other details, as appropriate, for the preservation of long-term viable populations.</p> <p>c) The project proponent will present the results of den excavations to USFWS and DFG within 5 days after these activities are completed.</p>	Program	USFWS DFG

**Table 2-7.
Conservation Measures for Biological Resources That May Be Affected by Settlement Actions (contd.)**

Conservation Measure and Identifier	Applicable Habitat and/or Species, and Conservation Measure Description	Level of Compliance	Regulatory Agency
PL	Pacific lamprey		
PL-1. Avoid and minimize effects to species	a) A qualified biologist will conduct preconstruction surveys as outlined in Attachment A of USFWS' <i>Best Management Practices to Minimize Adverse Effects to Pacific Lamprey (Entosphenus tridentatus)</i> (2010). b) Work in documented areas of Pacific lamprey presence will be timed to avoid in-channel work during typical lamprey spawning (March 1 to July 1). c) If temporary dewatering in documented areas of lamprey presence is required for instream channel work, salvage methods shall be implemented to capture and move ammocoetes to a safe area, in consultation with USFWS.	Program	USFWS
DS	Delta smelt		
DS-1. Avoid and minimize effects to species	a) All in-water work within delta smelt habitat, as defined by most recent USFWS guidance, shall be confined to a seasonal work window of August 1 - November 30, when delta smelt are least likely to be present. Because this species does not regulate its movements strictly within this time frame, modifications to the work windows may be approved by USFWS before project implementation, based on information from the various in-Delta monitoring programs. b) If activities occur within Delta smelt habitat, measure will be taken to maintain or increase shading of suitable shallow water habitat. The project will also avoid areas deemed suitable for delta smelt habitat that have established aquatic vegetation or have not been previously disturbed.	Program	USFWS DFG
RHSNC	Riparian habitat and other sensitive natural communities		
RHSNC-1. Avoid and minimize loss of riparian habitat and other sensitive natural communities	a) Biological surveys will be conducted to identify, map, and quantify riparian and other sensitive habitats in potential construction areas. b) Construction activities will be avoided in areas containing sensitive natural communities, as appropriate. c) If effects occur to riparian habitat, emergent wetland, or other sensitive natural communities associated with streams, the State lead agency will comply with Section 1602 of the California Fish and Game Code; compliance may include measures to protect fish and wildlife resources during the project.	Project and Program	DFG

**Table 2-7.
Conservation Measures for Biological Resources That May Be Affected by Settlement Actions (contd.)**

Conservation Measure and Identifier	Applicable Habitat and/or Species, and Conservation Measure Description	Level of Compliance	Regulatory Agency
RHSNC-2. Compensate for loss of riparian habitat and other sensitive natural communities	a) The Riparian Habitat Mitigation and Monitoring Plan for the SJRRP will be developed and implemented in coordination with DFG. Credits for increased acreage or improved ecological function or riparian and wetland habitats resulting from the implementation of SJRRP actions will be applied as compensatory mitigation before additional compensatory measures are required. b) If losses of other sensitive natural communities (e.g., recognized as sensitive by CNDDDB, but not protected under other regulations or policies) would not be offset by the benefits of the SJRRP, then additional compensation will be provided through creating, restoring, or preserving in perpetuity in-kind communities at a sufficient ratio for no net loss of habitat function or acreage. The appropriate ratio will be determined in consultation with USFWS or DFG, depending on agency jurisdiction.	Project and Program	DFG
WUS	Waters of the United States/waters of the State		
WUS-1. Identify and quantify wetlands and other waters of the United States	a) Before SJRRP actions that may affect waters of the United States or waters of the State, Reclamation will map the distribution of wetlands (including vernal pools and other seasonal wetlands) in the Eastside and Mariposa bypasses. b) The project proponent will determine, based on the mapped distribution of these wetlands and hydraulic modeling and field observation, the acreage of effects, if any, on waters of the United States. c) If it is determined that vernal pools or other seasonal wetlands will be affected by the SJRRP, the project proponent will conduct a delineation of waters of the United States, and submit the delineation to USACE for verification. The delineation will be conducted according to methods established in the USACE <i>Wetlands Delineation Manual</i> (Environmental Laboratory 1987) and <i>Arid West Supplement</i> (Environmental Laboratory 2008). d) Construction and modification of road crossings, control structures, fish barriers, fish passages, and other structures will be designed to minimize effects on waters of the United States and waters of the State, and will employ BMPs to avoid indirect effects on water quality.	Project and Program	USACE
WUS-2. Obtain permits and compensate for any loss of wetlands and other waters of the United States/waters of the State	a) The project proponent, in coordination with USACE, will determine the acreage of effects on waters of the United States and waters of the State that will result from implementation of the SJRRP. b) The project proponent will adhere to a “no net loss” basis for the acreage of wetlands and other waters of the United States and waters of the State that will be removed and/or degraded. Wetland habitat will be restored, enhanced, and/or replaced at acreages and locations and by methods agreed on by USACE and the Central Valley RWQCB, as appropriate, depending on agency jurisdiction. c) The project proponent will obtain Section 404 and Section 401 permits and comply with all permit terms. The acreage, location, and methods for compensation will be determined during the Section 401 and Section 404 permitting processes. d) The compensation will be consistent with recommendations in the Fish and Wildlife Coordination Act Report (Appendix F of this Draft PEIS/R).	Project and Program	USACE

**Table 2-7.
Conservation Measures for Biological Resources That May Be Affected by Settlement Actions (contd.)**

Conservation Measure and Identifier	Applicable Habitat and/or Species, and Conservation Measure Description	Level of Compliance	Regulatory Agency
INV	Invasive plants		
INV-1. Implement the Invasive Vegetation Monitoring and Management Plan	a) Reclamation and the project lead agencies will implement the Invasive Vegetation Monitoring and Management Plan for the SJRRP (Appendix L of this Draft PEIS/R), which includes measures to monitor, control, and where possible eradicate, invasive plant infestations during flow releases and construction activities. b) The implementation of the Invasive Vegetation Monitoring and Management Plan (Appendix L of this Draft PEIS/R) will include monitoring procedures, thresholds for management responses, success criteria, and adaptive management measures for controlling invasive plant species. c) The control of invasive weeds and other recommended actions in the Invasive Vegetation Monitoring and Management Plan (Appendix L of this Draft PEIS/R) will be consistent with recommendations in the Fish and Wildlife Coordination Act Report (Appendix F of this Draft PEIS/R).	Project and Program	Lead Agency
CP	Conservation plans		
CP-1. Remain consistent with approved conservation plans	a) Facility siting and construction activities will be conducted in a manner consistent with the goals and strategies of adopted habitat conservation plans, natural community conservation plans, or other approved local, regional, or State habitat conservation plans to the extent feasible. Coordination shall occur with USFWS and/or DFG, as appropriate.	Program	USFWS DFG
CP-2. Compensate effects consistent with approved conservation plans	a) The project proponent shall compensate effects consistent with applicable conservation plans and implement all applicable measures required by the plans.	Program	USFWS DFG
GS	Southern distinct population segment of North American green sturgeon		
GS-1. Avoid and minimize loss of habitat and individuals	a) The SJRRP will be operated in such a way that actions within green sturgeon habitat shall be done in accordance with existing operating criteria of the CVP and SWP, and prevailing and relevant laws, regulations, BOs, and court orders in place when the action(s) are performed.	Project and Program	NMFS

