

Volume 1

Table of Contents

Chapter 1 Executive Summary.....	1-1
1.1 Introduction	1-1
1.2 Background	1-3
1.2.1 Bay-Delta Water Quality Control Planning	1-4
1.2.2 Purpose and Need for Bay-Delta Plan Update.....	1-5
1.2.3 Delta Reform Act and Delta Flow Criteria Report.....	1-6
1.3 Development of Staff Report and Plan Amendments	1-7
1.3.1 Scientific Basis Report and Framework	1-7
1.3.2 Proposed VAs (Healthy Rivers and Landscapes) and Scientific Basis Report Supplement.....	1-7
1.3.3 Draft Staff Report (September 2023)	1-8
1.3.4 Draft Bay-Delta Plan (October 2024)	1-9
1.3.5 Revised Draft Bay-Delta Plan (July 2025).....	1-10
1.3.6 Revised Proposed Plan Amendments and Limited Recirculation of the Draft Staff Report (December 2025).....	1-11
1.3.7 Final Draft Bay-Delta Plan and Final Staff Report (August 2026).....	1-12
1.4 Organization of the Staff Report.....	1-14
1.5 Environmental Analysis.....	1-21
1.5.1 Sacramento/Delta Watershed, Plan Area, and Study Area	1-22
1.5.2 Organization of the Analyses	1-23
1.5.3 Baseline, Evaluation Approach, and Modeling Tools.....	1-24
1.5.4 Alternatives Considered.....	1-26
1.5.5 Environmental Analysis Results	1-28
1.6 References	1-125
1.6.1 Common References.....	1-125
1.6.2 Section References	1-125
Chapter 2 Hydrology and Water Supply	2-1
2.1 Introduction	2-1
2.1.1 Natural and Unimpaired Flow.....	2-2
2.1.2 Watershed Overview	2-5
2.2 Hydrology of the Sacramento River and Major Tributaries.....	2-20
2.2.1 Sacramento River	2-20
2.2.2 Tributaries of Mount Lassen and Volcanic Buttes Region	2-29

2.2.3	Tributaries of the Chico Monocline	2-34
2.2.4	Tributaries of the Klamath Mountains.....	2-43
2.2.5	Tributaries of the Paleochannels and Tuscan Formation	2-46
2.2.6	Tributaries of the Northern Sierra Nevada	2-50
2.2.7	Delta Eastside Tributaries	2-64
2.2.8	Tributaries of the Northern Coast Range, Northern.....	2-73
2.2.9	Tributaries of the Northern Coast Range, Southern.....	2-79
2.3	Flood Basins	2-85
2.3.1	Butte Flood Basin	2-87
2.3.2	Colusa Flood Basin	2-87
2.3.3	Sutter Flood Basin	2-88
2.3.4	American Flood Basin	2-91
2.3.5	Yolo Flood Basin	2-91
2.3.6	Sacramento Flood Basin	2-95
2.4	Sacramento-San Joaquin Delta	2-95
2.4.1	Delta Inflows	2-97
2.4.2	Delta Hydrodynamics.....	2-100
2.4.3	Delta Barriers	2-102
2.4.4	Delta Cross Channel Gate Operations	2-102
2.4.5	South Delta Exports and Old and Middle River Reverse Flows	2-103
2.4.6	Delta Outflow and X2.....	2-105
2.5	Suisun Region.....	2-116
2.6	Climate Change and Drought.....	2-116
2.7	Existing and Future Water Rights in the Sacramento/Delta Watershed	2-117
2.8	Existing Water Supply	2-125
2.8.1	Sacramento River Watershed	2-128
2.8.2	Delta Eastside Tributaries	2-132
2.8.3	Delta	2-133
2.8.4	San Francisco Bay Area	2-135
2.8.5	San Joaquin Valley	2-138
2.8.6	Central Coast.....	2-140
2.8.7	Southern California	2-142
2.9	Conclusions	2-145
2.10	References Cited	2-146
2.10.1	Common References.....	2-146
2.10.2	Section References	2-149

Chapter 3	Scientific Knowledge to Inform Fish and Wildlife Flow Recommendations	3-1
3.1	Introduction	3-1
3.2	Flow and the Ecosystem	3-2
3.2.1	Riverine Flows	3-3
3.2.2	Freshwater Flow and Estuarine Resources	3-6
3.2.3	San Francisco Bay and Nearshore Coastal Ocean	3-11
3.2.4	Interior Delta Flows and Entrainment	3-11
3.3	Species-Specific Analyses	3-13
3.3.1	Updated Quantitative Analysis	3-14
3.4	Chinook Salmon (<i>Oncorhynchus tshawytscha</i>) and Central Valley Steelhead (<i>Oncorhynchus mykiss</i>)	3-15
3.4.1	Overview	3-15
3.4.2	Life History	3-16
3.4.3	Life History, Distribution, and Abundance Trends over Time	3-23
3.4.4	Dam and Reservoir Effects on Salmonids	3-35
3.4.5	Flow Effects on Salmonids	3-39
3.5	Longfin Smelt (<i>Spirinchus thaleichthys</i>)	3-60
3.5.1	Overview	3-60
3.5.2	Life History	3-60
3.5.3	Population Abundance Trends over Time	3-60
3.5.4	Flow Effects on Longfin Smelt	3-61
3.6	Green Sturgeon (<i>Acipenser medirostris</i>) and White Sturgeon (<i>Acipenser transmontanus</i>)	3-68
3.6.1	Overview	3-68
3.6.2	Life History	3-68
3.6.3	Population Abundance Trends over Time	3-70
3.6.4	Flow Effects on Green and White Sturgeon	3-71
3.7	Sacramento Splittail (<i>Pogonichthys macrolepidotus</i>)	3-74
3.7.1	Overview	3-74
3.7.2	Life History	3-75
3.7.3	Population Abundance Trends over Time	3-75
3.7.4	Flow Effects on Sacramento Splittail	3-76
3.8	Delta Smelt (<i>Hypomesus transpacificus</i>)	3-79
3.8.1	Overview	3-79
3.8.2	Life History	3-79
3.8.3	Population Abundance Trends over Time	3-80
3.8.4	Flow Effects on Delta Smelt	3-81

3.9	Starry Flounder (<i>Platichthys stellatus</i>).....	3-90
3.9.1	Overview	3-90
3.9.2	Life History	3-90
3.9.3	Population Abundance and Trends over Time	3-91
3.9.4	Flow Effects on Starry Flounder	3-92
3.10	California Bay Shrimp (<i>Crangon franciscorum</i>).....	3-94
3.10.1	Overview	3-94
3.10.2	Life History	3-94
3.10.3	Population Abundance Trends over Time	3-95
3.10.4	Flow Effects on California Bay Shrimp	3-96
3.11	Zooplankton (<i>Neomysis mercedis</i> and <i>Eurytemora affinis</i>).....	3-99
3.11.1	Overview	3-99
3.11.2	Life History	3-99
3.11.3	Population Abundance and Trends over Time	3-100
3.11.4	Flow Effects on Zooplankton	3-100
3.12	Nonnative Fish Species	3-103
3.13	Method for Developing Environmental Flows.....	3-104
3.13.1	Environmental Flow Methods.....	3-104
3.13.2	Hydraulic Rating Methods	3-105
3.13.3	Habitat Simulation Methods.....	3-105
3.13.4	Holistic Methods for Determining Environmental Flows	3-105
3.13.5	Justification for Environmental Flows.....	3-107
3.13.6	Summary for Evaluating Environmental Flows.....	3-108
3.14	Evaluation of Bay-Delta Environmental Flow Effects	3-109
3.14.1	Summary of Flow Thresholds for Species Protection	3-109
3.14.2	Salmonid Tributary Habitat Analyses.....	3-135
3.14.3	Cold Water Storage.....	3-142
3.15	Conclusion.....	3-144
3.16	References Cited	3-147
3.16.1	Common References.....	3-147
3.16.2	Section References	3-158
Chapter 4	Other Aquatic Ecosystem Stressors.....	4-1
4.1	Introduction	4-1
4.2	Physical Habitat Loss or Alteration	4-2
4.2.1	Riparian Habitat and Open Channels.....	4-4
4.2.2	Tidal Marsh Habitat	4-4
4.2.3	Floodplain and Wetland Habitat.....	4-6

4.2.4	Upper Watershed Forest and Meadow Habitat	4-8
4.3	Water Quality.....	4-9
4.3.1	Contaminants.....	4-9
4.3.2	Harmful Algal Blooms	4-17
4.3.3	Dissolved Oxygen	4-20
4.3.4	Sediment and Turbidity	4-21
4.3.5	Temperature	4-22
4.4	Nonnative Species.....	4-24
4.4.1	Fishes	4-25
4.4.2	Invertebrates	4-26
4.4.3	Aquatic Plants	4-28
4.5	Fisheries Management	4-30
4.5.1	Harvest.....	4-30
4.5.2	Hatcheries	4-32
4.5.3	Fish Passage Barriers.....	4-33
4.5.4	Thiamine Deficiency.....	4-36
4.5.5	Disease	4-38
4.6	Climate Change	4-38
4.7	References Cited	4-42
4.7.1	Common References.....	4-42
4.7.2	Section References	4-49
Chapter 5	Proposed Changes to the Bay-Delta Plan for the Sacramento/Delta	5-1
5.1	Introduction	5-1
5.2	State Water Board Responsibilities and Authorities	5-4
5.2.1	Water Quality.....	5-5
5.2.2	Water Rights	5-6
5.2.3	Regulations and Adjudicative Proceedings.....	5-7
5.3	Reason for the Proposed Plan Amendments.....	5-8
5.4	Proposed New and Modified Objectives and Implementation	5-10
5.4.1	Voluntary and Default Implementation.....	5-10
5.4.2	Inflows.....	5-14
5.4.3	Cold Water Habitat	5-21
5.4.4	Delta Outflows	5-26
5.4.5	Suisun Marsh	5-34
5.4.6	Interior Delta Flows	5-36
5.5	Habitat Restoration and Other Complementary Ecosystem Measures	5-41
5.5.1	Physical Habitat Restoration.....	5-42

5.5.2	Fish Passage Improvement Projects	5-43
5.5.3	Invasive Species Control Measures.....	5-43
5.5.4	Fishery Management Actions	5-44
5.5.5	Species Recovery Plans and Recovery Strategies	5-44
5.5.6	Regional Water Board Activities	5-45
5.6	General Changes to the Program of Implementation	5-46
5.6.1	Monitoring, Reporting, Assessment, Accounting, and Adaptive Management	5-47
5.6.2	General Measures to Assist with Implementation of the Bay-Delta Plan	5-66
5.7	References Cited	5-71
5.7.1	Common References.....	5-71
5.7.2	Section References	5-74
Chapter 6	Changes in Hydrology and Water Supply	6-1
6.1	Introduction	6-1
6.1.1	Presentation of Results	6-2
6.2	SacWAM Model Assumptions.....	6-5
6.2.1	Baseline Assumptions	6-5
6.2.2	Unimpaired Flow Scenario Assumptions	6-7
6.2.3	Climate Change	6-9
6.3	Changes in Hydrology	6-9
6.3.1	Flows	6-9
6.3.2	Reservoir Storage and Elevation	6-38
6.4	Changes in Surface Water Supply	6-52
6.4.1	Total Water Supply	6-53
6.4.2	Sacramento/Delta Water in the Study Area	6-56
6.4.3	Sacramento/Delta Supply to the Sacramento River Watershed	6-58
6.4.4	Sacramento/Delta Supply to the Delta Eastside Tributaries	6-62
6.4.5	Sacramento/Delta Supply to the Delta	6-65
6.4.6	Sacramento/Delta Supply to the San Francisco Bay Area	6-67
6.4.7	Sacramento/Delta Supply to Central Coast	6-70
6.4.8	Sacramento/Delta Supply to the San Joaquin Valley.....	6-71
6.4.9	Sacramento/Delta Supply to Southern California.....	6-77
6.5	Changes in Groundwater Supply	6-80
6.6	Other Water Management Actions	6-82
6.6.1	Overview	6-82
6.6.2	Regional Use of Other Water Management Actions	6-96
6.7	References Cited	6-107
6.7.1	Common References.....	6-107

6.7.2	Section References	6-109
Chapter 7	Environmental Analysis	7.1-1
7.1	Introduction, Project Description, and Approach to Environmental Analysis	7.1-1
7.1.1	Introduction	7.1-1
7.1.2	California Environmental Quality Act	7.1-3
7.1.3	Purpose and Goals of the Sacramento/Delta Update to the Bay-Delta Plan	7.1-4
7.1.4	Proposed Plan Amendments	7.1-6
7.1.5	Environmental Analysis.....	7.1-10
7.1.6	Project Alternatives	7.1-22
7.1.7	Summary of Potential Environmental Impacts and Mitigation Measures	7.1-23
7.1.8	Other State Water Board CEQA Requirements	7.1-23
7.1.9	Impact Summary	7.1-24
7.1.10	References Cited	7.1-25
7.2	Description of Alternatives	7.2-1
7.2.1	Introduction	7.2-1
7.2.2	Proposed Plan Amendments	7.2-2
7.2.3	Alternatives	7.2-3
7.2.4	References Cited	7.2-16
7.3	Aesthetics.....	7.3-1
7.3.1	Environmental Checklist	7.3-1
7.3.2	Environmental Setting	7.3-2
7.3.3	Impact Analysis	7.3-5
7.3.4	Mitigation Measures.....	7.3-10
7.3.5	References Cited	7.3-10
7.4	Agriculture and Forest Resources.....	7.4-1
7.4.1	Environmental Checklist	7.4-2
7.4.2	Environmental Setting	7.4-2
7.4.3	Impact Analysis	7.4-34
7.4.4	Mitigation Measures.....	7.4-98
7.4.5	References Cited	7.4-101
7.5	Air Quality	7.5-1
7.5.1	Environmental Checklist	7.5-1
7.5.2	Environmental Setting	7.5-2
7.5.3	Impact Analysis	7.5-11
7.5.4	Mitigation Measures.....	7.5-19
7.5.5	References Cited	7.5-19

7.6	Biological Resources	7.6.1-1
7.6.1	Terrestrial Biological Resources	7.6.1-1
7.6.1.1	Environmental Checklist	7.6.1-1
7.6.1.2	Environmental Setting	7.6.1-2
7.6.1.3	Regulatory Setting	7.6.1-41
7.6.1.4	Impact Analysis	7.6.1-53
7.6.1.5	Mitigation Measures.....	7.6.1-87
7.6.1.6	References Cited	7.6.1-91
7.6.2	Aquatic Biological Resources	7.6.2-1
7.6.2.1	Environmental Checklist	7.6.2-2
7.6.2.2	Environmental Setting	7.6.2-2
7.6.2.3	Regulatory Setting	7.6.2-20
7.6.2.4	Impact Analysis	7.6.2-35
7.6.2.5	Mitigation Measures.....	7.6.2-104
7.6.2.6	References Cited	7.6.2-106
7.7	Cultural Resources	7.7-1
7.7.1	Environmental Checklist	7.7-1
7.7.2	Environmental Setting	7.7-2
7.7.3	Regulatory Setting	7.7-12
7.7.4	Impact Analysis	7.7-14
7.7.5	Mitigation Measures.....	7.7-17
7.7.6	References Cited	7.7-18
7.8	Energy.....	7.8-1
7.8.1	Environmental Checklist	7.8-1
7.8.2	Environmental Setting	7.8-2
7.8.3	Impact Analysis	7.8-17
7.8.4	Mitigation Measures.....	7.8-41
7.8.5	References Cited	7.8-44
7.9	Geology and Soils.....	7.9-1
7.9.1	Environmental Checklist	7.9-1
7.9.2	Environmental Setting	7.9-2
7.9.3	Impact Analysis	7.9-8
7.9.4	Mitigation Measures.....	7.9-13
7.9.5	References Cited	7.9-14
7.10	Greenhouse Gas Emissions	7.10-1
7.10.1	Environmental Checklist	7.10-1
7.10.2	Environmental Setting	7.10-2