**Table 2-7.
Conservation Measures for Biological Resources That May Be Affected by Settlement Actions (contd.)**

Conservation Measure and Identifier	Applicable Habitat and/or Species, and Conservation Measure Description	Level of Compliance	Regulatory Agency
CVS	Central Valley steelhead		
CVS-1. Avoid loss of habitat and risk of take of species	<p>a) Impacts to habitat conditions (i.e., changes in flows potentially resulting in decreased flows in the tributaries, increases in temperature, increases in pollutant concentration, change in recirculation/recapture rates and methods, decrease in floodplain connectivity, removal of riparian vegetation, decreased in quality rearing habitat, etc.) must be analyzed in consultation with NMFS.</p> <p>b) The Hills Ferry Barrier will be operated and maintained to exclude Central Valley steelhead from the Restoration Area during construction activities and until suitable habitat conditions are restored.</p> <p>c) Maintenance of conservation measures will be conducted to the extent necessary to ensure that the overall long-term habitat effects of the project are positive.</p> <p>d) Before implementation of site-specific actions, the action agency shall conduct an education program for all agency and contracted employees relative to the Federally listed species that may be encountered within the study area of the action, and required practices for their avoidance and protection. A NMFS-appointed representative shall be identified to employees and contractors to ensure that questions regarding avoidance and protection measures are addressed in a timely manner.</p> <p>e) Disturbance of riparian vegetation will be avoided to the greatest extent practicable.</p> <p>f) A spill prevention plan will be prepared describing measures to be taken to minimize the risk of fluids or other materials used during construction (e.g., oils, transmission and hydraulic fluids, cement, fuel) from entering the San Joaquin River or contaminating riparian areas adjacent to the river itself. In addition to a spill prevention plan, a cleanup protocol will be developed before construction begins and shall be implemented in case of a spill.</p> <p>g) Stockpiling of materials, including portable equipment, vehicles and supplies, such as chemicals, shall be restricted to the designated construction staging areas, exclusive of any riparian and wetland areas.</p> <p>h) A qualified biological monitor will be present during all construction activities, including clearing, grubbing, pruning, and trimming of vegetation at each job site during construction initiation, midway through construction, and at the close of construction, to monitor implementation of conservation measures and water quality.</p> <p>i) The San Joaquin River channel shall be designed to decrease or eliminate predator holding habitat, in coordination with NMFS.</p>	Project and Program	NMFS

**Table 2-7.
Conservation Measures for Biological Resources That May Be Affected by Settlement Actions (contd.)**

Conservation Measure and Identifier	Applicable Habitat and/or Species, and Conservation Measure Description	Level of Compliance	Regulatory Agency
CVS-2. Minimize loss of habitat and risk of take of species	<ul style="list-style-type: none"> a) In-channel construction activities that could affect designated critical habitat for Central Valley steelhead will be limited to the low-flow period between June 1 and October 1 to minimize potential for adversely affecting Federally listed anadromous salmonids during their emigration period. b) In-channel construction activities that could affect designated critical habitat for Central Valley steelhead will be limited to daylight hours during weekdays, leaving a nighttime and weekend period of passage for Federally listed fish species. c) Construction BMPs for off-channel staging, and storage of equipment and vehicles, will be implemented to minimize the risk of contaminating the waters of the San Joaquin River by spilled materials. BMPs will also include minimization of erosion and stormwater runoff, as appropriate. d) Riparian vegetation removed or damaged will be replaced at a ratio, coordinated with NMFS, within the immediate area of the disturbance to maintain habitat quality. e) If individuals of listed species are observed present within a project area, NMFS must be notified. NMFS personnel shall have access to construction sites during construction, and following completion, to evaluate species presence and condition and/or habitat conditions. f) If bank stabilization activities should be necessary, then such stabilization shall be constructed to minimize predator habitat, minimize erosion potential, and contain material suitable for supporting riparian vegetation. 	Program	NMFS
WRCS	Sacramento Valley winter-run Chinook salmon		
WRCS-1. Avoid and minimize loss of habitat and individuals	<ul style="list-style-type: none"> a) The SJRRP will be operated in such a way that actions related to the SJRRP in the vicinity of winter-run Chinook salmon habitat shall be performed in accordance with existing operating criteria of the CVP and SWP, and prevailing and relevant laws, regulations, BOs, and court orders in place at the time the actions are performed. 	Project and Program	NMFS DFG
SRCS	Central Valley spring-run Chinook salmon		
SRCS-1. Avoid and minimize loss of habitat and individuals	<ul style="list-style-type: none"> a) The SJRRP will be operated in such a way that actions in the vicinity of spring-run Chinook salmon habitat shall be done in accordance with existing operating criteria of the CVP and SWP, and prevailing and relevant laws, regulations, BOs, and court orders in place at the time the actions are performed. b) SJRRP actions shall be performed in accordance with the Experimental Population 4(d) rule, as it is developed, and where applicable. 	Project and Program	NMFS DFG

**Table 2-7.
Conservation Measures for Biological Resources That May Be Affected by Settlement Actions (contd.)**

Conservation Measure and Identifier	Applicable Habitat and/or Species, and Conservation Measure Description	Level of Compliance	Regulatory Agency
EFH	Essential fish habitat (Pacific salmonids and starry flounder)		
EFH-1. Avoid loss of habitat and risk of take of species	<ul style="list-style-type: none"> a) Impacts to habitat conditions (e.g., changes in flows potentially resulting in decreased flows in the tributaries, increases in temperature, increases in pollutant concentration, change in recirculation/recapture rates and methods, decrease in floodplain connectivity, removal of riparian vegetation, decreased in quality rearing habitat) must be analyzed in consultation with NMFS. b) The Hills Ferry Barrier will be operated and maintained to exclude Pacific salmonids from the Restoration Area during construction activities, and until suitable habitat conditions are restored. c) Maintenance of conservation measures will be conducted to the extent necessary to ensure that the overall long-term habitat effects of the project are positive. d) Before implementation of site-specific actions, the action agency shall conduct an education program for all agency and contracted employees relative to the Federally listed species that may be encountered within the study area of the action, and required practices for their avoidance and protection. A NMFS-appointed representative shall be identified to employees and contractors to ensure that questions regarding avoidance and protection measures are addressed in a timely manner. e) Disturbance of riparian vegetation will be avoided to the greatest extent practicable. f) A spill prevention plan will be prepared describing measures to be taken to minimize the risk of fluids or other materials used during construction (e.g., oils, transmission and hydraulic fluids, cement, fuel) from entering the San Joaquin River or contaminating riparian areas adjacent to the river itself. In addition to a spill prevention plan, a cleanup protocol will be developed before construction begins and shall be implemented in case of a spill. g) Stockpiling of materials, including portable equipment, vehicles and supplies, such as chemicals, shall be restricted to the designated construction staging areas, exclusive of any riparian and wetland areas. h) A qualified biological monitor will be present during all construction activities, including clearing, grubbing, pruning, and trimming of vegetation at each job site during construction initiation, midway through construction, and at the close of construction to monitor implementation of conservation measures and water quality. i) The bottom topography of the San Joaquin River channel will be designed to decrease or eliminate predator holding habitat. 	Project and Program	NMFS

**Table 2-7.
Conservation Measures for Biological Resources That May Be Affected by Settlement Actions (contd.)**

Conservation Measure and Identifier	Applicable Habitat and/or Species, and Conservation Measure Description	Level of Compliance	Regulatory Agency
EFH-2. Minimize loss of habitat and risk of take from implementation of construction activities	a) In-channel construction activities that could affect habitat for will be limited to the low-flow period between June 1 and October 1 to minimize potential for adversely affecting Federally listed anadromous salmonids during their emigration period. b) In-channel construction activities that could affect habitat for starry flounder and Pacific salmonids will be limited to daylight hours during weekdays, leaving a nighttime and weekend period of passage for Federally listed fish species. c) Construction BMPs for off-channel staging and storage of equipment and vehicles will be implemented to minimize the risk of contaminating the waters of the San Joaquin River by spilled materials. BMPs will also include minimization of erosion and stormwater runoff, as appropriate. d) Riparian vegetation removed or damaged will be replaced at a ratio, coordinated with NMFS, within the immediate area of the disturbance to maintain habitat quality. e) If individuals of listed species are observed present within a project area, NMFS must be notified. NMFS personnel shall have access to construction sites during construction and following completion to evaluate species presence and condition and/or habitat conditions. f) If bank stabilization activities should be necessary, then such stabilization shall be constructed to minimize predator habitat, minimize erosion potential, and contain material suitable for supporting riparian vegetation.	Program	NMFS

Key:

°C = degrees Celsius

°F = degrees Fahrenheit

BMP = best management practice

BO = Biological Opinion

CFR = Code of Federal Regulations

cfs = cubic feet per second

CNDDDB = California Natural Diversity Database

CVP = Central Valley Project

DFG = California Department of Fish and Game

DWR = California Department of Water Resources

EPA = Federal Environmental Protection Agency

NMFS = National Marine Fisheries Service

PEIS/R = Program Environmental Impacts Statement/Report

Reclamation = U.S. Department of the Interior, Bureau of Reclamation

RWQCB = Regional Water Quality Control Board

Settlement = Stipulation of Settlement in *NRDC, et al., v. Kirk Rodgers, et al.*

SJRRP = San Joaquin River Restoration Program

State = State of California

SWP = State Water Project

USACE = U.S. Army Corps of Engineers

USFWS = U.S. Fish and Wildlife Service

1 **2.5 Alternative A2**
2 **Reach 4B1 at 4,500 cfs, Delta Recapture**

3 Project-level actions in Alternative A2 are identical to project-level actions in
4 Alternative A1. Program-level actions in Alternative A2 include all of the program-level
5 actions in Alternative A1, plus additional Restoration actions in Reach 4B1 and the
6 bypass system to increase the capacity of Reach 4B1, as described below and as shown in
7 Table 2-2. Flow routing and water recapture under Alternative A2 are shown in
8 Figure 2-9.

9 **2.5.1 Additional Restoration Actions**

10 Alternative A2 includes all of the modifications to Reach 4B1 described in Alternative
11 A1 plus additional modifications needed to increase the capacity of Reach 4B1 to at least
12 4,500 cfs, with integrated floodplain habitat, as specified in Paragraph 11(b)(1) of the
13 Settlement. The additional modifications to increase the capacity of Reach 4B1 to at least
14 4,500 cfs would be implemented during Phase 2, unless the Secretary, in consultation
15 with the RA and with concurrence by NMFS and USFWS, determines that such
16 modifications would not substantially enhance achievement of the Restoration Goal.
17 These modifications to Reach 4B1 would require subsequent environmental compliance
18 documentation, and would include modifications to the San Joaquin River Headgates at
19 the upstream end of Reach 4B1 to provide for fish passage, and enable flow routing of
20 between 500 cfs and 4,500 cfs into Reach 4B1, and related modifications to the Sand
21 Slough Control Structure, as stipulated in Paragraphs 11(a)(4) and 11(a)(5) of the
22 Settlement, respectively.

23 Before modifications are completed to convey at least 4,500 cfs in Reach 4B1, Interim
24 and Restoration flows of up to 475 cfs would be routed through Reach 4B1, with
25 remaining Interim and Restoration flows routed through the Eastside Bypass. After
26 modifications are completed to convey at least 4,500 cfs through Reach 4B1, all Interim
27 and Restoration flows would be routed through Reach 4B1. Modifications to and
28 operations of Reach 4B1, the San Joaquin River Headgate, and the Sand Slough Control
29 Structure to convey at least 4,500 cfs through Reach 4B1 in Alternative A2 are the same
30 in Alternatives B2 and C2, as shown in Figures 2-2 and 2-8, and therefore are not
31 discussed further in the presentation of those alternatives.

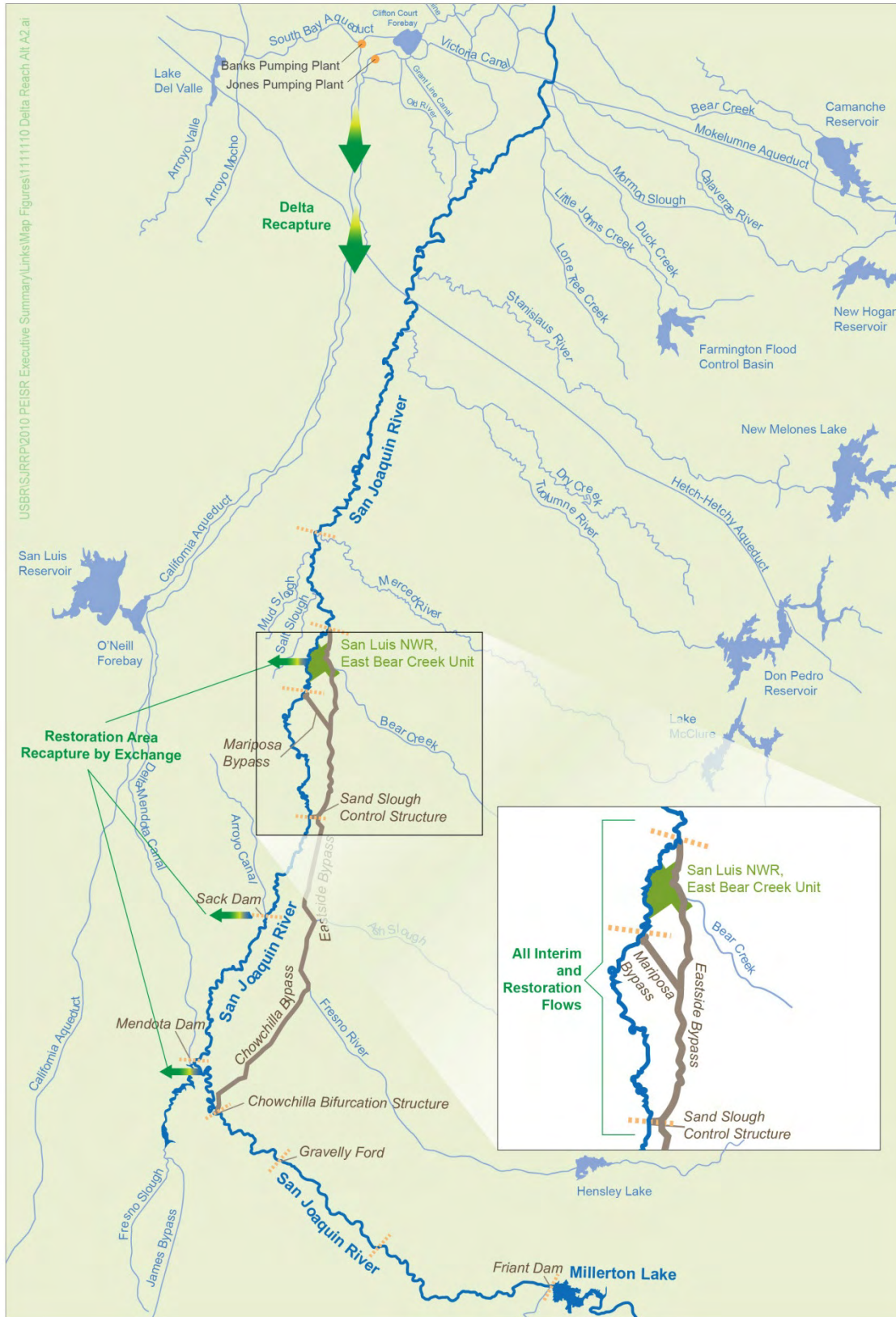


Figure 2-9.
Flow Routing and Water Recapture Under Alternative A2

1
2
3

1 Although the exact extent of potential floodplain habitat through Reach 4B1 has not been
2 identified, floodplains in Reach 4B1 could provide significant benefits for salmon and
3 other native fish. Therefore, Alternative A2 includes modifications to Reach 4B1 that
4 bracket a reasonable range of potential implementation. New levees would be constructed
5 in Reach 4B1 to provide new floodplain habitat ranging in average width from about
6 1,900 feet to 4,800 feet, and levee heights at an average of 4 feet to 5 feet, depending on
7 the characteristics of the floodplain habitat. Specific levee alignments, modifications, and
8 floodplain characteristics would be determined through a project-specific study that
9 would consider a variety of factors, as specified in the Act, including, but not limited to,
10 fisheries and other ecological requirements, flood risk reduction, land uses, subsurface
11 conditions, topography, and the condition of existing levees. The Fisheries Management
12 Plan (Appendix E) addresses specific actions to improve habitats and evaluates their
13 merits (including uncertainty) in an action routing process.

14 Road crossings are present at several locations in Reach 4B1. Washington Road crosses
15 the river just downstream from the San Joaquin River Headgates. Turner Island Road
16 crosses the river approximately midway along the reach. Three unnamed crossings are
17 also present in Reach 4B1, as described in Alternative A1. These crossings would be
18 modified to provide flow capacity and fish passage, if necessary. Project-specific studies
19 of these crossings would identify specific modifications needed to facilitate flow and fish
20 passage.