7.10.3	Regulatory Setting	7.10-4
7.10.4	Impact Analysis	7.10-10
7.10.5	Mitigation Measures.....	7.10-22
7.10.6	References Cited	7.10-24
7.11	Hazards and Hazardous Materials	7.11-1
7.11.1	Environmental Checklist	7.11-1
7.11.2	Environmental Setting	7.11-2
7.11.3	Impact Analysis	7.11-9
7.11.4	References Cited	7.11-12
7.12	Hydrology and Water Quality	7.12.2-1
7.12.1	Surface Water	7.12.1-1
7.12.1.1	Environmental Checklist	7.12.1-2
7.12.1.2	Environmental Setting	7.12.1-3
7.12.1.3	Impact Analysis	7.12.1-55
7.12.1.4	Mitigation Measures.....	7.12.1-118
7.12.1.5	References Cited	7.12.1-122
7.12.2	Groundwater.....	7.12.2-1
7.12.2.1	Environmental Checklist	7.12.2-2
7.12.2.2	Environmental Setting	7.12.2-2
7.12.2.3	Impact Analysis	7.12.2-38
7.12.2.4	Mitigation Measures.....	7.12.2-67
7.12.2.5	References Cited	7.12.2-71
7.13	Land Use and Planning.....	7.13-1
7.13.1	Environmental Checklist	7.13-1
7.13.2	Environmental Setting	7.13-1
7.13.3	Impact Analysis	7.13-3
7.13.4	References Cited	7.13-5
7.14	Mineral Resources	7.14-1
7.14.1	Environmental Checklist	7.14-1
7.14.2	Environmental Setting	7.14-1
7.14.3	Impact Analysis	7.14-5
7.14.4	References Cited	7.14-6
7.15	Noise	7.15-1
7.15.1	Environmental Checklist	7.15-1
7.15.2	Environmental Setting	7.15-2
7.15.3	Impact Analysis	7.15-9
7.15.4	Mitigation Measures.....	7.15-11

7.15.5	References Cited	7.15-12
7.16	Population and Housing	7.16-1
7.16.1	Environmental Checklist	7.16-1
7.16.2	Environmental Setting	7.16-1
7.16.3	Impact Analysis	7.16-6
7.16.4	References Cited	7.16-7
7.17	Public Services.....	7.17-1
7.17.1	Environmental Checklist	7.17-1
7.17.2	Environmental Setting	7.17-2
7.17.3	Impact Analysis	7.17-3
7.17.4	References Cited	7.17-4
7.18	Recreation.....	7.18-1
7.18.1	Environmental Checklist	7.18-1
7.18.2	Environmental Setting	7.18-2
7.18.3	Impact Analysis	7.18-6
7.18.4	Mitigation Measures.....	7.18-16
7.18.5	References Cited	7.18-17
7.19	Transportation/Traffic	7.19-1
7.19.1	Environmental Checklist	7.19-1
7.19.2	Environmental Setting	7.19-2
7.19.3	Impact Analysis	7.19-8
7.19.4	References Cited	7.19-10
7.20	Utilities and Service Systems	7.20-1
7.20.1	Environmental Checklist	7.20-1
7.20.2	Environmental Setting	7.20-2
7.20.3	Impact Analysis	7.20-18
7.20.4	Mitigation Measures.....	7.20-49
7.20.5	References Cited	7.20-51
7.21	Habitat Restoration and Other Ecosystem Projects	7.21-1
7.21.1	Descriptions of Physical Habitat Restoration and Other Ecosystem Projects	7.21-6
7.21.2	Evaluation of Potential Environmental Impacts	7.21-17
7.21.3	Summary of Impacts	7.21-153
7.21.4	References Cited	7.21-185
7.22	New or Modified Facilities	7.22-1
7.22.1	Description of New or Modified Facilities	7.22-4
7.22.2	Evaluation of Potential Environmental Impacts	7.22-15
7.22.3	Summary of Impacts	7.22-150

7.22.4	References Cited	7.22-184
7.23	Cumulative Impact Analysis, Growth-Inducing Impacts, and Significant Irreversible Environmental Changes	7.23-1
7.23.1	Cumulative Impact Analysis	7.23-1
7.23.2	Growth-Inducing Impacts	7.23-61
7.23.3	Significant Irreversible Environmental Changes	7.23-67
7.23.4	References Cited	7.23-71
7.24	Alternatives Analysis	7.24-1
7.24.1	Introduction	7.24-1
7.24.2	No Project Alternative (Alternative 1)	7.24-3
7.24.3	Low Flow Alternative (Alternative 2)	7.24-16
7.24.4	High Flow Alternative (Alternative 3)	7.24-24
7.24.5	Modular Alternatives for Interior Flows/Fall Delta Outflow (Alternatives 4a, 4b, and 4c)	7.24-34
7.24.6	Modular Drought Alternatives (Alternative 5a and 5b)	7.24-46
7.24.7	Environmentally Superior Alternative	7.24-52
7.24.8	References Cited	7.24-53
Chapter 8	Economic Analysis and Other Considerations	8-1
8.1	Introduction	8-1
8.2	Economic Profile	8-3
8.2.1	Population—Current and Future	8-5
8.2.2	Employment and Income	8-6
8.2.3	Municipal Water Use	8-7
8.2.4	Industrial Water Use	8-9
8.2.5	Agricultural Water Use	8-12
8.2.6	Farming-Dependent Industries	8-14
8.2.7	Exports of Agricultural Commodities	8-23
8.2.8	Sacramento/Delta Watershed Regional Profile	8-24
8.2.9	San Francisco Bay Area Regional Profile	8-26
8.2.10	San Joaquin Valley Regional Profile	8-28
8.2.11	Central Coast Regional Profile	8-29
8.2.12	Southern California Regional Profile	8-31
8.3	Costs Associated with Other Water Management Actions	8-33
8.3.1	Groundwater Use	8-34
8.3.2	Groundwater Storage and Recovery	8-34
8.3.3	Water Transfers	8-35
8.3.4	Water Recycling	8-36

8.3.5	Desalination	8-36
8.3.6	Water Conservation and Water Efficiency Measures.....	8-37
8.4	Agricultural Water Supply Economic Effects	8-41
8.4.1	Approach to Analysis	8-41
8.4.2	Agricultural Economic Effects	8-46
8.4.3	Regional Economic Effects.....	8-84
8.4.4	Agricultural Economic Effects on Economically Disadvantaged Communities.....	8-88
8.4.5	Financial Assistance for Agricultural Water Conservation.....	8-90
8.5	Municipal Water Supply Economic Effects	8-95
8.5.1	Approach to Analysis	8-95
8.5.2	Sacramento River Watershed	8-99
8.5.3	Delta Eastside Tributaries	8-100
8.5.4	Delta	8-100
8.5.5	San Francisco Bay Area	8-101
8.5.6	San Joaquin Valley	8-101
8.5.7	Central Coast.....	8-102
8.5.8	Southern California	8-102
8.5.9	Economically Disadvantaged Communities and Drinking Water	8-103
8.5.10	Potential Sources of Funding for Municipal Water Conservation and Alternative Water Supplies	8-105
8.6	Fisheries Economic Analysis.....	8-107
8.6.1	Introduction	8-107
8.6.2	Commercial Fisheries.....	8-109
8.6.3	Recreational Fishing.....	8-119
8.6.4	Non-Use Benefits	8-126
8.6.5	Subsistence Fishing and Tribal Uses of Fish	8-128
8.6.6	Threatened and Endangered Fish Species.....	8-131
8.6.7	Fish-Dependent Species.....	8-135
8.7	Other Economic Effects	8-138
8.7.1	Recreation.....	8-138
8.7.2	Ecosystem Services	8-141
8.7.3	Wildlife Refuges	8-142
8.7.4	Energy	8-142
8.8	Costs Associated with Habitat Restoration and Other Ecosystem Projects	8-144
8.8.1	Physical Habitat Restoration.....	8-144
8.8.2	Fish Passage Improvements.....	8-145
8.8.3	Predatory Fish Control	8-147

8.8.4	Invasive Aquatic Vegetation Control	8-147
8.9	Costs Associated with New or Modified Facilities	8-148
8.9.1	New or Modified Existing Reservoirs and Points of Diversion.....	8-148
8.9.2	Water Treatment Facilities	8-149
8.9.3	Groundwater Wells and Groundwater Storage and Recovery	8-151
8.10	References	8-152
8.10.1	Common References.....	8-152
8.10.2	Section References	8-154
Chapter 9	Proposed Voluntary Agreements	9-1
9.1	Introduction	9-1
9.2	Background	9-3
9.3	Description of the Proposed Voluntary Agreements.....	9-4
9.3.1	Components of Proposed Voluntary Agreements.....	9-7
9.3.2	Narrative Viability Objective and Narrative Salmon Objective.....	9-7
9.3.3	Tributary Assets	9-8
9.3.4	Delta and Estuary Assets.....	9-12
9.3.5	New Water Projects (before Year 8).....	9-13
9.3.6	Points of Comparison for VA Flow Assets.....	9-13
9.4	Regulatory Implementation Pathway.....	9-16
9.5	Changes in Hydrology and Water Supply.....	9-16
9.5.1	Introduction	9-16
9.5.2	VA Modeling Approach	9-18
9.5.3	Changes in Hydrology	9-19
9.5.4	Changes in Sacramento/Delta Surface Water Supply.....	9-58
9.6	Beneficial Environmental Effects of Proposed VAs.....	9-73
9.7	Environmental Analysis.....	9-82
9.7.1	Approach.....	9-82
9.7.2	Topics that Do Not Require Additional Impact Analyses	9-83
9.7.3	Aesthetics.....	9-84
9.7.4	Agriculture and Forest Resources.....	9-87
9.7.5	Air Quality	9-95
9.7.6	Biological Resources	9-99
9.7.7	Cultural Resources	9-119
9.7.8	Energy	9-121
9.7.9	Geology and Soils.....	9-129
9.7.10	Greenhouse Gas Emissions	9-131
9.7.11	Hazards and Hazardous Materials	9-135

9.7.12	Hydrology and Water Quality	9-137
9.7.13	Land Use and Planning	9-154
9.7.14	Mineral Resources	9-155
9.7.15	Noise	9-155
9.7.16	Population and Housing	9-157
9.7.17	Public Services	9-157
9.7.18	Recreation	9-157
9.7.19	Transportation and Traffic	9-159
9.7.20	Utilities and Service Systems	9-161
9.7.21	Cumulative Impacts, Growth-Inducing Effects, and Significant Irreversible Environmental Changes	9-164
9.7.22	Impact Summary	9-170
9.7.23	Ability to Achieve Project Purpose and Goals	9-191
9.8	Economic Analysis and Other Considerations	9-191
9.8.1	Introduction	9-191
9.8.2	Agricultural Water Supply Economic Effects	9-192
9.8.3	Municipal Water Supply Economic Effects	9-198
9.8.4	Costs Associated with Proposed VAs	9-199
9.9	Modular Alternatives for Proposed VAs	9-200
9.9.1	Introduction	9-200
9.9.2	Protection of Voluntary Agreement Flows Alternative	9-200
9.9.3	Economic Effects	9-201
9.9.4	Achievement of Project Purpose and Goals	9-201
9.10	References Cited	9-201
9.10.1	Common References	9-201
9.10.2	Section References	9-202
Chapter 10	Economically Disadvantaged Communities	10-1
10.1	Introduction	10-1
10.2	Overview of DACs and Water Supplies	10-2
10.3	Regulatory Background	10-4
10.3.1	Safe Drinking Water Act	10-4
10.3.2	Human Right to Water	10-4
10.3.3	Sustainable Groundwater Management Act	10-5
10.3.4	State Water Board's Racial Equity Resolution and Racial Equity Action Plan	10-5
10.3.5	Assembly Bill 2108 (2022)	10-6
10.3.6	Executive Order on Revitalizing Our Nation's Commitment to Environmental Justice for All	10-6

10.4	Issues of Concern for DACs	10-6
10.4.1	Harmful Algal Blooms	10-8
10.5	Assistance Programs	10-9
10.5.1	Financial Assistance	10-9
10.5.2	Technical Assistance	10-10
10.6	References Cited	10-11
10.6.1	Common References.....	10-11
10.6.2	Section References	10-12
Chapter 11	Tribal Engagement, Traditional Ecological Knowledge and Tribal Beneficial Uses	11-1
11.1	Introduction	11-1
11.2	Background and History of Native American Tribes.....	11-2
11.2.1	Tribal Reserved Water Rights	11-5
11.3	Tribal Outreach and Engagement	11-6
11.3.1	State Policies for Outreach and Engagement	11-6
11.3.2	Tribal Outreach and Engagement on the Sacramento/Delta Update to the Bay-Delta Plan	11-9
11.3.3	Other Tribal Outreach and Engagement.....	11-13
11.4	Traditional Ecological Knowledge	11-14
11.4.1	Consideration of Traditional Ecological Knowledge in the Bay-Delta Plan.....	11-14
11.4.2	Description of Traditional Ecological Knowledge	11-15
11.4.3	Tribal Connections to Native Fish and Plant Species	11-17
11.4.4	Traditional Land Stewardship Practices.....	11-18
11.4.5	Effects of Aquatic Ecosystem Stressors on Tribal Uses of Water	11-19
11.4.6	Incorporating Traditional Ecological Knowledge into Bay-Delta Plan Implementation	11-21
11.5	Tribal Beneficial Uses	11-22
11.5.1	Incorporation of Tribal Beneficial Uses in the Bay-Delta Plan	11-23
11.5.2	Designation of Tribal Tradition and Culture (CUL).....	11-25
11.6	California Native American Tribes and Harmful Algal Blooms	11-28
11.7	References Cited	11-28
11.7.1	Common References.....	11-28
11.7.2	Section References	11-29
Chapter 12	Public Participation	12-1
12.1	Introduction	12-1
12.1	CEQA Scoping.....	12-2
12.2	Informational Workshops Regarding Scientific and Technical Basis for Potential Changes to the Bay-Delta Plan	12-2

12.3	SacWAM Development	12-4
12.4	Scientific Basis Report	12-5
12.5	October 2017 Notice Regarding Information and Future Updates on Sacramento/Delta Update to the Bay-Delta Plan	12-6
12.6	Framework for Possible Sacramento/Delta Updates to the Bay-Delta Plan	12-6
12.7	State Water Board Informational Items	12-6
12.8	Scientific Basis Report Supplement	12-7
12.9	Environmental Justice Focused Listening Sessions	12-8
12.10	2023 Draft Staff Report	12-8
12.11	Workshop on Proposed VAs (HRL Proposal)	12-9
12.12	2024 Draft Bay-Delta Plan	12-10
12.12.1	Workshop on 2024 Draft Bay-Delta Plan	12-11
12.12.2	Working Meetings on 2024 Draft Bay-Delta Plan	12-11
12.13	July 2025 Revised Draft Bay-Delta Plan	12-12
12.14	December 2025 Revised Draft Bay-Delta Plan and Partially Recirculated Draft Staff Report	12-13
12.15	2026 Final Draft Bay-Delta Plan and Final Staff Report	12-14
12.16	Additional Activities	12-14
12.17	References Cited	12-15
12.17.1	Common References	12-15
12.17.2	Section References	12-15
Chapter 13	Revised Proposed Plan Amendments	13.1-1
13.1	Introduction	13.1-1
13.2	Planning Process	13.2-1
13.2.1	Scientific Basis Report and Framework	13.2-2
13.2.2	Voluntary Agreement Pathway for Healthy Rivers and Landscapes Commitments	13.2-2
13.2.3	Scientific Basis Report Supplement	13.2-3
13.2.4	Draft Staff Report	13.2-4
13.2.5	Draft Bay-Delta Plan (October 2024)	13.2-5
13.2.6	Revised Draft Bay-Delta Plan (July 2025)	13.2-6
13.2.7	Revised Draft Plan (December 2025) and Chapter 13	13.2-8
13.3	Revised Proposed Plan Amendments	13.3-1
13.3.1	Introduction	13.3-1
13.3.2	Water Quality Objectives for Fish and Wildlife Uses	13.3-2
13.3.3	Regulatory Pathway	13.3-5
13.3.4	Voluntary Agreement Pathway	13.3-10
13.3.5	Implementation Methodology	13.3-26