21 **2.6 Alternative B1**

22 **Reach 4B1 at 475 cfs, San Joaquin River Recapture**

23 Project-level actions in Alternative B1 are identical to project-level actions in
24 Alternatives A1 and A2. Program-level actions in Alternative B1 include all of the
25 program-level actions in Alternative A1, plus additional Water Management actions to
26 recapture Interim and Restoration flows using existing facilities along the San Joaquin
27 River between the Merced River and the Delta, as shown in Table 2-2. Flow routing and
28 water recapture under Alternative B1 are shown in Figure 2-10.

29

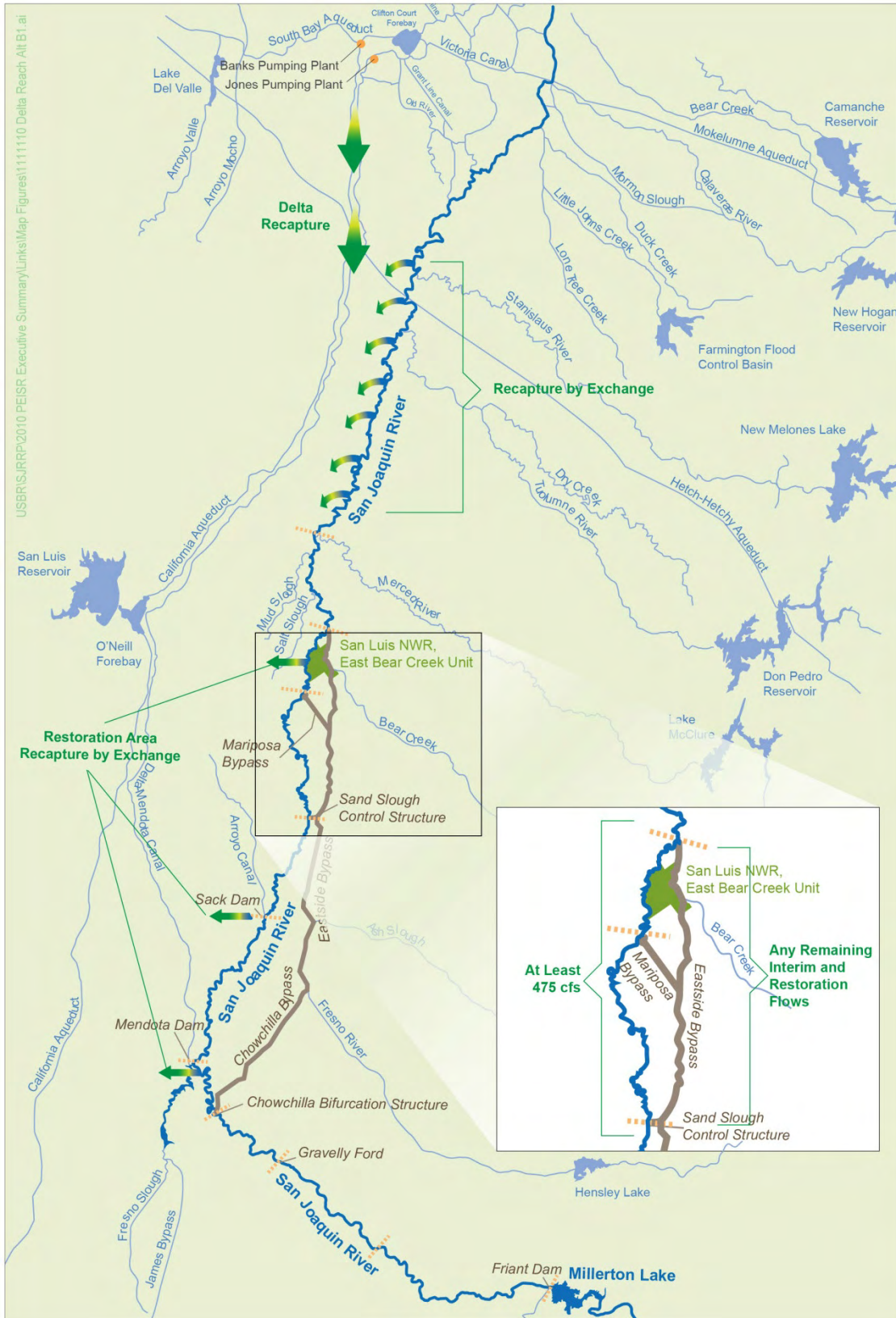


Figure 2-10.
Flow Routing and Water Recapture Under Alternative B1

1
2
3

1 **2.6.1 Additional Water Management Actions on San Joaquin River**

2 Alternative B1 includes recapturing Interim and Restoration flows from the San Joaquin
3 River below the Merced River confluence at existing pumping facilities owned and
4 operated by CVP contractors who possess San Joaquin River water rights, as illustrated in
5 Figure 2-10. These actions could include potential in-district modifications to existing
6 off-river facilities to facilitate routing or storage of water, such as expanding existing
7 canals or constructing lift stations on existing canals. These actions are analyzed at a
8 program level in this Draft PEIS/R. Recaptured Interim and Restoration flows from the
9 San Joaquin River would be exchanged for CVP Delta water supplies scheduled for
10 delivery to these CVP contractors. Implementing recapture at existing facilities on the
11 San Joaquin River would require agreements with San Joaquin River water right holders
12 to allow pumping of Interim and Restoration flows in exchange for delivery of CVP
13 water from the Delta. Recapture of Interim or Restoration flows at existing facilities
14 would occur only if doing so would not adversely affect downstream water quality or
15 fisheries, consistent with the requirements of Paragraph 16(a)(1) of the Settlement. To the
16 extent they are available, CVP storage and conveyance facilities would be used to convey
17 the exchanged water to the Friant Division. As a result of these diversions along the San
18 Joaquin River, the portion of the Restoration Flows reaching the Delta under Alternative
19 B1 would be less than under Alternative A1.

20 Water supply recaptured through exchange with San Joaquin River water right holders
21 available to Friant Division long-term contractors would range from zero to the total
22 amount of recaptured Interim and Restoration flows. Recapture would be limited by
23 conveyance capacity and conditions identified by exchanging entities, such as water
24 quality requirements for land application or other potential concerns.

25 Implementing Alternative B1 would require exchange and/or conveyance agreements
26 between Reclamation and CVP water users who possess water rights on the San Joaquin
27 River. This alternative also would require exchange and/or conveyance agreements for
28 recirculating recaptured Interim and Restoration flows at Delta export pumping facilities,
29 as described under Alternative A1.

30 **2.7 Alternative B2**
31 **Reach 4B1 at 4,500 cfs, San Joaquin River Recapture**

32 Project-level actions in Alternative B2 are identical to project-level actions in
33 Alternatives A1, A2, and B1. Program-level actions in Alternative B2 include all of the
34 program-level actions in Alternative B1, plus additional Restoration actions in Reach 4B1
35 and the bypass system to increase the capacity of Reach 4B1 to at least 4,500 cfs, as
36 described for Alternative A2, as shown in Table 2-2. Flow routing and water recapture
37 under Alternative B2 are shown in Figure 2-11.