13.3.6	Interior Delta Flows	13.3-27
13.3.7	Designation of Tribal Tradition and Culture (CUL) and Incorporation of Tribal and Subsistence Fishing Beneficial Uses	13.3-27
13.3.8	General Provisions	13.3-29
13.3.9	Monitoring and Evaluation	13.3-29
13.4	Changes in Hydrology and Water Supply.....	13.4-1
13.4.1	Introduction	13.4-1
13.4.2	Modeling Approach	13.4-1
13.4.3	Changes in Hydrology	13.4-13
13.4.4	Changes in Surface Water Supply	13.4-109
13.4.5	Changes in Groundwater Supply	13.4-152
13.4.6	Sensitivity Analysis for 2025 Record of Decision and 2025 Incidental Take Permit	13.4-155
13.5	Beneficial Environmental Effects	13.5-1
13.5.1	Introduction	13.5-1
13.5.2	Methods.....	13.5-2
13.5.3	Regulatory Pathway.....	13.5-6
13.5.4	Voluntary Agreement Pathway.....	13.5-14
13.5.5	Range of Possible Benefits.....	13.5-21
13.6	Public Trust and Water Code Section 13241 Analyses	1
13.6.1	Public Trust Analysis	1
13.6.2	Water Code Section 13241 Analysis	7
13.6.3	Antidegradation	10
13.7	Environmental Analysis.....	13.7-1
13.7.1	Approach.....	13.7-1
13.7.2	Environmental Analysis of CUL Tribal Beneficial Use Designation	13.7-21
13.7.3	Aesthetics.....	13.7-30
13.7.4	Agriculture and Forest Resources.....	13.7-33
13.7.5	Air Quality	13.7-47
13.7.6	Biological Resources	13.7-49
13.7.7	Cultural Resources.....	13.7-117
13.7.8	Energy	13.7-121
13.7.9	Geology and Soils.....	13.7-134
13.7.10	Greenhouse Gas Emissions	13.7-136
13.7.11	Hazards and Hazardous Materials	13.7-140
13.7.12	Hydrology and Water Quality	13.7-140
13.7.13	Land Use and Planning.....	13.7-180
13.7.14	Mineral Resources	13.7-180

13.7.15 Noise	13.7-180
13.7.16 Population and Housing	13.7-182
13.7.17 Public Services	13.7-182
13.7.18 Recreation	13.7-182
13.7.19 Transportation and Traffic	13.7-189
13.7.20 Utilities and Service Systems	13.7-189
13.7.21 Cumulative Impacts, Growth-Inducing Impacts, and Significant Irreversible Environmental Changes	13.7-201
13.7.22 Impact Summary	13.7-223
13.7.23 Ability to Achieve Project Purpose and Goals	13.7-321
13.8 Economic Analysis and Other Considerations	13.8-1
13.8.1 Introduction	13.8-1
13.8.2 Agricultural Water Supply Economic Effects	13.8-2
13.8.3 Municipal Water Supply Economic Effects	13.8-12
13.8.4 Fisheries Economic Effects	13.8-16
13.8.5 Other Economic Effects	13.8-20
13.8.6 Costs Associated with Other Water Management Actions, Habitat Restoration and Other Ecosystem Projects, and New and Modified Facilities	13.8-23
13.9 References Cited	13.9-1
13.9.1 Section 13.1, Introduction	13.9-1
13.9.2 Section 13.2, Planning Process	13.9-1
13.9.3 Section 13.3, Revised Proposed Plan Amendments	13.9-1
13.9.4 Section 13.4, Changes in Hydrology and Water Supply	13.9-2
13.9.5 Section 13.5, Beneficial Environmental Effects	13.9-2
13.9.6 Section 13.6, Public Trust and Water Code Section 13241 Analyses	13.9-3
13.9.7 Section 13.7, Environmental Analysis	13.9-3
13.9.8 Section 13.8, Economic Analysis and Other Considerations	13.9-6

Volume 1

Tables

Table	Page
1-1 Impact and Mitigation Measure Summary—Changes to Hydrology and Supply †	1-30
1-2 Impact and Mitigation Measure Summary—Habitat Restoration and Other Ecosystem Projects †	1-56
1-3 Impact and Mitigation Measure Summary—New or Modified Facilities †	1-90
2.1-1 Summary Information Used in SacWAM for the Major Tributaries to the Sacramento River and the Delta Eastside Tributaries	2-16
2.2-1 Cumulative Distribution of Current Conditions as Percent of Unimpaired Flow in Sacramento River below Keswick Reservoir	2-24
2.2-2 Cumulative Distribution of Current Conditions as Percent of Unimpaired Flow in Sacramento River at Freeport	2-28
2.2-3 Cumulative Distribution of Current Conditions as Percent of Unimpaired Flow in Battle Creek	2-31
2.2-4 Cumulative Distribution of Current Conditions as Percent of Unimpaired Flow in Cow Creek	2-33
2.2-5 Cumulative Distribution of Current Conditions as Percent of Unimpaired Flow in Antelope Creek	2-36
2.2-6 Cumulative Distribution of Current Conditions as Percent of Unimpaired Flow in Deer Creek	2-39
2.2-7 Cumulative Distribution of Current Conditions as Percent of Unimpaired Flow in Mill Creek	2-42
2.2-8 Cumulative Distribution of Current Conditions as Percent of Unimpaired Flow in Clear Creek	2-45
2.2-9 Cumulative Distribution of Current Conditions as Percent of Unimpaired Flow in Butte Creek	2-48
2.2-10 Cumulative Distribution of Current Conditions as Percent of Unimpaired Flow in Feather River above Confluence with Yuba River	2-52
2.2-11 Cumulative Distribution of Current Conditions as Percent of Unimpaired Flow in Feather River with Confluence of Sacramento River	2-54

2.2-12	Cumulative Distribution of Current Conditions as Percent of Unimpaired Flow in Yuba River	2-58
2.2-13	Cumulative Distribution of Current Conditions as Percent of Unimpaired Flow in Bear River	2-60
2.2-14	Cumulative Distribution of Current Conditions as Percent of Unimpaired Flow in American River	2-63
2.2-15	Cumulative Distribution of Current Conditions as Percent of Unimpaired Flow in Mokelumne River	2-66
2.2-16	Cumulative Distribution of Current Conditions as Percent of Unimpaired Flow in Cosumnes River	2-69
2.2-17	Cumulative Distribution of Current Conditions as Percent of Unimpaired Flow in Calaveras River	2-72
2.2-18	Cumulative Distribution of Current Conditions as Percent of Unimpaired Flow in Stony Creek.....	2-74
2.2-19	Cumulative Distribution of Current Conditions as Percent of Unimpaired Flow in Cottonwood Creek	2-76
2.2-20	Cumulative Distribution of Current Conditions as Percent of Unimpaired Flow in Thomes Creek.....	2-78
2.2-21	Cumulative Distribution of Current Conditions as Percent of Unimpaired Flow in Cache Creek	2-81
2.2-22	Cumulative Distribution of Current Conditions as Percent of Unimpaired Flow in Putah Creek	2-84
2.3-1	Cumulative Distribution of Current Conditions as Percent of Unimpaired Flow in Sutter Bypass	2-90
2.3-2	Cumulative Distribution of Current Conditions as Percent of Unimpaired Flow in Yolo Bypass	2-94
2.4-1	Cumulative Distribution of Current Conditions as Percent of Unimpaired Flow for Delta Inflow.....	2-99
2.4-2	Median Current Conditions as Percent of Unimpaired Flow for Delta Inflow by Major Tributary	2-100
2.4-3	Cumulative Distribution of Current Conditions as Percent of Unimpaired Flow in Delta Outflow	2-110
2.4-4	Simulated Unimpaired Contributions to Total Delta Outflow from Various Locations in the Plan Area (percent of Delta outflow)	2-111

2.6-1	Sacramento Valley Unimpaired Runoff	2-117
2.7-1a	Summary of Active Water Right Records in the Sacramento/Delta Watershed: Post-1914 Appropriative Water Rights	2-120
2.7-1b	Summary of Active Water Right Records in the Sacramento/Delta Watershed: Statements of Diversion and Use	2-121
2.7-1c	Summary of Active Water Right Records in the Sacramento/Delta Watershed: Minor Water Right Types	2-121
2.7-2	Summary of California Department of Water Resources and U.S. Bureau of Reclamation Water Right Records in the Sacramento/Delta Watershed	2-121
2.7-3a	Summary of 2018 Reported Diversions by Volume for Water Right Records in the Sacramento/Delta Watershed	2-122
2.7-3b	Summary of 2019 Reported Diversions by Volume for Water Right Records in the Sacramento/Delta Watershed	2-122
2.7-4	SWP and CVP Supplemental Project Water Releases from 2000 to 2022	2-123
2.8-1	Estimated Average Annual Total Surface Water and Other Water Supplies by Geographic Region and Sector (thousand acre-feet)	2-127
2.8-2	Estimated Average Annual Groundwater Supply by Geographic Region and Sector (thousand acre-feet)	2-127
2.8-3	Simulated Average Annual Sacramento/Delta Surface Water Supply by Geographic Region and Sector (thousand acre-feet)	2-127
2.8-4	Average Annual Sacramento River Watershed Water Supply Estimates (thousand acre-feet)	2-129
2.8-5	Average Annual Delta Eastside Tributaries Water Supply Estimates (thousand acre-feet)	2-132
2.8-6	Average Annual Delta Water Supply Estimates (thousand acre-feet)	2-134
2.8-7	Average Annual San Francisco Bay Area Water Supply Estimates (thousand acre- feet)	2-135
2.8-8	Average Annual San Joaquin Valley Water Supply Estimates (thousand acre-feet)	2-139
2.8-9	Average Annual Central Coast Water Supply Estimates (thousand acre-feet)	2-141
2.8-10	Average Annual Southern California Water Supply Estimates (thousand acre- feet)	2-143
3.4-1	General Timing of Important Life Stages of Sacramento and San Joaquin River Basin Chinook Salmon and California Central Valley Steelhead	3-18

3.4-2	Timing of Juvenile Chinook Salmon and California Central Valley Steelhead Entry into the Delta from the Sacramento River Basin by Month	3-20
3.4-3	Summary of the Natural Production of All Four Runs of Chinook Salmon in the Sacramento and San Joaquin River Basins during the Central Valley Project Improvement Act Baseline Period of 1967–1991 and 1992–2015	3-24
3.4-4	Timing of Adult Chinook Salmon and Steelhead Migrations through the Delta to Upstream Sacramento and San Joaquin River Spawning Tributaries	3-41
3.4-5	State Water Board Staff Analysis of the Frequency of Common Flow-Related Stressors for Winter-Run and Spring-Run Chinook Salmon and Central Valley Steelhead in 22 Salmon-Bearing Tributaries of the Sacramento River	3-42
3.4-6	Salmon Returns on the Mokelumne River	3-43
3.4-7	Sacramento River and Interior Delta Flows to Increase the Abundance and Survival of Chinook Salmon Populations	3-54
3.5-1	Delta Outflow and Old and Middle Rivers Reverse Flows Indicated to Be Protective of Longfin Smelt Recruitment	3-68
3.6-1	Delta Outflow Indicated to Be Protective of White and Green Sturgeon	3-74
3.7-1	Delta Outflow Indicated to Be Protective of Sacramento Splittail	3-78
3.8-1	Delta Outflow and Old and Middle River Flows Indicated to Be Protective of Delta Smelt	3-85
3.9-1	Delta Outflow Indicated to Be Protective of Starry Flounder	3-93
3.10-1	Delta Outflows Indicated to Be Protective of California Bay Shrimp	3-98
3.11-1	Delta Outflow Indicated to Be Protective of Zooplankton Species	3-101
3.14-1	Magnitude and Timing of Delta Outflows Indicated to Be Protective of Estuarine-Dependent Species	3-111
3.14-2	Functional Flow Needs for Estuarine-Dependent Species	3-113
3.14-3	Summary of Interior Delta Flows Indicated to Be Protective of Salmonids and Estuarine-Dependent Fish Species (cubic feet per second)	3-116
3.14-4	Frequency of Meeting Rio Vista Targets for Chinook Salmon Species	3-121
3.14-5	Frequency of Meeting Freeport Targets for November–May	3-122
3.14-6	Summary of Frequency of Meeting Winter–Spring Delta Outflows to Benefit Estuarine Habitat and Species	3-128
3.14-7	Potential Percent Increase in Median Abundance Indices Relative to Baseline Condition, with 95 Percent Confidence Intervals and by Water Year Type	3-132

3.14-8	Change in Median (across All Years Modeled) Spawning Habitat from Baseline for Each Flow Scenario	3-137
3.14-9	Change in Median (across All Years Modeled) Rearing (Instream and Floodplain) Habitat from Baseline for Each Flow Scenario	3-139
3.14-10	Percent of Years in Which Meaningful Floodplain Events Are Attained in Each Tributary	3-140
3.15-1	Estuarine-Dependent Species Listed under the California and Federal Endangered Species Acts and Changes in Indices of Their Population Abundance in the San Francisco Estuary	3-145
4.5-1	Summary of Recent Take Regulations to Reduce the Impact of Commercial and Recreational Harvest on Native Fish Species	4-31
5.2-1	Existing Delta Outflow Objectives from July to January	5-27
6.2-1	SacWAM Baseline Model Assumptions	6-6
6.3-1	Total Annual Delta Inflow Average by Water Year Type and Scenario: Change from Baseline (thousand acre-feet)	6-28
6.3-2	Changes in Total Annual Delta Outflow Average by Water Year Type and Scenario (thousand acre-feet)	6-29
6.3-3	February through June Average X2 Position by Water Year Type and Scenario (kilometers)	6-30
6.3-4	Potentially Affected Upper Watershed Interbasin Diversions	6-33
6.3-5	Existing Reservoir Release and Downstream Flow Requirements for Export Reservoirs in the San Francisco Bay Area, Central Coast, and Southern California Regions	6-35
6.3-6	Average End-of-April Storage (thousand acre-feet) and Percent Differences from Baseline in Rim Reservoirs in the Scenarios for All Years	6-41
6.3-7	Average End-of-April Storage (thousand acre-feet) and Percent Differences from Baseline in Rim Reservoirs in the Scenarios for Critical Years	6-41
6.3-8	Average Carryover Storage (thousand acre-feet) and Percent Differences from Baseline in Rim Reservoirs in the Scenarios for All Years	6-42
6.3-9	Average Carryover Storage (thousand acre-feet) and Percent Differences from Baseline in Rim Reservoirs in the Scenarios for Critical Years	6-42
6.3-10	Average End-of-September Watershed Total Storage for Baseline (thousand acre-feet) and Percent Difference from Baseline for the Flow Scenarios	6-49

6.3-11	Average Critical Year End-of-September Watershed Total Storage for Baseline (thousand acre-feet) and Percent Difference from Baseline for the Flow Scenarios	6-49
6.3-12	Representative Terminal Reservoirs and Their Historical Response to Reduced Water Supply during Drought	6-50
6.4-1	Annual Average Water Supplied to Each Region in the Study Area (thousand acre-feet per year).....	6-54
6.4-2	Annual Water Year Type Average Annual Sacramento/Delta Supply for Baseline and Change from Baseline (thousand acre-feet)	6-57
6.4-3	Water Year Type Annual Average South-of-Delta Exports for Baseline and Change from Baseline (thousand acre-feet)	6-57
6.4-4	Annual Total Sacramento/Delta Supply to the Sacramento River Watershed Water Year Type Average: Change from Baseline (thousand acre-feet per year).....	6-59
6.4-5	Annual Sacramento/Delta Supply to Agriculture in the Sacramento River Watershed Water Year Type Average: Change from Baseline (thousand acre-feet per year)	6-60
6.4-6	Annual Sacramento/Delta Supply to Municipal and Industrial Use in the Sacramento River Watershed Water Year Type Average: Change from Baseline (thousand acre-feet per year)	6-61
6.4-7	Annual Sacramento/Delta Supply to Wildlife Refuges in the Sacramento River Watershed Water Year Type Average: Change from Baseline (thousand acre-feet per year)	6-62
6.4-8	Annual Sacramento/Delta Supply to the Delta Eastside Tributaries Region Water Year Type Average: Change from Baseline (thousand acre-feet)	6-64
6.4-9	Annual Sacramento/Delta Supply to Agriculture in the Delta Eastside Tributaries Region Water Year Type Average: Change from Baseline (thousand acre-feet per year).....	6-64
6.4-10	Annual Sacramento/Delta Supply to Municipal and Industrial Use in the Delta Eastside Tributaries Region Water Year Type Average: Change from Baseline (thousand acre-feet per year)	6-64
6.4-11	Annual Sacramento/Delta Supply to the Delta Region Water Year Type Average: Change from Baseline (thousand acre-feet per year)	6-66
6.4-12	Annual Sacramento/Delta Supply to Agriculture in the Delta Region Water Year Type Average: Change from Baseline (thousand acre-feet per year)	6-67

6.4-13	Annual Sacramento/Delta Supply to Municipal and Industrial Use in the Delta Region Water Year Type Average: Change from Baseline (thousand acre-feet per year).....	6-67
6.4-14	Annual Sacramento/Delta Supply to the San Francisco Bay Area Region Water Year Type Average: Change from Baseline (thousand acre-feet)	6-68
6.4-15	Annual Sacramento/Delta Supply to Agriculture in the San Francisco Bay Area Region Water Year Type Average: Change from Baseline (thousand acre-feet per year).....	6-69
6.4-16	Annual Sacramento/Delta Supply to Municipal and Industrial Use in the San Francisco Bay Area Region Water Year Type Average: Change from Baseline (thousand acre-feet per year)	6-69
6.4-17	Annual Sacramento/Delta Supply to the Central Coast Region Water Year Type Average: Change from Baseline (thousand acre-feet)	6-71
6.4-18	Annual Sacramento/Delta Supply to Agriculture in the Central Coast Region Water Year Type Average: Change from Baseline (thousand acre-feet per year)	6-71
6.4-19	Annual Sacramento/Delta Supply to Municipal and Industrial Use in the Central Coast Region Water Year Type Average: Change from Baseline (thousand acre-feet per year)	6-71
6.4-20	Annual Sacramento/Delta Supply to the San Joaquin Valley Region Water Year Type Average: Change from Baseline (thousand acre-feet)	6-74
6.4-21	Sacramento/Delta Supply to Agriculture in the San Joaquin Valley Region Water Year Type Average: Change from Baseline (thousand acre-feet)	6-75
6.4-22	Sacramento/Delta Supply to Urban Use in the San Joaquin Valley Region Water Year Type Average Change from Baseline (thousand acre-feet)	6-76
6.4-23	Sacramento/Delta Supply to Wildlife Refuges in the San Joaquin Valley Region Water Year Type Average: Change from Baseline (thousand acre-feet)	6-77
6.4-24	Sacramento/Delta Supply to the Southern California Region Water Year Type Average: Change from Baseline (thousand acre-feet)	6-79
6.4-25	Annual Sacramento/Delta Supply to Agriculture in the Southern California Region Water Year Type Average: Change from Baseline (thousand acre-feet per year)	6-79
6.4-26	Annual Sacramento/Delta Supply to Municipal and Industrial Use in the Southern California Region Water Year Type Average: Change from Baseline (thousand acre-feet/year)	6-79
6.5-1	Average Annual Groundwater Use by Geographic Region and Sector, 2005–2015 (thousand acre-feet).....	6-80

6.6-1	Summary of Market-Based Water Transfers, by Region (Annual Average – thousand acre-feet per year)	6-86
6.6-2	Destination Use of Long-Term and Permanent Contracts	6-88
6.6-3	Water Transfers in California by Type of Market, Volume Committed (acre-feet)	6-88
7.1-1	Overview of Modeling Tools Used in the Staff Report.....	7.1-12
7.1-2	Impact and Mitigation Measure Summary—Proposed Plan Amendments	standalone file 7.1-1
7.2-1	Proposed VA Assets.....	7.2-14
7.4-1	Average Annual Total Water Supply (Surface Water and Groundwater) by Geographic Region and Sector, 2005–2015 (thousand acre-feet).....	7.4-9
7.4-2	Average Annual Groundwater Supply by Geographic Region and Sector, 2005– 2015 (thousand acre-feet).....	7.4-9
7.4-3	Simulated Average Annual Sacramento/Delta Surface Water Supply by Geographic Region and Sector (thousand acre-feet)	7.4-10
7.4-4	Top-Producing Crops, by Acreage, Sacramento River Watershed (2011–2016 average).....	7.4-15
7.4-5	Baseline Irrigated Crop Acreage in Upper Watersheds (acres).....	7.4-16
7.4-6	Top-Producing Crops, by Acreage, Delta Eastside Tributaries (2011–2016 average).....	7.4-20
7.4-7	Top-Producing Crops, by Acreage, Delta Region (2011–2016 average)	7.4-21
7.4-8	Top-Producing Crops, by Acreage, San Francisco Bay Area Region (2011–2016 average).....	7.4-23
7.4-9	Top-Producing Crops, by Acreage, San Joaquin Valley Region (2011–2016 average).....	7.4-24
7.4-10	Top-Producing Crops, by Acreage, Central Coast Region (2011–2016 average)	7.4-31
7.4-11	Top-Producing Crops, by Acreage, Southern California Region (2011–2016 average).....	7.4-33
7.4-12	Range of Applied Water Requirements by Crop Category used in the SWAP Model Analysis, Sacramento/Delta and San Joaquin Valley (acre-feet per acre per year)	7.4-38
7.4-13	Representative Revenue Generated per Acre of Crop Production	7.4-39
7.4-14	Crop Groups for Display of Results and Analysis.....	7.4-39

7.4-15	Sacramento/Delta Supply to Agriculture in the Sacramento River Watershed, Delta Eastside Tributaries, and Delta Regions by Water Year Type Average: Change from Baseline (thousand acre-feet per year)	7.4-44
7.4-16	Total Surface Water Supply for Agriculture in the SWAP Zones of the Sacramento River Watershed, Delta Eastside Tributaries, and Delta Regions, Average and Dry Water Year Types, SWAP Model Inputs for Baseline and Flow Scenario Runs (thousand acre-feet per year).....	7.4-44
7.4-17	Average Year: Irrigated Crop Acreage in the Sacramento/Delta, SWAP Model Analysis, No Replacement Groundwater (acres)	7.4-47
7.4-18	Dry Year: Irrigated Crop Acreage in the Sacramento/Delta, SWAP Model Analysis, No Replacement Groundwater (acres)	7.4-50
7.4-19	Sacramento/Delta Supply to San Joaquin Valley Region Agriculture, Water Year Type Average: Change from Baseline Conditions (thousand acre-feet)	7.4-55
7.4-20	Total Surface Water Supply for Agriculture in the SWAP Zones of the San Joaquin Valley Region, Average and Dry Water Year Types, SWAP Model Inputs for Baseline and Flow Scenario Runs (thousand acre-feet per year)	7.4-55
7.4-21	Average Year: Irrigated Crop Acreage in the San Joaquin Valley Region, No Replacement Groundwater (acres)	7.4-58
7.4-22	Dry Year: Irrigated Crop Acreage in the San Joaquin Valley Region, No Replacement Groundwater (acres)	7.4-60
7.4-23	Exchange Contractor Shortage (thousand acre-feet) Percent Exceedance by Scenario	7.4-67
7.4-24	Estimated Annual Volume of Millerton Lake Supply Redirected to Exchange Contractors Due to Calls on Friant, Average and Dry Water Year (thousand acre-feet)	7.4-67
7.4-25	Sacramento/Delta Supply to Bay Area Region Agriculture Water Year Type Average Change from Baseline (thousand acre-feet)	7.4-76
7.4-26	Surface Water Supply for Agriculture in the San Francisco Bay Area Region, Average and Dry Water Year Types, Baseline and Flow Scenarios (thousand acre-feet per year).....	7.4-76
7.4-27	Average Year: Irrigated Crop Acreage in the San Francisco Bay Area Region (acres)	7.4-78
7.4-28	Dry Year: Irrigated Crop Acreage in the San Francisco Bay Area Region (acres)	7.4-78
7.4-29	Change in Sacramento/Delta Supply to Central Coast Agriculture, Water Year Type Annual Change from Baseline (thousand acre-feet)	7.4-81

7.4-30	Surface Water Supply for Agriculture in the Central Coast Region, Average and Dry Water Year Types, Baseline and Scenarios (thousand acre-feet per year)	7.4-81
7.4-31	Average Year: Irrigated Crop Acreage in the Central Coast Region (acres)	7.4-82
7.4-32	Dry Year: Irrigated Crop Acreage in the Central Coast Region (acres)	7.4-82
7.4-33	Sacramento/Delta Supply to Southern California Agricultural, Water Year Type Annual Change from Baseline (thousand acre-feet)	7.4-84
7.4-34	Surface Water Supply for Agriculture in the Southern California Region, Average and Dry Water Year Types, Baseline and Scenarios (thousand acre-feet per year)	7.4-84
7.4-35	Average Year: Irrigated Crop Acreage in the Southern California Region (acres)	7.4-86
7.4-36	Dry Year: Irrigated Crop Acreage in the Southern California Region (acres)	7.4-86
N-7.5-1	Sources and Potential Health and Environmental Effects of Criteria Pollutants	7.5-3
7.5-1	Regional Air Basin, Air District, and Federal and State Criteria Pollutant Attainment Designations for Counties in the Study Area	7.5-6
7.6.1-1	Sensitive Natural Communities with Potential to Occur or Known to Occur in the Study Area	7.6.1-4
7.6.1-2	Special-Status Plants with Potential to Occur or Known to Occur in the Study Area	7.6.1-6
7.6.1-3	Special-Status Wildlife (excluding Fish and Vernal Pool Branchiopods) with Potential to Occur or Known to Occur in the Study Area	7.6.1-8
7.6.1-4	Regional Habitat Conservation Plans and Natural Community Conservation Plans in the Study Area	7.6.1-42
7.6.1-5	SacWAM Results for Annual Average Reductions in Refuge Water Supplies (TAF/yr) from Sacramento/Delta Water	7.6.1-62
7.6.2-1	Special-Status Fish Species That Occur in the Study Area	7.6.2-6
7.6.2-2	On-Stream Export Reservoirs: Capacities, Streams Impounded, River Basins, and Geographic Regions	7.6.2-19
7.6.2-3	Habitat Conservation Plans and Natural Community Conservation Plans with Covered Fish Species	7.6.2-25
7.6.2-4	Percent of Months within Each Season That Exceed Sacramento and Delta Flows Associated with Successful Juvenile Chinook Salmon Emigration through the Delta	7.6.2-37
7.6.2-5	Frequency of Meeting Winter–Spring Delta Outflows to Benefit Estuarine Habitat and Species (percent of months)	7.6.2-39

7.6.2-6	SacWAM Results for Frequency (Percent of Months) of Positive Old and Middle River Flows	7.6.2-43
7.6.2-7	SacWAM Results for Frequency (Percent of Months) of Old and Middle River Flows More Positive than -1,250 cubic feet per second	7.6.2-43
7.6.2-8	SacWAM Results for Frequency (Percent of Months) of Old and Middle River Flows More Positive than -2,500 cubic feet per second	7.6.2-43
7.6.2-9	SacWAM Results for Frequency (Percent of Months) of Old and Middle River Flows More Positive than -5,000 cubic feet per second	7.6.2-43
7.6.2-10	SacWAM Results for Frequency (Percent of Months) of Positive Jersey Point Flows.....	7.6.2-44
7.6.2-11	SacWAM Results for Average San Joaquin Inflow to Export (I:E) Ratios.....	7.6.2-45
7.6.2-12	Average Percent of Days above Each Winter-Run Chinook Salmon Water Temperature Criterion under Baseline, Sacramento River	7.6.2-62
7.6.2-13	Summary of Potential Effects of Flow Scenarios on Winter-Run Chinook Salmon, Sacramento River	7.6.2-63
7.6.2-14	Average Percent of Days above Each Spring-Run Chinook Salmon Water Temperature Criterion under Baseline, Sacramento River	7.6.2-64
7.6.2-15	Summary of Potential Effects of Flow Scenarios on Spring-Run Chinook Salmon, Sacramento River	7.6.2-65
7.6.2-16	Average Percent of Days above Each Fall-Run Chinook Salmon Water Temperature Criterion under Baseline, Sacramento River	7.6.2-66
7.6.2-17	Summary of Potential Effects of Flow Scenarios on Fall-Run Chinook Salmon, Sacramento River	7.6.2-67
7.6.2-18	Average Percent of Days above Each Late Fall-Run Chinook Salmon Water Temperature Criterion under Baseline, Sacramento River	7.6.2-68
7.6.2-19	Summary of Potential Effects of Flow Scenarios on Late Fall-Run Chinook Salmon, Sacramento River	7.6.2-69
7.6.2-20	Average Percent of Days above Each Central Valley Steelhead Water Temperature Criterion under Baseline, Sacramento River	7.6.2-69
7.6.2-21	Summary of Potential Effects of Flow Scenarios on Central Valley Steelhead, Sacramento River	7.6.2-71
7.6.2-22	Average Percent of Days above Each Green Sturgeon Water Temperature Criterion under Baseline, Sacramento River	7.6.2-72

7.6.2-23	Summary of Potential Effects of Flow Scenarios on Green Sturgeon, Sacramento River.....	7.6.2-73
7.6.2-24	Average Percent of Days above the Winter-Run Chinook Salmon Non-Natal Juvenile Rearing Water Temperature Criterion under Baseline, American River.....	7.6.2-74
7.6.2-25	Summary of Potential Effects of Flow Scenarios on Winter-Run Chinook Salmon, American River	7.6.2-75
7.6.2-26	Average Percent of Days above Each Fall-Run Chinook Salmon Water Temperature Criterion under Baseline, American River	7.6.2-75
7.6.2-27	Summary of Potential Effects of Flow Scenarios on Fall-Run Chinook Salmon, American River	7.6.2-76
7.6.2-28	Average Percent of Days above Each Central Valley Steelhead Water Temperature Criterion under Baseline, American River	7.6.2-77
7.6.2-29	Summary of Potential Effects of Flow Scenarios on Central Valley Steelhead, American River	7.6.2-78
7.6.2-30	Average Percent of Days above the Winter-Run Chinook Salmon Non-Natal Juvenile Rearing Water Temperature Criterion under Baseline, Feather River.....	7.6.2-81
7.6.2-31	Summary of Potential Effects of Flow Scenarios on Winter-Run Chinook Salmon, Feather River	7.6.2-81
7.6.2-32	Average Percent of Days above Each Spring-Run Chinook Salmon Water Temperature Criterion under Baseline, Feather River	7.6.2-82
7.6.2-33	Summary of Potential Effects of Flow Scenarios on Spring-Run Chinook Salmon, Feather River	7.6.2-83
7.6.2-34	Average Percent of Days above Each Fall-Run Chinook Salmon Water Temperature Criterion under Baseline, Feather River	7.6.2-84
7.6.2-35	Summary of Potential Effects of Flow Scenarios on Fall-Run Chinook Salmon, Feather River	7.6.2-85
7.6.2-36	Average Percent of Days above Each Central Valley Steelhead Water Temperature Criterion under Baseline, Feather River	7.6.2-86
7.6.2-37	Summary of Potential Effects of Flow Scenarios on Central Valley Steelhead, Feather River	7.6.2-87
7.6.2-38	Average Percent of Days above Each Green Sturgeon Water Temperature Criterion under the Baseline Flow Scenario, Feather River	7.6.2-88
7.6.2-39	Summary of Potential Effects of Flow Scenarios on Green Sturgeon, Feather River.....	7.6.2-89

7.7-1	Paleontological Sensitivity Ratings	7.7-2
7.8-1	Fuel Sources for Electric Power in California in 2021	7.8-5
7.8-2	Natural Gas, Hydropower, and Other Renewable Monthly Generation (gigawatt hour)	7.8-16
7.8-3	Cumulative Distribution of Annual Hydropower Generation: Baseline Condition and Change from Baseline Condition (gigawatt hour)	7.8-21
7.8-4	Cumulative Distribution: Energy for Exports—Baseline Condition and Change from Baseline Condition (gigawatt hour)	7.8-23
7.8-5	Existing Energy Costs for Pumping Sacramento/Delta Water Supply and Possible Response Actions	7.8-34
7.10-1	Greenhouse Gas Emission Factors for Natural-Gas Facilities (pounds per megawatt hour)	7.10-12
7.10-2	Greenhouse Gas Emissions Associated with Replacement Power due to Reductions in Hydropower Generation	7.10-12
7.10-3	Summary of Potential Energy and Greenhouse Gas Emissions Costs of Other Water Management Actions	7.10-17
7.10-4	Range of Possible Greenhouse Gas Emissions from Water Transfers and Municipal Water Conservation under the 55 Scenario	7.10-18
7.12.1-1a	Designated Beneficial Uses for Waterbodies Identified in the Bay-Delta Water Quality Control Plan	7.12.1-4
7.12.1-1b	Designated Beneficial Uses for Waterbodies Identified in the Water Quality Control Plan for the San Francisco Bay Basin	7.12.1-6
7.12.1-1c	Designated Beneficial Uses for Waterbodies Identified in the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins	7.12.1-7
7.12.1-2	Summary of Completed and Ongoing Total Maximum Daily Loads	7.12.1-9
7.12.1-3	Impaired Waterbodies in the Study Area	7.12.1-12
7.12.1-4	Sacramento River and Tributary Reservoirs	7.12.1-48
7.12.1-5	Delta Eastside Tributaries Reservoirs	7.12.1-50
7.12.1-6	River Channel Capacities for the Sacramento River and Major Tributaries	7.12.1-52
7.12.1-7	Average Flow at Downstream Ends of Cache Creek, Putah Creek, and Yolo Bypass during January through March for Baseline and Flow Scenarios (cubic feet per second)	7.12.1-63