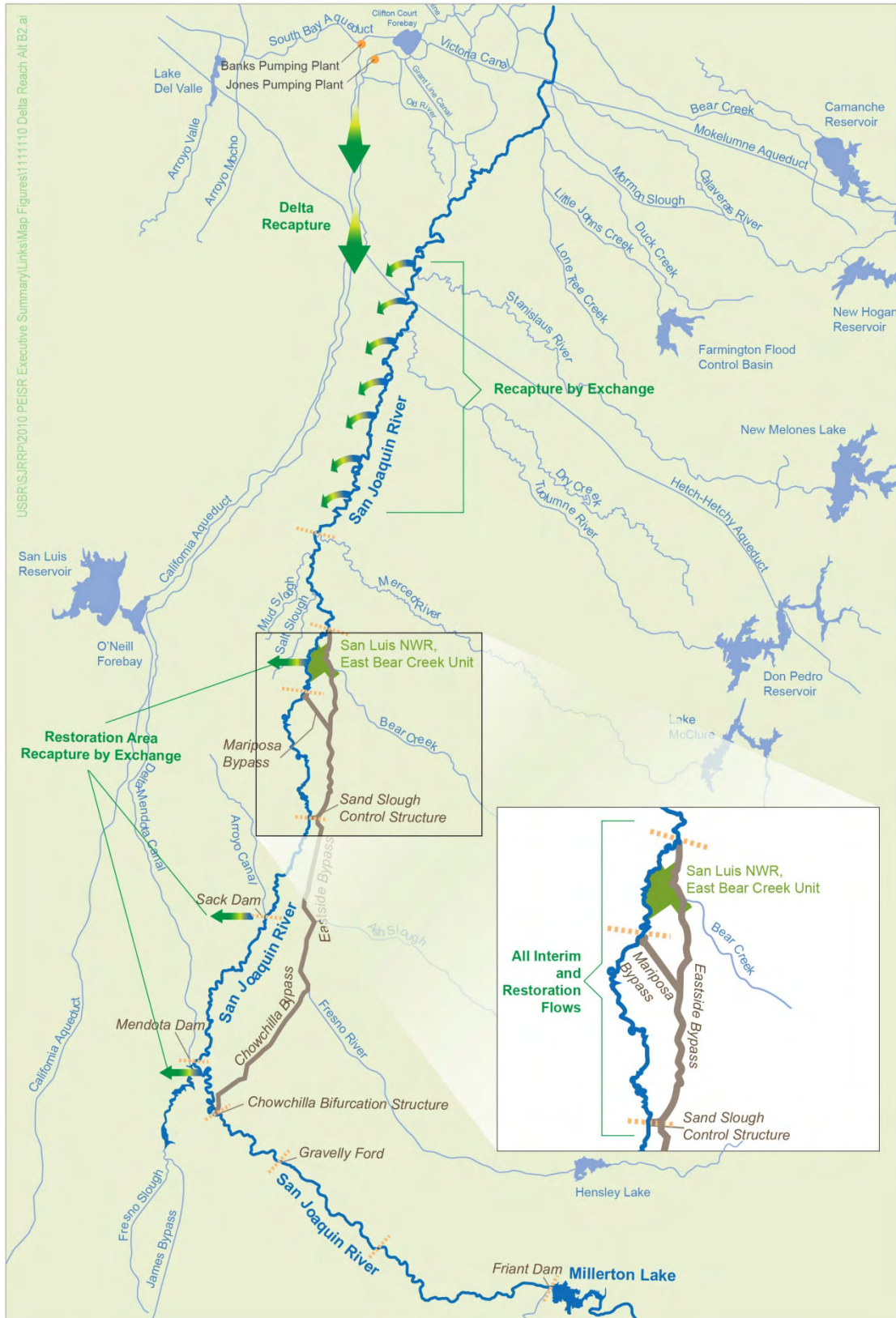


Figure 2-11.
Flow Routing and Water Recapture Under Alternative B2

1
2
3

1 **2.8 Alternative C1**
2 **Reach 4B1 at 475 cfs, New Pumping Plant Recapture**

3 Project-level actions in Alternative C1 are identical to project-level actions in alternatives
4 A1, A2, B1, and B2. Program-level actions in Alternative C1 include all of the program-
5 level actions in Alternative B1, plus additional Water Management actions for
6 constructing and operating new infrastructure to facilitate recapture of Interim and
7 Restoration flows on the San Joaquin River below the confluence of the Merced River, as
8 described below and as shown in Table 2-2. Flow routing and water recapture under
9 Alternative C1 are shown in Figure 2-12.

10 **2.8.1 Additional Water Management Actions on San Joaquin River**

11 In addition to water exchanges with existing water right holders along the San Joaquin
12 River, Alternative C1 also includes constructing new infrastructure to increase pumping
13 capacity along the San Joaquin River below the Merced River confluence for the direct
14 recapture of Interim and Restoration flows, and infrastructure to convey recaptured flows
15 to the DMC or California Aqueduct. Construction of new pumping capacity would
16 include a new pumping plant on the San Joaquin River or enlarging the pumping capacity
17 of an existing facility on the San Joaquin River. This action is analyzed at a program
18 level in this Draft PEIS/R. Before completion of new pumping capacity on the river,
19 recapture would occur in the Delta, as described under Alternatives A1 and A2, and/or at
20 existing facilities along the river, as described under Alternatives B1 and B2. After
21 construction of new pumping capacity, a smaller portion of Restoration Flows would
22 reach the Delta under Alternative C1 than under Alternative B1, because of the additional
23 recapture that would be possible along the San Joaquin River at the new pumping
24 infrastructure. A smaller portion of Interim and Restoration Flows would be available for
25 recapture through exchange at existing facilities under Alternative C1 than under
26 Alternative B1 because of recapture of flows at the new pumping infrastructure.

27 The new pumping infrastructure could have a capacity of up to 1,000 cfs, and would be
28 located on the San Joaquin River downstream from the Merced River confluence and
29 upstream from Vernalis. This river reach includes a range of anticipated flows and water
30 quality conditions that would affect design and operation of the facility; therefore, the
31 location and capacity of the pumping infrastructure would be determined as part of a
32 subsequent site-specific study. New pumping infrastructure would also include
33 infrastructure to convey recaptured flows to the DMC or California Aqueduct. To the
34 extent they are available, existing south-of-Delta CVP and SWP storage and conveyance
35 facilities would be used to recirculate recaptured water to the Friant Division, as
36 described for Alternative B1.