7.12.1-8	Patterns of Change in Sacramento River Temperatures Associated with the Flow Scenarios (50th and 90th percentiles) as Simulated with HEC-5Q	7.12.1-68
7.12.1-9	Patterns of Change in Feather River Temperatures Associated with the Flow Scenarios (50th and 90th percentiles) as Simulated with HEC-5Q	7.12.1-70
7.12.1-10	Sensitivity Analysis of Feather River Temperatures with Increased Power Bypass (50th and 90th percentiles) as Simulated with HEC-5Q.....	7.12.1-72
7.12.1-11	Patterns of Change in American River Temperatures Associated with the Flow Scenarios (50th and 90th percentiles) as Simulated with HEC-5Q	7.12.1-74
7.12.1-12	Electrical Conductivity Values ($\mu\text{S}/\text{cm}$) for Emmaton under Baseline and Flow Scenarios (90th Percentile Values for Water Years 1976–1991)	7.12.1-81
7.12.1-13	DSM2 Electrical Conductivity Values ($\mu\text{S}/\text{cm}$) for Chipps Island near Mallard Slough under Baseline and Flow Scenarios (90th Percentile Values for Water Years 1976–1991).....	7.12.1-82
7.12.1-14	DSM2 Electrical Conductivity Values ($\mu\text{S}/\text{cm}$) for Collinsville under Baseline and Flow Scenarios (90th Percentile Values for Water Years 1976–1991).....	7.12.1-84
7.12.1-15	DSM2 Electrical Conductivity Values ($\mu\text{S}/\text{cm}$) for Clifton Court Forebay under Baseline and Flow Scenarios (90th Percentile Values for Water Years 1976–1991).....	7.12.1-85
7.12.1-16	DSM2 Electrical Conductivity Values ($\mu\text{S}/\text{cm}$) for Delta-Mendota Canal Intake under Baseline and Flow Scenarios (90th Percentile Values for Water Years 1976–1991).....	7.12.1-86
7.12.1-17	DSM2 Electrical Conductivity Values ($\mu\text{S}/\text{cm}$) for Old River at Tracy Boulevard under Baseline and Flow Scenarios (90th Percentile Values for Water Years 1976–1991).....	7.12.1-87
7.12.1-18	Average Travel Time (in days) through Victoria Canal Estimated with DSM2 Flows—Baseline and Increase under Flow Scenarios Relative to Baseline.....	7.12.1-91
7.12.1-19	Number of Months with SacWAM-Modeled Flow in Clear Creek Greater than 3,250 and 6,000 Cubic Feet per Second (94-Year Simulation Period)	7.12.1-108
7.12.1-20	Rivers and Locations Analyzed for Flood Impacts	7.12.1-110
7.12.1-21	Flow and Storage Changes on Central Valley Rivers during High-Flow Months under the 55 Scenario as Simulated by SacWAM	7.12.1-114
7.12.1-22	Flow Changes on Clear Creek (cubic feet per second) above the Confluence with the Sacramento River under the 55 Scenario (October through May)	7.12.1-118
7.12.2-1	Adjudicated Groundwater Basins and Subbasins in the Study Area	7.12.2-5

7.12.2-2	Medium-Priority and High-Priority Groundwater Subbasins—Sacramento River Watershed	7.12.2-18
7.12.2-3	Medium-Priority and High-Priority Groundwater Subbasins—Delta Eastside Tributaries Region	7.12.2-21
7.12.2-4	Medium-Priority Groundwater Subbasins—Delta Region	7.12.2-22
7.12.2-5	Medium-Priority and High-Priority Groundwater Subbasins—San Francisco Bay Area Region	7.12.2-24
7.12.2-6	Medium-Priority and High-Priority Groundwater Subbasins—San Joaquin Valley	7.12.2-27
7.12.2-7	Medium-Priority and High-Priority Groundwater Subbasins—Central Coast.....	7.12.2-34
7.12.2-8	Medium-Priority and High-Priority Groundwater Subbasins—Southern California	7.12.2-36
7.12.2-9	SWAP Model Results for Increased Agricultural Groundwater Use Compared with Baseline Condition, Maximum Replacement Groundwater Pumping—Sacramento River Watershed (thousand acre-feet)	7.12.2-43
7.12.2-10	SWAP Model Results for Increased Agricultural Groundwater Use Compared with Baseline Condition, Maximum Replacement Groundwater Pumping—Delta Eastside Tributaries (thousand acre-feet)	7.12.2-43
7.12.2-11	SacWAM Results for Change in Average Annual Groundwater Recharge from Stream-Aquifer Interactions Compared with Baseline Condition, No Replacement Groundwater Pumping (thousand acre-feet)	7.12.2-44
7.12.2-12	SacWAM Results for Change in Average Annual Incidental Groundwater Recharge from Deep Percolation and Transmission Losses Compared with Baseline Condition, No Replacement Groundwater Pumping (thousand acre-feet)	7.12.2-45
7.12.2-13	SacWAM Results for Average Annual Change in Groundwater Compared with Baseline Condition, No Replacement Groundwater Pumping—Sacramento River Watershed and Delta Eastside Tributaries Regions (thousand acre-feet)	7.12.2-45
7.12.2-14	SWAP Model Results for Increased Groundwater Use Compared with Baseline Condition, Maximum Replacement Groundwater Pumping—San Joaquin Valley (thousand acre-feet).....	7.12.2-48
7.15-1	Acoustic Terminology	7.15-2
7.15-2	Typical A-Weighted Sound Levels	7.15-4
7.15-3	Vibration Source Levels for Construction Equipment	7.15-5
7.15-4	Guideline Vibration Damage Potential Threshold Criteria	7.15-6
7.15-5	Guideline Vibration Annoyance Potential Criteria	7.15-6

7.15-6	Approximate Average Day-Night Noise Levels for Various Locations.....	7.15-8
7.20-1	Average Annual Total Water Supply by Geographic Region and Sector (thousand acre-feet)	7.20-10
7.20-2	Estimated Average Annual Groundwater Supply by Geographic Region and Sector, 2005–2015 (thousand acre-feet)	7.20-10
7.20-3	Simulated Average Annual Sacramento/Delta Surface Water Supply by Geographic Region and Sector (thousand acre-feet)	7.20-11
7.20-4	Annual Average Surface Water and Groundwater Sources of Municipal Supply by region, and Annual Average Sacramento/Delta Supply and Percent of Total Supply for Municipal Use (thousand acre-feet per year)	7.20-26
7.20-5	Annual Sacramento/Delta Supply to Municipal Uses by Water Year Type Average, Baseline and Estimated Change from Baseline for Flow Scenario (thousand acre-feet per year)	7.20-27
7.20-6	Change from Baseline Conditions: Annual Average Sacramento/Delta Supply for Municipal Use by Region and Scenario (thousand acre-feet per year).....	7.20-27
7.20-7	Change in Annual Average Sacramento/Delta Supply for Municipal Use by Region and Scenario, Percent of Baseline Sacramento/Delta Supply.....	7.20-28
7.20-8	Change in Annual Average Sacramento/Delta Supply to Municipal Users by Region and Scenario, Percent of Total Municipal Supply.....	7.20-28
7.20-9	Sacramento/Delta Supply for Municipal Use in the Sacramento River Watershed: Change from Baseline (thousand acre-feet per year)	7.20-32
7.20-10	Sacramento River Watershed Water Service Reliability Assessment for Municipal Suppliers That Rely on Sacramento/Delta Supply as a Part of Water Portfolio	7.20-33
7.20-11	Sacramento/Delta Deliveries for Municipal Use in the Delta Eastside Tributaries Region: Change from Baseline (thousand acre-feet per year)	7.20-34
7.20-12	Delta Eastside Tributaries Region Water Service Reliability Assessment for Municipal Suppliers That Rely on Sacramento/Delta Supply as a Part of Water Portfolio	7.20-35
7.20-13	Sacramento/Delta Supply for Municipal Use in the Delta Region: Change from Baseline (thousand acre-feet per year).....	7.20-36
7.20-14	Delta Region Water Service Reliability Assessment for Municipal Suppliers That Rely on Sacramento/Delta Supply as a Part of Water Portfolio	7.20-36
7.20-15	Sacramento/Delta Supply for Municipal Use in the San Francisco Bay Area Region: Change from Baseline (thousand acre-feet per year)	7.20-37

7.20-16	San Francisco Bay Area Region Water Service Reliability Assessment for Municipal Suppliers That Rely on Sacramento/Delta Supply as a Part of Water Portfolio (acre-feet per year)	7.20-38
7.20-17	Sacramento/Delta Supply for Municipal Use in the San Joaquin Valley Region: Change from Baseline (thousand acre-feet per year)	7.20-39
7.20-18	San Joaquin Valley Region Water Service Reliability Assessment for Municipal Suppliers That Rely on Sacramento/Delta Supply as a Part of Water Portfolio	7.20-40
7.20-19	Sacramento/Delta Supply for Municipal Use in the Central Coast Region: Change from Baseline (thousand acre-feet per year)	7.20-41
7.20-20	Central Coast Region Water Service Reliability Assessment for Municipal Suppliers That Rely on Sacramento/Delta Supply as a Part of Water Portfolio	7.20-41
7.20-21	Sacramento/Delta Supply for Municipal Use in the Southern California Region: Change from Baseline (thousand acre-feet per year)	7.20-42
7.20-22	Southern California Region Water Service Reliability Assessment for Municipal Suppliers That Rely on Sacramento/Delta Supply as a Part of Water Portfolio	7.20-43
7.21-1	Impact and Mitigation Measure Summary—Habitat Restoration and Other Ecosystem Projects.....	7.21-154
7.22-1	Impact and Mitigation Measure Summary—New or Modified Facilities.....	7.22-151
7.23-1	Projects Considered for Cumulative Impact Analysis.....	7.23-22
7.24-1	Change in Delta Outflow (TAF per year) that Could Occur as a Result of Several Proposed Water Infrastructure Projects	7.24-8
7.24-2	SacWAM Results for Average Annual Delta Outflow (TAF): Baseline and Change from Baseline for Interior Delta Flow and Fall Delta Outflow Related Amendments Scenarios.....	7.24-37
7.24-3	SacWAM Results for Average Annual Delta Outflow (TAF): 55 Scenario and Change from 55 Scenario for Interior Delta Flow and Fall Delta Outflow Related Amendments Scenarios.....	7.24-37
7.24-4	SacWAM Results for Average Annual South of Delta Exports (TAF): Baseline and Change from Baseline for Exclusion of Interior Delta Flow and Fall Delta Outflow Related Amendments Scenarios	7.24-39
7.24-5	SacWAM Results for Average Annual South of Delta Exports (TAF): 55 Scenario and Change from 55 Scenario for Exclusion of Interior Delta Flow and Fall Delta Outflow Related Amendments Scenarios	7.24-39
8.2-1	California Gross Domestic Product by Industry Category, 2020	8-3
8.2-2	Agriculture in the California Economy	8-4

8.2-3	Counties Included in the Economic Profile for the Geographic Regions.....	8-4
8.2-4	Population Estimates for the State of California and Geographic Regions of the Study Area, 2010–2016	8-6
8.2-5	Population Projections for State of California and Geographic Regions of the Study Area	8-6
8.2-6	Income, Poverty Rates, and Unemployment Rate, 2015	8-7
8.2-7	CVP and SWP Average Municipal Water Delivery Costs (\$ per acre-foot per year), 2018.....	8-8
8.2-8	Statewide Municipal Water Uses	8-8
8.2-9	Industrial Water Use in California, 2010 (million gallons per day).....	8-10
8.2-10	Primary Manufacturing Sectors in California, 2015	8-12
8.2-11	CVP and SWP Average Agricultural Water Costs (\$ per acre-foot per year).....	8-14
8.2-12	Economic Characteristics of Selected Farming-Dependent Sectors in the Sacramento/Delta, 2015	8-15
8.2-13	Economic Characteristics of Selected Farming-Dependent Sectors in the San Joaquin Valley, 2015.....	8-15
8.2-14	Sacramento/Delta Watershed Employment and Annual Payroll for Selected Sectors, 2015	8-25
8.2-15	Employment and Payroll for Selected Manufacturing Sectors in the Sacramento/Delta, 2015	8-25
8.2-16	San Francisco Bay Area Employment and Annual Payroll for Selected Sectors, 2015.....	8-26
8.2-17	Employment and Payroll for Selected Manufacturing Sectors in the San Francisco Bay Area, 2015	8-27
8.2-18	San Joaquin Valley Employment and Payroll for Selected Sectors, 2015	8-28
8.2-19	Employment and Payroll for Selected Manufacturing Sectors in the San Joaquin Valley, 2015	8-29
8.2-20	Central Coast Employment and Annual Payroll for Selected Sectors, 2015	8-30
8.2-21	Employment and Payroll for Selected Manufacturing Sectors in the Central Coast, 2015.....	8-31
8.2-22	Southern California Employment and Annual Payroll for Selected Sectors, 2015.....	8-32
8.2-23	Employment and Payroll for Selected Manufacturing Sectors in Southern California, 2015	8-33

8.3-1	Residential Daily Use by DWR Hydrologic Region during August (GPCD), 2013–2017	8-39
8.4-1	Total Surface Water Supply for Agriculture in the SWAP Zones of the Sacramento River Watershed, Delta Eastside Tributaries, and Delta Regions, Average and Dry Water Year Types, SWAP Model Inputs for Baseline and Flow Scenarios (thousand acre-feet per year)	8-46
8.4-2	Total Surface Water Supply for Agriculture in the SWAP Zones of the San Joaquin Valley Region, Average and Dry Water Year Types, SWAP Model Inputs for Baseline and Flow Scenarios (thousand acre-feet per year)	8-46
8.4-3	Top-Producing Commodities in the Sacramento/Delta, by Production Revenue, 2011–2016 average	8-47
8.4-4	Average Year: Crop Revenue in the Sacramento/Delta, SWAP Model Analysis, No Replacement Groundwater Pumping (\$)	8-50
8.4-5	Average Year: Crop Revenue in the Sacramento/Delta, SWAP Model Analysis, Maximum Replacement Groundwater Pumping (\$)	8-51
8.4-6	Dry Year: Crop Revenue in the Sacramento/Delta, SWAP Model Analysis, No Replacement Groundwater Pumping (\$)	8-52
8.4-7	Dry Year: Crop Revenue in the Sacramento/Delta, SWAP Model Analysis, Maximum Replacement Groundwater Pumping (\$)	8-53
8.4-8	Top-Producing Commodities in the San Joaquin Valley by Production Revenue, 2011–2016 average	8-55
8.4-9	Average Year: Crop Revenue in the San Joaquin Valley, SWAP Model Analysis, No Replacement Groundwater Pumping (\$)	8-59
8.4-10	Average Year: Crop Revenue in the San Joaquin Valley, SWAP Model Analysis, Maximum Replacement Groundwater Pumping (\$)	8-60
8.4-11	Dry Year: Crop Revenue in the San Joaquin Valley, SWAP Model Analysis, No Replacement Groundwater Pumping (\$)	8-61
8.4-12	Dry Year: Crop Revenue in the San Joaquin Valley, SWAP Model Analysis, Maximum Replacement Groundwater Pumping (\$)	8-62
8.4-13	Top-Producing Commodities in the San Francisco Bay Area, by Production Revenue, 2011–2016 average	8-64
8.4-14	Average Year: Crop Revenue in the San Francisco Bay Area, CASRAA Model Analysis, No Replacement Groundwater Pumping (\$)	8-68
8.4-15	Dry Year: Crop Revenue in the San Francisco Bay Area, CASRAA Model Analysis, No Replacement Groundwater Pumping (\$)	8-69