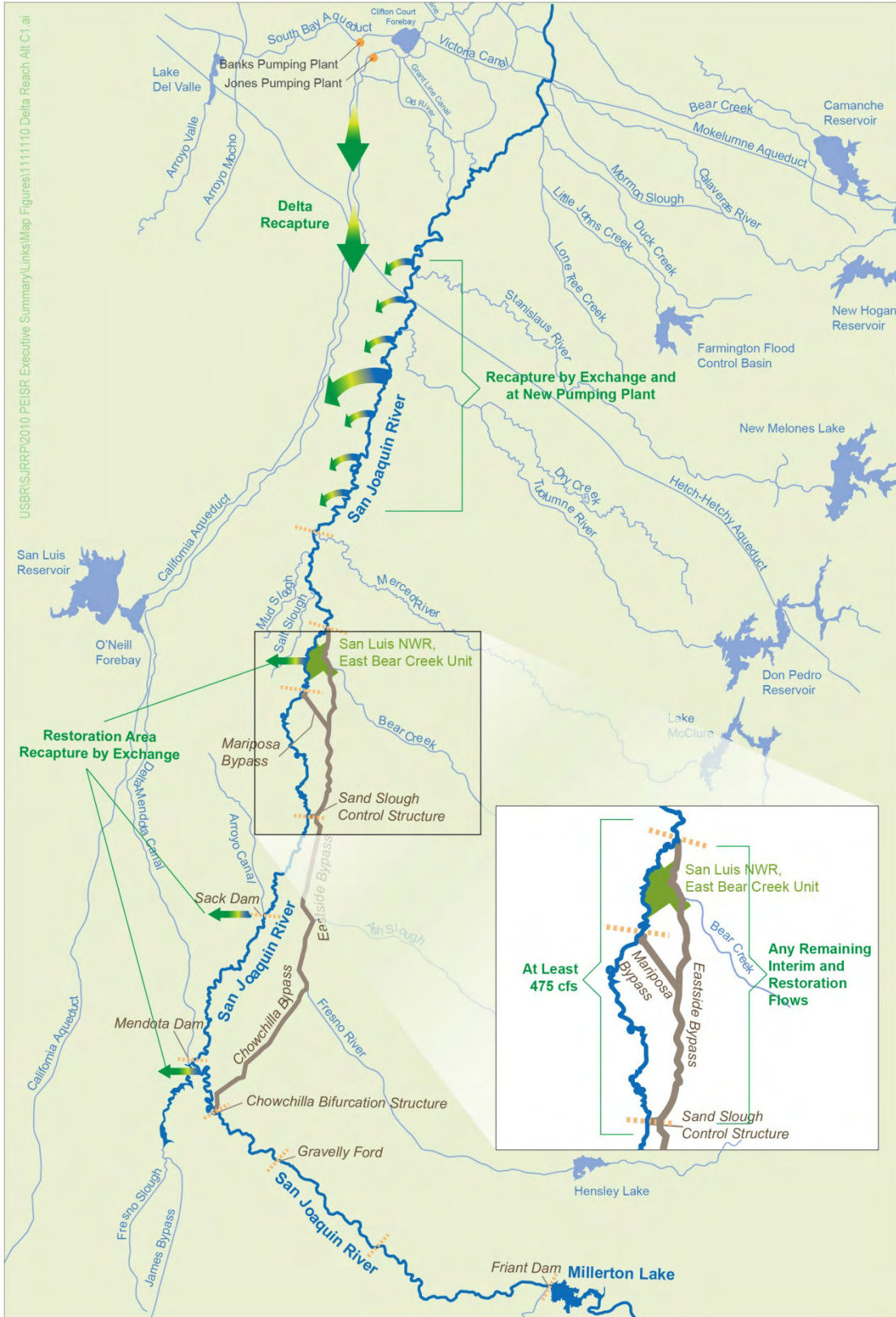


Figure 2-12.
Flow Routing and Water Recapture Under Alternative C1

1
2
3

1 The availability of water would be limited to direct recapture of Interim and Restoration
2 flows in the San Joaquin River and in the Delta. Recaptured water available to Friant
3 Division long-term contractors would range from zero to the total amount of recaptured
4 Interim and Restoration flows, and would be limited by conveyance capacity and water
5 quality requirements for introducing recaptured water to the DMC and California
6 Aqueduct. The conveyance of water would be limited by physical pumping plant
7 capacity, permit limitations for pumping from the San Joaquin River, and available
8 conveyance capacity in the DMC and the California Aqueduct. New water right permits,
9 or modifications to existing permits, would be needed to redivert water from the San
10 Joaquin River at new pumping infrastructure.

11 **2.9 Alternative C2**

12 **Reach 4B1 at 4,500 cfs, New Pumping Plant Recapture**

13 Project-level actions in Alternative C2 are identical to project-level actions in
14 Alternatives A1, A2, B1, B2, and C1. Program-level actions in Alternative C2 include all
15 of the program-level actions in Alternative C1, plus additional Restoration actions in
16 Reach 4B1 and the bypass system, to increase the capacity of Reach 4B1 to at least 4,500
17 cfs, as described for Alternative A2 and as shown in Table 2-2. Flow routing and water
18 recapture under Alternative C1 are shown in Figure 2-13.

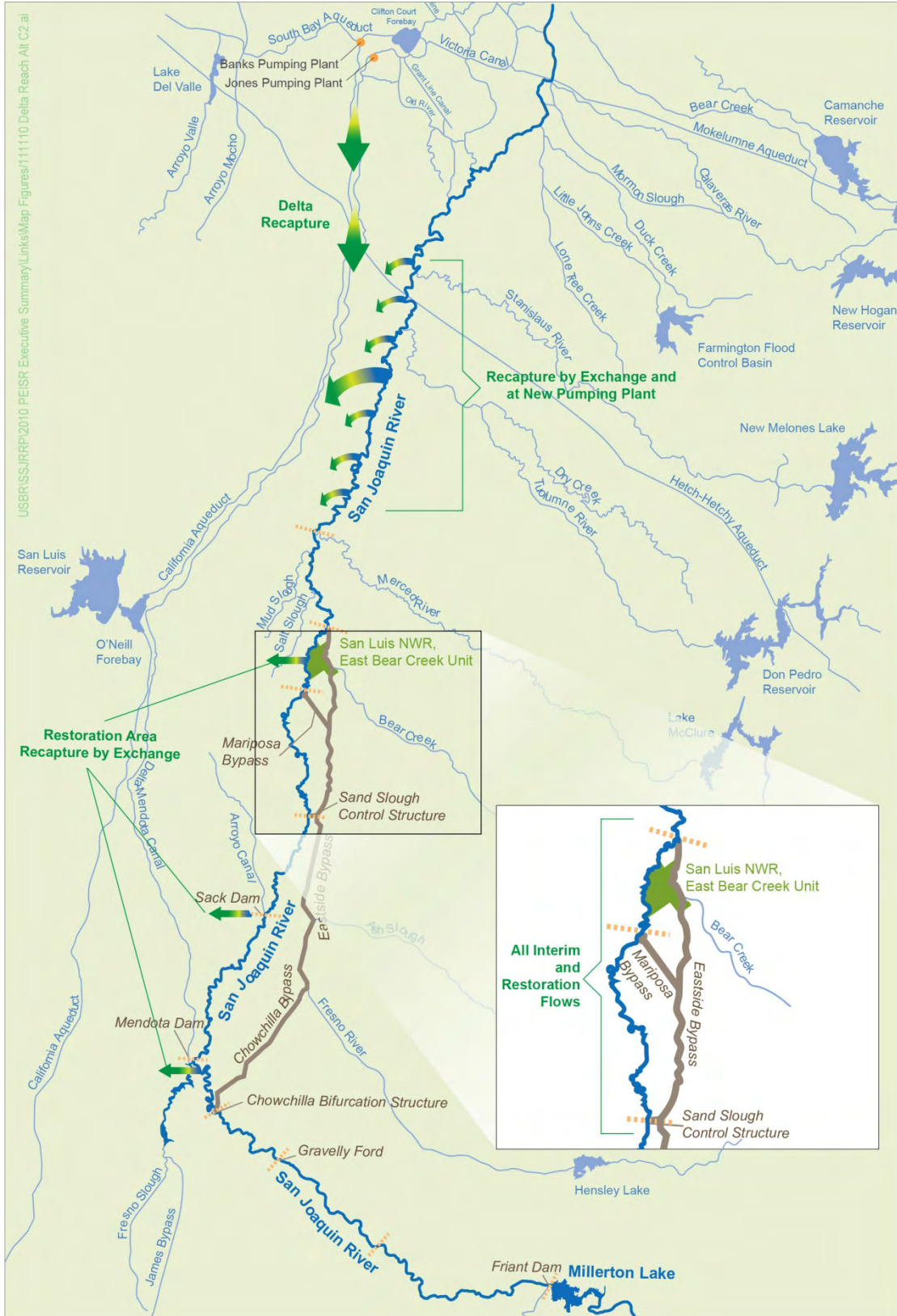


Figure 2-13.
Flow Routing and Water Recapture Under Alternative C2

1
2
3

2.10 Alternatives Considered and Eliminated from Further Consideration

Formulation of a range of program alternatives for evaluation in this Draft PEIS/R began with a review of Settlement provisions for achieving the Restoration and Water Management goals. This was followed by identifying the purpose, need, and objectives; developing criteria for including actions in the program alternatives; defining planning and implementation constraints; and identifying related projects and opportunities associated with achieving the purpose and need. These steps were applied to actions, identified in Settlement provisions and in comments received during the public scoping process, to identify a range of alternatives to be addressed. The IPAR identified a reasonable range of alternatives and eliminated some potential actions, as previously described.

Several sources of information were used in formulating program alternatives for evaluation in this Draft PEIS/R. These included the Settlement, previous and ongoing studies that address possible Restoration and Water Management strategies or actions, input from Settling Parties and other stakeholders, and input received from the public through the NEPA and CEQA scoping processes. Following the release of the NOP and NOI, Reclamation and DWR held a series of formal public scoping meetings throughout the study area during the specified scoping period. Reclamation and DWR also held a series of informal meetings during development of alternatives to receive input from a range of interested parties.