8.4-16	Top-Producing Commodities in the Central Coast, by Production Revenue, 2011–2016 average	8-70
8.4-17	Average Year: Crop Revenue in the Central Coast, CASRAA Model Analysis, No Replacement Groundwater Pumping (\$)	8-73
8.4-18	Dry Year: Crop Revenue in the Central Coast, CASRAA Model Analysis, No Replacement Groundwater Pumping (\$)	8-74
8.4-19	Top-Producing Commodities in Southern California, by Production Revenue, 2011–2016 average	8-75
8.4-20	Estimated Total Agricultural Water Demand, MWD Member Agencies.....	8-76
8.4-21	Average Year: Crop Revenue in Southern California, CASRAA Model Analysis, No Replacement Groundwater Pumping (\$)	8-78
8.4-22	Dry Year: Crop Revenue in Southern California, CASRAA Model Analysis, No Replacement Groundwater Pumping (\$)	8-79
8.4-23	Summary of IMPLAN-Estimated Regional Economic Effects in the Sacramento/Delta from SWAP-Modeled Changes in Agricultural Production by Flow Scenario	8-85
8.4-24	IMPLAN-Estimated Economic Effects on the Sacramento/Delta Regional Economy Due to SWAP-Modeled Changes in Agricultural Production under the 55 Scenario	8-85
8.4-25	IMPLAN-Estimated Economic Effects on the California Economy from SWAP-Modeled Changes in Agricultural Production by Flow Scenario	8-87
8.4-26	IMPLAN-Estimated Economic Effects on California Statewide Economy Due to SWAP-Modeled Changes in Agricultural Production under the 55 Scenario	8-87
8.4-27	Estimated Change in Agriculture Output, Income, and Jobs for Each Flow Scenario	8-89
8.4-28	Estimated Change in Other Natural Resources and Mining Output, Income, and Jobs for Each Flow Scenario	8-89
8.4-29	Estimated Change in Food Processing Output, Income, and Jobs for Each Flow Scenario	8-90
8.5-1	Lower Bound and Upper Bound Annual Average Supply Needs to Replace Reduction in Sacramento/Delta Supplies for Municipal Use (TAF/yr), and Range of Estimated Costs for Municipalities to Replace Reduced Supply by Region for the 55 Flow Scenario	8-98

8.5-2	Range of Estimated Costs for Municipalities in Sacramento River Watershed to Respond to Reduced Sacramento/Delta Supply and Costs as a Share of Economic Output	8-99
8.5-3	Range of Estimated Costs for Municipalities in Delta Eastside Tributaries to Respond to Reduced Sacramento/Delta Supply and Costs as a Share of Economic Output	8-100
8.5-4	Range of Estimated Costs for Municipalities in the Delta to Respond to Reduced Sacramento/Delta Supply and Costs as a Share of Economic Output	8-101
8.5-5	Range of Estimated Costs for Municipalities in the San Francisco Bay Area to Respond to Reduced Sacramento/Delta Supply and Costs as a Share of Economic Output	8-101
8.5-6	Range of Estimated Costs for Municipalities in the San Joaquin Valley to Respond to Reduced Sacramento/Delta Supply and Costs as a Share of Economic Output	8-102
8.5-7	Range of Estimated Costs for Municipalities in the Central Coast to Respond to Reduced Sacramento/Delta Supply and Costs as a Share of Economic Output	8-102
8.5-8	Range of Estimated Costs for Municipalities in Southern California to Respond to Reduced Sacramento/Delta Supply and Costs as a Share of Economic Output	8-103
8.6-1	California Commercial Troll Chinook Salmon Landings (in number of fish) and Prices by Area of Landing, 1976–2023	8-112
8.6-2	Recreational fishing effort and catch for native species within the Bay-Delta watershed, based on the Central Valley Angler Survey Database	8-120
8.6-3	California Ocean Recreational Chinook Salmon Landings (in number of fish) by Area of Landing, 1976–2023	8-121
8.6-4	Existing Studies that Measure the Public’s Willingness-to-Pay for River Flow and Fish Population Restoration	8-127
8.6-5	Comparison of Special-Status Species Abundance in Bay-Delta Region	8-131
8.6-6	Existing Studies that Measure the Public’s Willingness-to-Pay per Household for Restoration or Protection of Threatened and Endangered Fish Species	8-134
9.3-1	Proposed VA Assets as Modeled	9-5
9.3-2	Summary of VA Tributary Habitat Restoration Commitments by Habitat Type and Watershed	9-9
9.3-3	New Water Projects (before Year 8) Identified in Appendix I of the VA Term Sheet, Thousand Acre-Feet (TAF)	9-13

9.5-1	Change in Shasta Reservoir Average End of Month Storage (TAF and Percent Difference) for All Years and Critical Years.....	9-21
9.5-2	Change in January–June Monthly Average Flow of the Sacramento River below Keswick by Water Year Type (TAF/yr)	9-22
9.5-3	Change in July–December Monthly Average Flow of the Sacramento River below Keswick by Water Year Type (TAF/yr)	9-23
9.5-4	Change in January–June Monthly Inflow for the Sacramento River by Water Year Type (TAF).....	9-24
9.5-5	Change in July–December Monthly Inflow for the Sacramento River by Water Year Type (TAF).....	9-24
9.5-6	Change in January–June Monthly Average Flow for the Sacramento River at Freeport by Water Year Type (TAF/yr)	9-25
9.5-7	Change in July–December Monthly Average Flow for the Sacramento River at Freeport by Water Year Type (TAF/yr)	9-26
9.5-8	Change in January–June Monthly Average Flow over the Tisdale Weir by Water Year Type (TAF/yr).....	9-27
9.5-9	Change in July–December Monthly Average Flow over the Tisdale Weir by Water Year Type (TAF/yr).....	9-27
9.5-10	Change in January–June Monthly Average Flow at Sacramento Slough by Water Year Type (TAF/yr)	9-28
9.5-11	Change in July–December Monthly Average Flow at Sacramento Slough by Water Year Type (TAF/yr)	9-28
9.5-12	Change in Oroville Reservoir Average End of Month Storage (TAF and Percent Difference) for All Years and Critical Years.....	9-29
9.5-13	Change in January–June Monthly Average Flow for the Feather River in the High Flow Channel by Water Year Type (TAF/yr)	9-30
9.5-14	Change in July–December Monthly Average Flow for the Feather River in the High Flow Channel by Water Year Type (TAF/yr)	9-31
9.5-15	Change in January–June Monthly Average Flow for the Feather River above the Sacramento River by Water Year Type (TAF/yr)	9-31
9.5-16	Change in July–December Monthly Average Flow for the Feather River above the Sacramento River by Water Year Type (TAF/yr)	9-32
9.5-17	Change in New Bullards Bar Reservoir Average End of Month Storage (TAF and Percent Difference) for All Years and Critical Years	9-33

9.5-18	Change in January–June Monthly Average Flow for the Yuba River above the Feather River by Water Year Type (TAF/yr)	9-34
9.5-19	Change in July–December Monthly Average Flow for the Yuba River above the Feather River by Water Year Type (TAF/yr)	9-34
9.5-20	Change in Folsom Reservoir End of April and End of September Carryover Storage (TAF and Percent Difference) for All Years and Critical Years.....	9-35
9.5-21	Change in January–June Monthly Average Flow for the American River above the Sacramento River by Water Year Type (TAF/yr)	9-36
9.5-22	Change in July–December Monthly Average Flow for the American River above the Sacramento River by Water Year Type (TAF/yr)	9-36
9.5-23	Change in Camanche Reservoir End of April and End of September Carryover Storage (TAF and Percent Difference) for All Years and Critical Years.....	9-37
9.5-24	Change in January–June Monthly Average Flow for the Mokelumne River above the Confluence with the Cosumnes River by Water Year Type (TAF/yr)	9-38
9.5-25	Change in July–December Monthly Average Flow for the Mokelumne River above the Confluence with the Cosumnes River by Water Year Type (TAF/yr)	9-39
9.5-26	Change in Lake Berryessa End of April and End of September Carryover Storage (TAF and Percent Difference) for All Years and Critical Years	9-40
9.5-27	Change in January–June Monthly Average Flow for Putah Creek above the Yolo Bypass by Water Year Type (TAF/yr)	9-41
9.5-28	Change in July–December Monthly Average Flow for Putah Creek above the Yolo Bypass by Water Year Type (TAF/yr)	9-41
9.5-29	Change in January–June Average Delta Inflow by Water Year Type (TAF/yr) for VA Scenarios Compared with Baseline.....	9-43
9.5-30	Change in January–June Average Delta Inflow by Water Year Type (TAF/yr) for VA Scenarios Compared with the 2008–2009 BiOps Condition.....	9-44
9.5-31	Change in July–December Average Delta Inflow by Water Year Type (TAF/yr) for VA Scenarios Compared with Baseline.....	9-44
9.5-32	Change in July–December Average Delta Inflow by Water Year Type (TAF/yr) for VA Scenarios Compared with the 2008–2009 BiOps Condition.....	9-44
9.5-33	Change in January–June Average South of Delta Exports by Water Year Type (TAF/yr) for the VA Scenarios Compared to Baseline.	9-47
9.5-34	Change in January–June Average South of Delta Exports by Water Year Type (TAF/yr) for the VA Scenarios Compared to the 2008–2009 BiOps Condition	9-48

9.5-35	Change in July–December Average South of Delta Exports by Water Year Type (TAF/yr) for the VA Scenarios Compared to Baseline	9-48
9.5-36	Change in July–December Average South of Delta Exports by Water Year Type (TAF/yr) for the VA Scenarios Compared to the 2008–2009 BiOps Condition	9-48
9.5-37	Annual South of Delta Exports (TAF/yr) for VA Scenarios by Water Year Type Compared with Baseline.	9-49
9.5-38	Annual South of Delta Exports (TAF/yr) for VA Scenarios by Water Year Type Compared with the 2008–2009 BiOps Condition.....	9-49
9.5-39	Exceedance Frequency of Old and Middle River Net Flow (cfs) for December–June under Baseline, 2008–2009 BiOps Condition, VA, and VA High Export Cuts Scenarios	9-51
9.5-40	Change in January–June Monthly Total Delta Outflow by Water Year Type (TAF/yr) for VA Scenarios Compared to Baseline.....	9-54
9.5-41	Change in January–June Monthly Total Delta Outflow by Water Year Type (TAF/yr) for the VA Scenarios Compared to the 2008–2009 BiOps Condition	9-55
9.5-42	Change in July–December Monthly Total Delta Outflow by Water Year Type (TAF/yr) for the VA Scenarios Compared to Baseline	9-55
9.5-43	Change in July–December Monthly Total Delta Outflow by Water Year Type (TAF/yr) for VA Scenarios Compared to the 2008–2009 BiOps Condition.....	9-55
9.5-44	Change in January–June Monthly Total Delta Outflow by Water Year Type (TAF/yr) for VA w/Bias Correction and LSJR Placeholder and VA w/Bias Correction and 40% UF Merced and Stanislaus Scenarios Compared to the 2008–2009 BiOps Condition	9-56
9.5-45	Annual Total Sacramento/Delta Supply under Baseline and Proposed VAs (TAF/yr).....	9-60
9.5-46	Annual Total Sacramento/Delta Supply to the Sacramento/Delta Watershed under Baseline and Proposed VAs (TAF/yr)	9-61
9.5-47	Annual Sacramento/Delta Supply to Agriculture in the Sacramento/Delta Watershed under Baseline and Proposed VAs (TAF/yr).....	9-63
9.5-48	Annual Average Sacramento/Delta Supply to Municipal and Industrial Uses in the Sacramento/Delta Watershed under Baseline and Proposed VAs (TAF/yr).....	9-63
9.5-49	Annual Sacramento/Delta Supply to Wildlife Refuges in the Sacramento/Delta Watershed under Baseline and Proposed VAs (TAF/yr).....	9-64
9.5-50	Annual Sacramento/Delta Supply to the San Joaquin Valley Region (TAF/yr).....	9-66

9.5-51	Annual Sacramento/Delta Supply to Agriculture in the San Joaquin Valley Region (TAF/yr).....	9-67
9.5-52	Annual Sacramento/Delta Supply to Municipal and Industrial Uses in the San Joaquin Valley Region (TAF/yr).....	9-68
9.5-53	Change in Annual Sacramento/Delta Supply to San Francisco Bay Area, Central Coast and Southern California Regions (TAF/y)	9-70
9.5-54	Annual Sacramento/Delta Supply to Agriculture in the San Francisco Bay Area, Central Coast, and Southern California Regions (TAF/yr)	9-71
9.5-55	Annual Sacramento/Delta Supply to Municipal and Industrial uses in the San Francisco Bay Area, Central Coast, and Southern California Regions (TAF/yr)	9-72
9.6-1	Spawning Habitat Results Compared to the VA Term Sheet Commitments and the Habitat Required to Support 25 Percent of the Doubling Goal	9-75
9.6-2	Rearing Habitat (Combined In-Channel and Floodplain) Results Compared to the VA Term Sheet Commitments and the Habitat Required to Support 25 Percent of the Doubling Goal	9-77
9.6-3	Projected Increases in Habitat Area for Delta Smelt, Longfin Smelt, and Salmonids within Relevant Seasons for Each Species	9-79
9.6-4	Frequency of Exceeding Ecological Flow Thresholds within the Seasons Specified in Section 5.4 of the Final Draft Scientific Basis Report Supplement	9-80
9.7-1	SWAP Model Results for Irrigated Crop Acreage in the Sacramento/Delta Watershed, Average Year (acres) a	9-90
9.7-2	SWAP Model Results for Irrigated Crop Acreage, Proposed VAs in the Sacramento/Delta Watershed, Dry Year (acres) a	9-90
9.7-3	SWAP Model Results for Irrigated Crop Acreage in the San Joaquin Valley Region, Average Year (acres) a	9-92
9.7-4	SWAP Model Results for Irrigated Crop Acreage in the San Joaquin Valley Region, Dry Year (acres) a	9-92
9.7-5	Giant Gartersnake Habitat Acreage under the Proposed VAs in the Sacramento/Delta and San Joaquin Valley Regions	9-102
9.7-6	Swainson's Hawk Habitat Acreage under the Proposed VAs in the Sacramento/Delta and San Joaquin Valley Regions	9-102
9.7-7	Greater Sandhill Crane Habitat Acreage under the Proposed VA in the Sacramento/Delta and San Joaquin Valley Regions	9-103
9.7-8	Tricolored Blackbird Habitat Acreage Under the Proposed VAs in the Sacramento/Delta and San Joaquin Valley Regions	9-104

9.7-9	Average Monthly Hydropower Generation by Water Year Type—Baseline and Change from Baseline Expanded to Account for Flow Assets not Simulated by SacWAM	9-124
9.7-10	Greenhouse Gas Emission Factors for Natural Gas Facilities (pounds per megawatt hour).....	9-132
9.7-11	Reduction in Greenhouse Gas Emissions Associated with Increased Hydropower Generation.....	9-132
9.7-12	Changes in High Flows on Voluntary Agreement Tributaries during High Flow Months under the Proposed Voluntary Agreements.....	9-149
9.7-13	Impact and Mitigation Measure Summary—Proposed Voluntary Agreements 1	9-172
9.8-1	Average Year: Crop Revenue in the Sacramento/Delta, SWAP Model Analysis (dollars)a.....	9-193
9.8-2	Dry Year: Crop Revenue in the Sacramento/Delta, SWAP Model Analysis (dollars)a.....	9-193
9.8-3	Average Year: Crop Revenue in the San Joaquin Valley, SWAP Model Analysis (dollars)a.....	9-194
9.8-4	Dry Year: Crop Revenue in the San Joaquin Valley, SWAP Model Analysis (dollars)a.....	9-195
9.8-5	Estimated Economic Effects of the Proposed VAs Compared with Baseline: Modeled Changes in Agricultural Production and Compensated Water Purchases in the Sacramento/Deltaa	9-197
9.8-6	Estimated Economic Effects of the Proposed VAs Compared with Baseline: Modeled Changes in Agricultural Production and Compensated Water Purchases California Statewide a	9-198
9.8-7	Costs to Implement the Proposed VAs: Costs in Planning Agreement (\$ millions)	9-199
9.8-8	Additional Costs to Achieve VAs as Described in VA Term Sheet (\$ millions)	9-199
13.3-1	VA Flow and Non-Flow Commitments	13.3-12
13.3-2	HRL Habitat Restoration Commitments	13.3-21
13.4-1	Tributary-Specific Water Supply Adjustments	13.4-6
13.4-2	Average Total January–June Flow for the American River above the Sacramento River by Water Year Type for the 55 w/WSAs Scenario.....	13.4-16
13.4-3	Average Total July–December Flow for the American River above the Sacramento River by Water Year Type for the 55 w/WSAs Scenario	13.4-16

13.4-4	Average Total Annual Flow for the American River above the Sacramento River by Water Year Type for the 55 w/WSAs Scenario	13.4-17
13.4-5	Average Total January–June Flow for the American River above the Sacramento River by Water Year Type for the VA Scenario.....	13.4-18
13.4-6	Average Total July–December Flow for the American River above the Sacramento River by Water Year Type for the VA Scenario	13.4-18
13.4-7	Average Total Annual Flow for the American River above the Sacramento River by Water Year Type for the VA Scenario	13.4-19
13.4-8	Average Total January–June Flow for the Feather River above the Sacramento River by Water Year Type for the 55 w/WSAs Scenario.....	13.4-20
13.4-9	Average Total July–December Flow for the Feather River above the Sacramento River by Water Year Type for the 55 w/WSAs Scenario.....	13.4-20
13.4-10	Average Total Annual Flow for the Feather River above the Sacramento River by Water Year Type for the 55 w/WSAs Scenario.....	13.4-21
13.4-11	Average Total January–June Flow for the Feather River above the Sacramento River by Water Year Type for the VA Scenario.....	13.4-22
13.4-12	Average Total July–December Flow for the Feather River above the Sacramento River by Water Year Type for the VA Scenario.....	13.4-22
13.4-13	Average Total Annual Flow for the Feather River above the Sacramento River by Water Year Type for the VA Scenario.....	13.4-23
13.4-14	Average Total January–June Flow for the Sacramento River below Keswick by Water Year Type for the 55 w/WSAs Scenario.....	13.4-24
13.4-15	Average Total July–December Flow for the Sacramento River below Keswick by Water Year Type for the 55 w/WSAs Scenario.....	13.4-24
13.4-16	Average Total Annual Flow for the Sacramento River below Keswick by Water Year Type for the 55 w/WSAs Scenario.....	13.4-25
13.4-17	Average Total January–June Flow for the Sacramento River at Freeport by Water Year Type for the 55 w/WSAs Scenario.....	13.4-26
13.4-18	Average Total July–December Flow for the Sacramento River at Freeport by Water Year Type for the 55 w/WSAs Scenario.....	13.4-26
13.4-19	Average Total Annual Flow for the Sacramento River at Freeport by Water Year Type for the 55 w/WSAs Scenario	13.4-27
13.4-20	Average Total January–June Flow for the Sacramento River below Keswick by Water Year Type for the VA Scenario.....	13.4-28

13.4-21	Average Total July–December Flow for the Sacramento River below Keswick by Water Year Type for the VA Scenario.....	13.4-28
13.4-22	Average Total Annual Flow for the Sacramento River below Keswick by Water Year Type for the VA Scenario.....	13.4-29
13.4-23	Average Total January–June Flow for the Sacramento River at Freeport by Water Year Type for the VA Scenario.....	13.4-30
13.4-24	Average Total July–December Flow for the Sacramento River at Freeport by Water Year Type for the VA Scenario.....	13.4-30
13.4-25	Average Total Annual Flow for the Sacramento River at Freeport by Water Year Type for the VA Scenario.....	13.4-30
13.4-26	Average Total January–June Flow for the Yuba River above the Feather River by Water Year Type for the 55 w/WSAs Scenario.....	13.4-31
13.4-27	Average Total July–December Flow for the Yuba River above the Feather River by Water Year Type for the 55 w/WSAs Scenario.....	13.4-32
13.4-28	Average Total Annual Flow for the Yuba River above the Feather River by Water Year Type for the 55 w/WSAs Scenario.....	13.4-32
13.4-29	Average Total January–June Flow for the Yuba River above the Feather River by Water Year Type for the VA Scenario.....	13.4-33
13.4-30	Average Total July–December Flow for the Yuba River above the Feather River by Water Year Type for the VA Scenario.....	13.4-33
13.4-31	Average Total Annual Flow for the Yuba River above the Feather River by Water Year Type for the VA Scenario.....	13.4-34
13.4-32	Average Total January–June Flow for the Bear River above the Feather River by Water Year Type for the 55 w/WSAs Scenario.....	13.4-35
13.4-33	Average Total July–December Flow for the Bear River above the Feather River by Water Year Type for the 55 w/WSAs Scenario.....	13.4-35
13.4-34	Average Total Annual Flow for the Bear River above the Feather River by Water Year Type for the 55 w/WSAs Scenario.....	13.4-36
13.4-35	Average Total January–June Flow for the Mokelumne River above the Confluence with the Cosumnes River by Water Year Type for the 55 w/WSAs Scenario.....	13.4-37
13.4-36	Average Total July–December Flow for the Mokelumne River above the Confluence with the Cosumnes River by Water Year Type for the 55 w/WSAs Scenario.....	13.4-38

13.4-37	Average Total Annual Flow for the Mokelumne River above the Confluence with the Cosumnes River by Water Year Type for the 55 w/WSAs Scenario	13.4-38
13.4-38	Average Total January–June Flow for the Mokelumne River above the Confluence with the Cosumnes River by Water Year Type for the VA Scenario.....	13.4-39
13.4-39	Average Total July–December Flow for the Mokelumne River above the Confluence with the Cosumnes River by Water Year Type for the VA Scenario.....	13.4-39
13.4-40	Average Total Annual Flow for the Mokelumne River above the Confluence with the Cosumnes River by Water Year Type for the VA Scenario.....	13.4-40
13.4-41	Average Total January–June Flow for the Calaveras River Inflow to the Delta by Water Year Type for the 55 w/WSAs Scenario.....	13.4-41
13.4-42	Average Total July–December Flow for the Calaveras River Inflow to the Delta by Water Year Type for the 55 w/WSAs Scenario.....	13.4-41
13.4-43	Average Total Annual Flow for the Calaveras River Inflow to the Delta by Water Year Type for the 55 w/WSAs Scenario.....	13.4-42
13.4-44	Average Total January–June Flow for Putah Creek above the Yolo Bypass by Water Year Type for the 55 w/WSAs Scenario.....	13.4-43
13.4-45	Average Total July–December Flow for Putah Creek above the Yolo Bypass by Water Year Type for the 55 w/WSAs Scenario.....	13.4-43
13.4-46	Average Total Annual Flow for Putah Creek above the Yolo Bypass by Water Year Type for the 55 w/WSAs Scenario.....	13.4-44
13.4-47	Average Total January–June Flow for Putah Creek above the Yolo Bypass by Water Year Type for the VA Scenario.....	13.4-45
13.4-48	Average Total July–December Flow for Putah Creek above the Yolo Bypass by Water Year Type for the VA Scenario.....	13.4-45
13.4-49	Average Total Annual Flow for Putah Creek above the Yolo Bypass by Water Year Type for the VA Scenario.....	13.4-46
13.4-50	Average Total January–June Flow for Cache Creek above the Yolo Bypass by Water Year Type for the 55 w/WSAs Scenario.....	13.4-47
13.4-51	Average Total July–December Flow for Cache Creek above the Yolo Bypass by Water Year Type for the 55 w/WSAs Scenario.....	13.4-47
13.4-52	Average Total Annual Flow for Cache Creek above the Yolo Bypass by Water Year Type for the 55 w/WSAs Scenario.....	13.4-48
13.4-53	Average Total January–June Flow for Yolo Bypass below Putah Creek Inflow by Water Year Type for the 55 w/WSAs Scenario.....	13.4-52

13.4-54	Average Total July–December Flow for Yolo Bypass below Putah Creek Inflow by Water Year Type for the 55 w/WSAs Scenario.....	13.4-52
13.4-55	Average Total Annual Flow for Yolo Bypass below Putah Creek Inflow by Water Year Type for the 55 w/WSAs Scenario.....	13.4-53
13.4-56	Average Total January–June Flow over the Tisdale Weir by Water Year Type for the 55 w/WSAs Scenario	13.4-54
13.4-57	Average Total July–December Flow over the Tisdale Weir by Water Year Type for the 55 w/WSAs Scenario	13.4-54
13.4-58	Average Total Annual Flow over the Tisdale Weir by Water Year Type for the 55 w/WSAs Scenario	13.4-55
13.4-59	Average Total January–June Flow at Sacramento Slough by Water Year Type for the 55 w/WSAs Scenario	13.4-56
13.4-60	Average Total July–December Flow at Sacramento Slough by Water Year Type for the 55 w/WSAs Scenario.....	13.4-56
13.4-61	Average Total Annual Flow at Sacramento Slough by Water Year Type for the 55 w/WSAs Scenario	13.4-57
13.4-62	Average Total January–June Flow for Yolo Bypass below Putah Creek Inflow by Water Year Type for the VA Scenario.....	13.4-58
13.4-63	Average Total January–June Flow for Yolo Bypass below Putah Creek Inflow by Water Year Type for the VA Scenario.....	13.4-58
13.4-64	Average Total Annual Flow for Yolo Bypass below Putah Creek Inflow by Water Year Type for the VA Scenario.....	13.4-59
13.4-65	Average Total January–June Flow over the Tisdale Weir by Water Year Type for the VA Scenario	13.4-60
13.4-66	Average Total July–December Flow over the Tisdale Weir by Water Year Type for the VA Scenario	13.4-60
13.4-67	Average Total Annual Flow over the Tisdale Weir by Water Year Type for the VA Scenario.....	13.4-60
13.4-68	Average Total January–June Flow at Sacramento Slough by Water Year Type for the VA Scenario	13.4-61
13.4-69	Average Total July–December Flow at Sacramento Slough by Water Year Type for the VA Scenario.....	13.4-61
13.4-70	Average Total Annual Flow at Sacramento Slough by Water Year Type for the VA Scenario	13.4-62

13.4-71	Average Total January–June Delta Inflow by Water Year Type for the 55 w/WSAs Scenario	13.4-63
13.4-72	Average Total July–December Delta Inflow by Water Year Type for the 55 w/WSAs Scenario	13.4-63
13.4-73	Average Total Annual Delta Inflow by Water Year Type for the 55 w/WSAs Scenario	13.4-64
13.4-74	Average Total January–June Delta Inflow by Water Year Type for the VA Scenario	13.4-65
13.4-75	Average Total July–December Delta Inflow by Water Year Type for the VA Scenario	13.4-65
13.4-76	Average Total Annual Delta Inflow by Water Year Type for the VA Scenario	13.4-65
13.4-77	Average Total January–June South of Delta Exports by Water Year Type for the 55 w/WSAs Scenario	13.4-66
13.4-78	Average Total July–December South of Delta Exports by Water Year Type for the 55 w/WSAs Scenario	13.4-67
13.4-79	Average Total Annual South of Delta Exports by Water Year Type for the 55 w/WSAs Scenario	13.4-67
13.4-80	Average Total January–June South of Delta Exports by Water Year Type for the VA Scenario	13.4-68
13.4-81	Average Total July–December South of Delta Exports by Water Year Type for the VA Scenario	13.4-68
13.4-82	Average Total Annual South of Delta Exports by Water Year Type for the VA Scenario	13.4-69
13.4-83	Frequency of Months Exceeding Old and Middle River Net Flow thresholds for December–June under Baseline and 55 w/WSAs	13.4-70
13.4-84	Frequency of Months Exceeding Old and Middle River Net Flow thresholds for December–June under Baseline and VA Scenarios	13.4-72
13.4-85	Potential Flow Contributions from the Tuolumne VA and 2018 LSJR 40% Unimpaired Flow Alternative	13.4-74
13.4-86	Average Total January–June Delta Outflow by Water Year Type for the 55 w/WSAs Scenario	13.4-75
13.4-87	Average Total July–December Delta Outflow by Water Year Type for the 55 w/WSAs Scenario	13.4-75

13.4-88	Average Total Annual Delta Outflow by Water Year Type for the 55 w/WSAs Scenario	13.4-76
13.4-89	Average Total January–June Delta Outflow by Water Year Type for the VA Scenario	13.4-77
13.4-90	Average Total July–December Delta Outflow by Water Year Type for the VA Scenario	13.4-77
13.4-91	Average Total Annual Delta Outflow by Water Year Type for the VA Scenario	13.4-78
13.4-92	Average End-of-April Storage and Percent Differences from Baseline in Rim Reservoirs in the 55 w/WSAs Scenario for All Years	13.4-82
13.4-93	Average End-of-April Storage and Percent Differences from Baseline in Rim Reservoirs in the 55 w/WSAs Scenario for Critical Years	13.4-83
13.4-94	Average Carryover Storage and Percent Differences from Baseline in Rim Reservoirs in the 55 w/WSAs Scenario for All Years	13.4-83
13.4-95	Average Carryover Storage and Percent Differences from Baseline in Rim Reservoirs in the 55 w/WSAs Scenario for Critical Years	13.4-84
13.4-96	Average End-of-April Storage and Percent Differences from Baseline in Rim Reservoirs in the VA Scenario for All Years	13.4-97
13.4-97	Average End-of-April Storage and Percent Differences from Baseline in Rim Reservoirs in the VA Scenario for Critical Years	13.4-97
13.4-98	Average Carryover Storage and Percent Differences from Baseline in Rim Reservoirs in the VA Scenario for All Years	13.4-97
13.4-99	Average Carryover Storage and Percent Differences from Baseline in Rim Reservoirs in the VA Scenario for Critical Years	13.4-97
13.4-100	Average End-of-September Watershed Total Storage for Baseline (thousand acre-feet) and Percent Difference from Baseline	13.4-105
13.4-101	Average Critical Year End-of-September Watershed Total Storage for Baseline (thousand acre-feet) and Percent Difference from Baseline	13.4-105
13.4-102	Average End-of-September Watershed Total Storage for Baseline (thousand acre-feet) and Percent Difference from Baseline	13.4-106
13.4-103	Average Critical Year End-of-September Watershed Total Storage for Baseline (thousand acre-feet) and Percent Difference from Baseline	13.4-106
13.4-104	Annual Average Water Supplied to Each Region in the Study Area (TAF/yr)	13.4-111
13.4-105	Average Annual Total Sacramento/Delta Supply by Water Year Type for the 55 w/WSAs Scenario	13.4-113

13.4-106	Average Annual Sacramento/Delta Supply by Water Year Type for the VA Scenario	13.4-114
13.4-107	Average Annual Total Sacramento/Delta Supply to the Sacramento River Watershed by Water Year Type for the 55 w/WSAs Scenario	13.4-115
13.4-108	Average Annual Sacramento/Delta Supply to Agriculture in the Sacramento River Watershed by Water Year Type for the 55 w/WSAs Scenario	13.4-116
13.4-109	Average Annual Sacramento/Delta Supply to Municipal and Industrial Use in the Sacramento River Watershed by Water Year for the 55 w/WSAs Scenario	13.4-117
13.4-110	Average Annual Sacramento/Delta Supply to Wildlife Refuges in the Sacramento River Watershed Water Year Type for the 55 w/WSAs Scenario.....	13.4-118
13.4-111	Average Annual Total Sacramento/Delta Supply to the Sacramento River Watershed by Water Year Type for the VA Scenarios	13.4-119
13.4-112	Average Annual Sacramento/Delta Supply to Agriculture in the Sacramento River Watershed by Water Year Type for the VA Scenarios	13.4-120
13.4-113	Average Annual Sacramento/Delta Supply to Municipal and Industrial Use in the Sacramento River Watershed by Water Year Type for the VA Scenario.....	13.4-121
13.4-114	Average Annual Sacramento/Delta Supply to Wildlife Refuges in the Sacramento River Watershed by Water Year Type for VA Scenario	13.4-122
13.4-115	Average Annual Total Sacramento/Delta Supply to the Delta Eastside Tributaries Region by Water Year Type for the 55 w/WSAs Scenario.....	13.4-123
13.4-116	Average Annual Sacramento/Delta Supply to Agriculture in the Delta Eastside Tributaries Region by Water Year Type for the 55 w/WSAs Scenario	13.4-124
13.4-117	Average Annual Sacramento/Delta Supply to Municipal and Industrial Use in the Delta Eastside Tributaries Region by Water Year Type for the 55 w/WSAs Scenario	13.4-124
13.4-118	Average Annual Total Sacramento/Delta Supply to the Delta Eastside Tributaries Region by Water Year Type for the VA Scenario	13.4-125
13.4-119	Average Annual Sacramento/Delta Supply to Agriculture in the Delta Eastside Tributaries Region by Water Year Type for the VA Scenario	13.4-126
13.4-120	Average Annual Sacramento/Delta Supply to Municipal and Industrial Use in the Delta Eastside Tributaries Region by Water Year Type for the VA Scenario.....	13.4-126
13.4-121	Average Annual Total Sacramento/Delta Supply to the Delta Region by Water Year Type for the 55 w/WSAs Scenario.....	13.4-128
13.4-122	Average Annual Sacramento/Delta Supply to Agriculture in the Delta Region by Water Year Type for the 55 w/WSAs Scenario.....	13.4-128