The Implementing Agencies received numerous suggestions for potential actions to achieve the goals of the Settlement. Each suggestion was reviewed for inclusion in program alternatives relative to the planning considerations, including NEPA and CEQA requirements, the project purpose and objectives, and the need for action, as described in Chapter 1.0, "Introduction," as well as associated opportunities and planning constraints described in Appendix G, "Plan Formulation." Some actions suggested during the scoping process and considered by the SJRRP were not retained for inclusion in the program alternatives because they would not meet the purpose, need, and objectives of the Settlement, including the following:

- **Release Restoration Flows of a different timing and magnitude than those presented in Exhibit B of the Settlement** – The Settlement specifies the timing and magnitude of Restoration Flows, and provides flexibility in the flow schedules through provisions that include flexible flow periods and buffer flows. Consistent with Exhibit B of the Settlement, alternative methods for allocating flow and alternative methods for transforming allocated flows between flow schedules for the six year types were considered, as presented in Appendix G, "Plan Formulation." However, implementing alternatives to the flow schedules, beyond the alternative allocation and transformation methods, would be inconsistent with the Settlement. This action was not retained because it would prevent achieving the SJRRP purpose.

- 1 • **Utilize the Chowchilla Bypass to Route Interim Flows and/or Restoration**
2 **Flows on a Permanent Basis** – Routing of Interim and/or Restoration flows
3 through the Chowchilla Bypass instead of through the San Joaquin River on a
4 permanent basis would not be consistent with the Restoration Goal, which is to
5 “restore and maintain fish populations in good condition in the main stem of the
6 San Joaquin River.” This action was not retained because it would prevent
7 achieving the SJRRP purpose and need, consistent with the Settlement.
- 8 • **Restore other rivers in California that are currently undergoing restoration** –
9 Restoration of other river systems in the State would not meet the SJRRP purpose.
10 The Restoration Goal calls for restoring the San Joaquin River, not other rivers.
11 This action was not retained because it does not substantially contribute to the
12 SJRRP purpose.
- 13 • **Consider population growth, and demands on water supply in the San**
14 **Joaquin Valley and throughout California** – The Settlement specifies the
15 amount of water to be used for restoration, and impacts on water users are
16 considered in the program alternatives analyses presented in Chapters 4.0 through
17 26.0. Implementing a policy to limit population growth in California does not
18 contribute to the SJRRP purpose. This action was not retained because it does not
19 substantially contribute to the SJRRP purpose.
- 20 • **Encourage the Central Valley Regional Water Quality Control Board to**
21 **develop salinity standards/restrictions to cap salt loading to the San Joaquin**
22 **River** – While this could benefit the SJRRP goals, it would require a broad
23 program with many entities and many years to complete, does not directly
24 contribute to the Restoration or Water Management goals, and is not necessary for
25 achieving the SJRRP purpose. This action was not retained because it does not
26 substantially contribute to the SJRRP purpose.
- 27 • **Remove trash and debris from the river** – The SJRRP would consider
28 removing debris that may adversely affect Restoration actions. However, while
29 removing trash/debris from the river may help restoration efforts, it would exceed
30 the needs of the Implementing Agencies for implementing the Settlement. This
31 action was not retained because it does not substantially contribute to the SJRRP
32 purpose.
- 33 • **Design and create a conservation zone from the river parkway to the San**
34 **Francisco Bay Area** – The SJRRP could fit into a conservation zone if one were
35 formed, but this would require efforts beyond those required for restoration of the
36 150-mile reach of the San Joaquin River. This action was not retained because it
37 does not substantially contribute to the SJRRP purpose.
- 38 • **Raise Friant Dam to store more water for dry year supply and provide flood**
39 **control** – Because of the long lead time for permitting, design, and construction
40 of this type of project, it would not satisfy the implementation timing necessary if
41 used for Restoration Flows. Also, development of additional storage at or

1 upstream from Friant Dam is currently being studied under separate authorization.
 2 This action was not retained because it does not substantially contribute to the
 3 SJRRP purpose.

- 4 • **Require the Central Valley Flood Protection Board to ensure the integrity of**
 5 **the flood management system through a permitting process before any**
 6 **activity affecting the system is undertaken** – Potential impacts of implementing
 7 program alternatives on the flood control system, and appropriate mitigation
 8 measures, are presented in Chapter 11.0, “Hydrology – Flood Management.” The
 9 Central Valley Flood Protection Board (CVFPB) is responsible for reviewing and
 10 approving proposed projects that could affect the integrity of flood management
 11 systems. Incorporating this activity into the program alternatives would be
 12 redundant to existing processes. This action was not retained because it does not
 13 substantially contribute to the SJRRP purpose.

14 2.11 Settlement Implementation

15 Implementation of the Settlement began in October 2006, with Court approval of the
 16 Settlement and subsequent formation of the SJRRP. Implementation of physical actions
 17 to implement the Settlement began in 2009, with the installation of stream flow gages and
 18 monitoring wells, the release and recapture of Interim Flows and establishment of the
 19 RWA in October 2009. All actions of the Settlement are addressed in this Draft PEIS/R.
 20 Site-specific documentation was completed as necessary for actions completed or
 21 currently underway, and would be completed, as necessary, for actions described at a
 22 program level of detail in this Draft PEIS/R. Site-specific NEPA and CEQA
 23 environmental documentation was prepared for actions necessary to meet the Settlement
 24 schedule for release of Interim Flows. These actions, which are included in the action
 25 alternatives, include installing and rehabilitating stream gages, installing monitoring
 26 wells, and releasing and conveying Water Year 2010 and 2011 Interim Flows, as shown
 27 in Table 2-8.

28 **Table 2-8.**
 29 **Site-Specific NEPA/CEQA Environmental Compliance Documentation for**
 30 **Settlement Actions Completed or in Progress**

Action	Description	NEPA/CEQA Environmental Compliance Document(s) ¹	Lead Agency/ Agencies
Install water level recorders	Install up to seven water level recorders in the San Joaquin River in Fresno and Madera counties to provide data related to hydrograph translation characteristics.	San Joaquin River Restoration Program Water Level Recorder Installation and Data Collection NOE. February 2009.	DWR (CEQA)
Install scour chains	Install scour chains in the San Joaquin River at locations in Fresno and Madera counties to provide data on sediment transport.	San Joaquin River Restoration Program Scour Chain Installation and Data Collection NOE. February 2009.	DWR (CEQA)

31

1
2
3

**Table 2-8.
Site-Specific NEPA/CEQA Environmental Compliance Documentation for
Settlement Actions Completed or in Progress (contd.)**

Action	Description	NEPA/CEQA Environmental Compliance Document(s) ¹	Lead Agency/Agencies
Install and rehabilitate stream gages	Rehabilitate and retrofit the existing stream gage stations at the Chowchilla Bypass Bifurcation Structure and below Sack Dam on the San Joaquin River, and install two new monitoring stations at the top of Reach 4B and one at the confluence of the Merced and San Joaquin rivers.	Installation and Rehabilitation of Stream Gages on the San Joaquin River, Fresno, Madera, and Merced Counties, California EA/FONSI. December 2008. Stream Gage Installation and Operation and Maintenance Project IS/MND. March 2009.	Reclamation (NEPA) and DWR (CEQA)
Sample streambed sediment	Sample bed material at 20 locations to establish baseline data before release of Water Year 2010 Interim Flows.	San Joaquin River Restoration Program Stream Bed and Sand Sampling NOE. April 2009.	DWR (CEQA)
Seal gates of Chowchilla Bypass Bifurcation Structure	Install seals on the gates of the Chowchilla Bypass Bifurcation Structure to reduce or prevent flow from entering the sediment catchment basin downstream from the gates.	Chowchilla Bifurcation Structure Gate Seal Installation NOE. August 2009.	DWR (CEQA)
Release Water Year 2010 Interim Flows	Implement provisions of the Settlement related to Water Year 2010 Interim Flows and to collect relevant data to guide future releases of Interim and Restoration flows.	Water Year 2010 Interim Flows Project EA/FONSI and IS/MND. September 2009.	Reclamation (NEPA) and DWR (CEQA)
Gather geotechnical data and install monitoring wells	Install groundwater monitoring wells adjacent to the San Joaquin River and collect geotechnical data through exploration holes at existing and potential new levees, control structures, river crossing structures, and test pits to identify possible borrow material.	Draft San Joaquin River Restoration Program Geotechnical Investigation and Seepage Well Installation Project IS/MND. October 2009.	DWR (CEQA)
Release Water Year 2011 Interim Flows	Implement provisions of the Settlement related to Water Year 2011 Interim Flows and collect relevant data to guide future releases of Interim and Restoration flows.	Water Year 2011 Interim Flows Project Supplemental EA/FONSI. September 2010.	Reclamation (NEPA)

Note:

¹ Authors of these documents are the lead agency/agencies listed for the relevant action.

Key:

CEQA = California Environmental Quality Act

DWR = California Department of Water Resources

EA/FONSI = Environmental Assessment/Finding of No Significant Impact

IS/MND = Initial Study/Mitigated Negative Declaration

NEPA = National Environmental Policy Act

NOE = Notice of Exemption

Reclamation = U.S. Department of the Interior, Bureau of Reclamation

1 As referenced throughout this “Description of Alternatives” chapter, the RA has an
2 integral role in implementing the Settlement. The RA’s duties are defined in the
3 Settlement, and include making recommendations to the Secretary on the release of
4 Interim and Restoration flows. The RA is also responsible for consulting with the
5 Secretary on implementing Paragraph 11 actions, and for identifying and recommending
6 additional actions under Paragraph 12, as described previously. In addition, the RA is
7 responsible for consulting with the Secretary on the reintroduction of Chinook salmon
8 under Paragraph 14. The RA’s recommendations would be taken into consideration by
9 the Secretary in making decisions or specific actions to be implemented under the
10 Settlement.

11 Before the release of Interim and Restoration flows, several actions would be completed
12 by Reclamation, including estimating channel capacity restrictions throughout the
13 Restoration Area, and estimating water supply demands at the Mendota Pool and/or the
14 East Bear Creek Unit, if those points are to be used for recapturing Interim or Restoration
15 flows. Reclamation would verify the Interim or Restoration flow schedule provided by
16 the RA for consistency with the Settlement, system capacity and water supply demand
17 estimates, and applicable environmental compliance documents and approvals.
18 Reclamation would then allocate water supply for Interim or Restoration flows based on
19 the RA’s schedule and on hydrologic conditions (i.e., water year type).

20 Before and during release of Interim or Restoration flows, Reclamation would implement
21 the components of the plans, mitigation measures, and permit and approval conditions, as
22 described throughout this Draft PEIS/R and in any permits or approvals issued for
23 implementing the Settlement. In coordination with State and local agencies, Reclamation
24 would monitor and manage the response of the system during release of Interim and
25 Restoration flows, and reduce or redirect flows, as necessary and as previously described,
26 to avoid and minimize impacts.

27 **2.11.1 Strategies for Implementation**

28 This section describes several strategies that would be employed throughout
29 implementation of the Settlement, including the following:

- 30 • Grouping of site-specific projects
- 31 • Estimating then-existing channel capacities for implementing Interim and
32 Restoration flows in response to monitoring results and project implementation
- 33 • Updating operating guidelines and obtaining biological clearance and other
34 agreements

35 ***Grouping Site-Specific Projects***

36 This “Description of Alternatives” chapter identifies several channel and facility
37 modifications that would be implemented to increase channel capacity and improve fish
38 passage in the Restoration Area. Because some of these projects have hydraulic and other
39 physical interdependencies, implementation would be accomplished by combining
40 related projects into groups. Project planning, environmental compliance, permitting,
41 design, and construction would be coordinated for projects in each group.

1 ***Estimating Then-Existing Channel Capacities for Implementing Interim and***
2 ***Restoration Flows***

3 Release of Interim and Restoration flows would occur over time and would be
4 constrained by channel capacity, among other factors. As channel capacity limitations
5 and other factors are addressed, the SJRRP would implement additional actions (such as
6 Paragraph 11(b) and Paragraph 12 actions) and/or increase Interim and Restoration flows
7 up to the amounts specified in the Settlement. Throughout implementation of the
8 Settlement Reclamation, through coordination with the Channel Capacity Advisory
9 Group as previously described, would estimate then-existing channel capacities in the
10 Restoration Area. Reclamation would provide estimates of then-existing channel
11 capacities to the RA, to allow the RA to incorporate those estimates in the RA's
12 recommendations for Interim and Restoration flow schedules.

13 The SJRRP is being implemented concurrently with other programs that other agencies
14 are considering to modify the San Joaquin River and the Lower San Joaquin River Flood
15 Control Project to address flood protection needs. In particular, DWR is characterizing
16 the condition of levees along the San Joaquin River and the bypasses in the Restoration
17 Area through the Initial findings from these evaluations indicate deficiencies in flood
18 conveyance capacity at several locations in the Restoration Area that were not identified
19 for channel improvements in the Settlement. Channel improvements to address these
20 deficiencies in flood protection have not yet been identified and evaluated, and are not
21 included in the Settlement (and therefore are not part of the action alternatives).

22 Potential channel improvements to increase channel capacity for reaches not specified in
23 the Settlement may be implemented by parties other than Reclamation to improve levee
24 integrity for conveyance of flood flows irrespective of Settlement implementation. Such
25 modifications could include levee setbacks; cutoff/slurry walls; levee strengthening,
26 widening, and raising; and channel dredging or other techniques to increase channel
27 capacity. These types of future projects would provide flood control benefits and would
28 be expected to have independent utility outside of the implementation of the Settlement
29 as DWR evaluates levee conditions along the San Joaquin River and the bypasses in the
30 Restoration Area through the Non-Urban Levee Evaluation Project as part of the
31 California FloodSAFE initiative. Because these potential future levee and channel
32 modifications are not specified in the Settlement, they are not part of the SJRRP and are
33 not included as part of the alternatives evaluated in the PEIS/R. Specific future
34 modifications to the flood control system under the FloodSAFE initiative are uncertain
35 and speculative, and are not considered reasonably foreseeable or probable future actions
36 at this time. Reclamation and DWR recognize the importance of coordination and
37 communication in planning and implementing projects that affect the flood control
38 system in order to prevent impacts to flood management. Therefore, the potential for
39 cumulative effects associated with implementation of the Settlement and FloodSAFE
40 programs and projects is presented in Chapter 26.0, "Cumulative Impacts."

41

1 ***Updating Operating Guidelines, Agreements, and Approvals***

2 The LSJLD operates and maintains the flood management system and is financially
3 supported through landowner assessments. The change in operations at Friant Dam and
4 the routing of Interim and Restoration flows could result in increased operations and
5 maintenance activities, including increased flap gate inspection and debris removal,
6 operation of flow control structures, levee patrols, vegetation control, and sand
7 excavation (these actions are as described under Alternative A1, “Physical Monitoring
8 and Management Plan”). Reclamation is currently working with LSJLD to develop a
9 financial assistance agreement to offset costs associated with conducting increased
10 operation and maintenance activities as a result of implementing the Settlement.

11 The change in operations at Friant Dam and the routing of Interim and Restoration flows
12 also would likely result in the need for revisions to existing guidelines for the operation
13 of flood management and water diversion facilities, including guidelines for splitting
14 Interim and Restoration flows at bifurcation structures. In addition, a revised plan of
15 flood control may be required that incorporates these guidelines and changes in
16 operations. Reclamation may make recommendations for these revisions. Subsequent
17 site-specific studies and structural modifications associated with program-level actions
18 would likely result in recommendations for additional revisions to the guidelines at the
19 time those studies are completed. However, LSJLD would continue to operate the flood
20 management system and, in coordination with CVFPB, would be responsible for
21 development of the necessary agreements and revisions.

22 Before Interim and Restoration flows can be increased based on the estimate of then-
23 existing capacities, the Implementing Agencies would obtain any additional necessary
24 regulatory compliance for biological resources, as described in this Draft PEIS/R. In
25 some reaches of the river and bypass system, field surveys would be required to
26 determine if listed species are present. Biological resources surveys would be designed
27 and scheduled to provide information relevant to contemplated changes in flow during
28 the time frame that survey results would be valid. Survey results would be used to
29 determine maximum flows that could be conveyed based on biological conditions. Until
30 appropriate conservation measures can be implemented, flows would be limited to levels
31 that would not adversely affect listed species.