13.4-123	Average Annual Sacramento/Delta Supply to Municipal and Industrial Use in the Delta Region by Water Year Type for the 55 w/WSAs Scenario	13.4-128
13.4-124	Average Annual Total Sacramento/Delta Supply to the Delta Region by Water Year Type for the VA Scenario	13.4-129
13.4-125	Average Annual Sacramento/Delta Supply to Agriculture in the Delta Region by Water Year Type for the VA Scenario	13.4-129
13.4-126	Average Annual Sacramento/Delta Supply to Municipal and Industrial Use in the Delta Region by Water Year Type for the VA Scenario	13.4-130
13.4-127	Average Annual Total Sacramento/Delta Supply to the San Joaquin Valley Region by Water Year Type for the 55 w/WSAs Scenario	13.4-132
13.4-128	Average Annual Sacramento/Delta Supply to Agriculture in the San Joaquin Valley Region by Water Year Type for the 55 w/WSAs Scenario	13.4-133
13.4-129	Average Annual Sacramento/Delta Supply to Municipal and Industrial Use in the San Joaquin Valley Region by Water Year Type for the 55 w/WSAs Scenario	13.4-134
13.4-130	Average Annual Sacramento/Delta Supply to Wildlife Refuges in the San Joaquin Valley Region by Water Year Type for the 55 w/WSAs Scenario	13.4-135
13.4-131	Average Annual Total Sacramento/Delta Supply to the San Joaquin Valley Region by Water Year Type for the VA Scenario	13.4-136
13.4-132	Average Annual Sacramento/Delta Supply to Agriculture in the San Joaquin Valley Region by Water Year Type for the VA Scenario	13.4-137
13.4-133	Average Annual Sacramento/Delta Supply to Municipal and Industrial Use in the San Joaquin Valley Region by Water Year Type for the VA Scenario	13.4-138
13.4-134	Average Annual Sacramento/Delta Supply to Wildlife Refuges in the San Joaquin Valley Region by Water Year Type for the VA Scenario	13.4-139
13.4-135	Average Annual Total Sacramento/Delta Supply to the San Francisco Bay Area Region by Water Year Type for the 55 w/WSAs Scenario	13.4-141
13.4-136	Average Annual Sacramento/Delta Supply to Agriculture in the San Francisco Bay Area Region by Water Year Type for the 55 w/WSAs Scenario	13.4-142
13.4-137	Average Annual Sacramento/Delta Supply to Municipal and Industrial Use in the San Francisco Bay Area Region by Water Year Type for the 55 w/WSAs Scenario	13.4-142
13.4-138	Average Annual Total Sacramento/Delta Supply to the San Francisco Bay Area Region by Water Year Type for the VA Scenario	13.4-143
13.4-139	Average Annual Sacramento/Delta Supply to Agriculture in the San Francisco Bay Area Region by Water Year Type for the VA Scenario	13.4-143

13.4-140	Average Annual Sacramento/Delta Supply to Municipal and Industrial Use in the San Francisco Bay Area Region by Water Year Type for the VA Scenario	13.4-144
13.4-141	Average Annual Total Sacramento/Delta Supply to the Central Coast Region by Water Year Type for the 55 w/WSAs Scenario	13.4-145
13.4-142	Average Annual Sacramento/Delta Supply to Agriculture in the Central Coast Region by Water Year Type for the 55 w/WSAs Scenario	13.4-146
13.4-143	Average Annual Sacramento/Delta Supply to Municipal and Industrial Use in the Central Coast Region by Water Year Type for the 55 w/WSAs Scenario	13.4-146
13.4-144	Average Annual Total Sacramento/Delta Supply to the Central Coast Region by Water Year Type for the VA Scenario	13.4-147
13.4-145	Average Annual Sacramento/Delta Supply to Agriculture in the Central Coast Region by Water Year Type for the VA Scenario	13.4-147
13.4-146	Average Annual Sacramento/Delta Supply to Municipal and Industrial Use in the Central Coast Region by Water Year Type for the VA Scenario	13.4-148
13.4-147	Average Annual Total Sacramento/Delta Supply to the Southern California Region by Water Year Type for the 55 w/WSAs Scenario	13.4-149
13.4-148	Average Annual Sacramento/Delta Supply to Agriculture in the Southern California Region by Water Year Type for the 55 w/WSAs Scenario	13.4-150
13.4-149	Average Annual Sacramento/Delta Supply to Municipal and Industrial Use in the Southern California Region by Water Year Type for the 55 w/WSAs Scenario	13.4-150
13.4-150	Average Annual Total Sacramento/Delta Supply to the Southern California Region by Water Year Type for the VA Scenario	13.4-151
13.4-151	Average Annual Sacramento/Delta Supply to Agriculture in the Southern California Region by Water Year Type for the VA Scenario	13.4-151
13.4-152	Average Annual Sacramento/Delta Supply to Municipal and Industrial Use in the Southern California Region by Water Year Type for the VA Scenario	13.4-152
13.4-153	Average Annual Groundwater Use by Geographic Region and Sector, 2005–2015 (thousand acre-feet)	13.4-153
13.4-154	Average Total January–June Delta Inflow Baseline and Change from Baseline (TAF) by Water Year Type for 2025 ROD/ITP Scenarios	13.4-160
13.4-155	Average Total July–December Delta Inflow Baseline and Change from Baseline (TAF) by Water Year Type for 2025 ROD/ITP Scenarios	13.4-160
13.4-156	Average Total Annual Delta Inflow Baseline and Change from Baseline (TAF) by Water Year Type for 2025 ROD/ITP Scenarios	13.4-160

13.4-157	Average Total January–June CVP South of Delta Exports Baseline and Change from Baseline (TAF) by Water Year Type for 2025 ROD/ITP Scenarios (Including Postprocessing of Additional CVP Export Effects Associated with 2025 ROD)	13.4-162
13.4-158	Average Total July–December CVP South of Delta Exports Baseline and Change from Baseline (TAF) by Water Year Type for 2025 ROD/ITP Scenarios.....	13.4-162
13.4-159	Average Total Annual CVP South of Delta Exports Baseline and Change from Baseline (TAF) by Water Year Type for 2025 ROD/ITP Scenarios (Including Postprocessing of Additional CVP Export Effects Associated with 2025 ROD)	13.4-162
13.4-160	Average Total January–June SWP South of Delta Exports Baseline and Change from Baseline (TAF) by Water Year Type for 2025 ROD/ITP Scenarios.....	13.4-163
13.4-161	Average Total July–December SWP South of Delta Exports Baseline and Change from Baseline (TAF) by Water Year Type for 2025 ROD/ITP Scenarios.....	13.4-163
13.4-162	Average Total Annual SWP South of Delta Exports Baseline and Change from Baseline (TAF) by Water Year Type for 2025 ROD/ITP Scenarios.....	13.4-163
13.4-163	Average Total January–June Delta Outflow Baseline and Change from Baseline (TAF) by Water Year Type for 2025 ROD/ITP Scenarios (Including Postprocessing of Additional CVP Export Effects Associated with 2025 ROD).....	13.4-164
13.4-164	Average Total July–December Delta Outflow Baseline and Change from Baseline (TAF) by Water Year Type for 2025 ROD/ITP Scenarios	13.4-165
13.4-165	Average Total Annual Delta Outflow Baseline and Change from Baseline (TAF) by Water Year Type for 2025 ROD/ITP Scenarios (Including Postprocessing of Additional CVP Export Effects Associated with 2025 ROD).....	13.4-165
13.4-166	Average Annual Total Sacramento/Delta Supply by Water Year Type for 2025 ROD/ITP Scenarios.....	13.4-166
13.4-167	Average Annual Total Sacramento/Delta Supply to Agriculture by Water Year Type for 2025 ROD/ITP Scenarios	13.4-166
13.4-168	Average Annual Total Sacramento/Delta Supply to Municipal and Industrial Use by Water Year Type for 2025 ROD/ITP Scenarios	13.4-167
13.4-169	Average Annual Total Sacramento/Delta Supply to Wildlife Refuges by Water Year Type for 2025 ROD/ITP Scenarios	13.4-167
13.5-1	Ecological Flow Thresholds used to Evaluate Benefits to Native Indicator Aquatic Species Populations.....	13.5-5
13.5-2	Change in Median (across All Years Modeled) Spawning Habitat from Baseline	13.5-7
13.5-3	Change in Median (across All Years Modeled) Rearing Habitat from Baseline	13.5-8

13.5-4	Percent of Years in Which Meaningful Floodplain Events Are Attained in Each Tributary for 25% of the Doubling Goal Habitat Area (or 25% of the Maximum Habitat Area if no Doubling Goal Was Available).....	13.5-10
13.5-5	Frequency of Exceeding Ecological Flow Thresholds within the Seasons Specified in Table 13.5-1	13.5-13
13.5-6	Spawning Habitat Results Compared to the HRL Habitat Commitments and the Habitat Required to Support 25 Percent of the Doubling Goal	13.5-16
13.5-7	Rearing Habitat (Combined In-Channel and Floodplain) Results Compared to the HRL Habitat Commitments and the Habitat Required to Support 25 Percent of the Doubling Goal.....	13.5-17
13.5-8	Frequency of Exceeding Ecological Flow Thresholds within the Seasons Specified in Table 13.5-1	13.5-20
13.7.4-1	Change from Baseline Conditions: Annual Average Sacramento/Delta Supply for Agricultural Use by Region and Pathway (thousand acre-feet per year)	13.7-36
13.7.4-2	Annual Average Sacramento/Delta Supply to Agriculture in the Sacramento River Watershed, Delta, and Delta Eastside Tributaries Regions: Change from Baseline (thousand acre-feet per year).....	13.7-38
13.7.4-3	Annual Average Sacramento/Delta Supply to Agriculture in the San Joaquin Valley Region: Change from Baseline (thousand acre-feet per year)	13.7-40
13.7.4-4	Annual Average Sacramento/Delta Supply to Agriculture in the San Francisco Bay Area, Central Coast, Southern California Regions: Change from Baseline (thousand acre-feet per year)	13.7-42
13.7.6.1-1	Change from Baseline Conditions: Annual Average Sacramento/Delta Supply for Agricultural Use by Region and Pathway (thousand acre-feet per year)	13.7-54
13.7.6.2-1	Summary of Potential Effects of 55 w/WSAs and VA Scenarios on All Races of Chinook Salmon on the Sacramento River	13.7-82
13.7.6.2-2	Summary of Potential Effects of 55 w/WSAs and VA Scenarios on Central Valley Steelhead and Green Sturgeon on the Sacramento River	13.7-83
13.7.6.2-3	Summary of Potential Effects of 55 w/WSAs and VA Scenarios on Winter-Run and Fall-Run Chinook Salmon and Central Valley Steelhead on the American River.....	13.7-84
13.7.6.2-4	Summary of Potential Effects of 55 w/WSAs and VA Scenarios on Winter-Run, Spring-Run, and Fall-Run Chinook Salmon on the Feather River	13.7-87
13.7.6.2-5	Summary of Potential Effects of 55 w/WSAs and VA Scenarios on Central Valley Steelhead and Green Sturgeon on the Feather River	13.7-88

13.7.6.2-6	Summary of Potential Effects of 55 w/WSAs and VA Scenarios on Spring-Run and Fall-Run Chinook Salmon on the Yuba River	13.7-90
13.7.6.2-7	Summary of Potential Effects of 55 w/WSAs and VA Scenarios on Central Valley Steelhead and Green Sturgeon on the Yuba River	13.7-90
13.7.12.1-1	Average Monthly Flow at Downstream Ends of Cache Creek and Putah Creek, and Yolo Bypass below Putah Creek Inflow during High-Flow Months—Percent Change from Baseline.....	13.7-147
13.7.12.1-2	Cumulative Distribution of Monthly Average Delta Outflow Simulated by SacWAM – Baseline and Changes from Baseline for WY 1923–2021	13.7-160
13.7.12.1-3	Changes in Flow (cfs) (90th Percentile) on Clear Creek during High Flow Months under the 55 w/WSAs Scenario.....	13.7-168
13.7.12.2-1	Change from Baseline Conditions: Annual Average Total Sacramento/Delta Supply by Region and Pathway (thousand acre-feet per year).....	13.7-173
13.7.20-1	Change from Baseline Conditions: Annual Average Sacramento/Delta Supply for Municipal Use by Region and Pathway (thousand acre-feet per year).....	13.7-194
13.7.20-2	Annual Average Sacramento/Delta Supply to Municipal and Industrial Uses in the Sacramento River Watershed, Delta, and Delta Eastside Tributaries Regions: Change from Baseline (thousand acre-feet per year)	13.7-195
13.7.20-3	Annual Average Sacramento/Delta Supply to Municipal and Industrial Uses in the San Joaquin Valley Region: Change from Baseline (thousand acre-feet per year).....	13.7-196
13.7.20-4	Annual Average Sacramento/Delta Supply to Municipal and Industrial Uses in the San Francisco Bay Area, Central Coast, and Southern California Regions: Change from Baseline (thousand acre-feet per year)	13.7-197
13.7.22-1	Impact and Mitigation Measure Summary—Changes to Hydrology and Supply.....	13.7-225
13.7.22-2	Impact and Mitigation Measure Summary— Habitat Restoration and Other Ecosystem Projects.....	13.7-251
13.7.22-3	Impact and Mitigation Measure Summary— New or Modified Facilities.....	13.7-285
13.8-1	Change from Baseline Conditions: Annual Average Sacramento/Delta Supply for Agricultural Use by Region and Pathway (thousand acre-feet per year).....	13.8-3
13.8-2	Change from Baseline Conditions: Annual Average Sacramento/Delta Supply for Municipal Use by Region and Pathway (thousand acre-feet per year).....	13.8-13
13.8-3	Upper Bound Annual Average Supply Needs to Replace Reduction in Sacramento/Delta Supplies for Municipal Use (TAF/yr), and Surrogate Estimated Costs for Municipalities to Replace Reduced Supply by Region	13.8-15

13.8-4	Summary of Other Water Management Actions and Relative Cost Information	13.8-24
13.8-5	Summary of Habitat Restoration and Other Ecosystem Projects and Relative Cost Information.....	13.8-26
13.8-6	Summary of New or Modified Facilities and Relative Cost Information	13.8-27

Volume 1

Figures

Figure	Page
1-1a	Sacramento/Delta Tributaries follow page 1-22
1-1b	Plan Area follow page 1-23
1-1c	Study Area Geographic Regions follow page 1-23
2.1-1	Quartile Distributions of Natural and Unimpaired Flows at Two Sample Rim Dam Locations, as Estimated by the California Department of Water Resources 2-3
2.1-2	Quartile Distributions of the California Department of Water Resources Estimates of Historical, Natural, and Unimpaired Delta Inflow 2-4
2.1-3	Quartile Distributions of the California Department of Water Resources Estimates of Historical, Natural, and Unimpaired Delta Outflow 2-4
2.1-4	Major Sacramento/Delta Tributaries and Watersheds 2-7
2.1-5	Elevation Map of Northern California 2-8
2.1-6	Annual Precipitation in Northern California 2-9
2.1-7	Water Year Type Snow Water Equivalents 2-10
2.1-8	Generalized Geologic Map of the Valley Floor 2-12
2.1-9	C2VSim Model Groundwater Subregions 2-13
2.1-10	Simulated Impaired Flows as a Percentage of Unimpaired Flows Ranked by Water Year Index for the Sacramento River, Its Major Tributaries, and Delta Eastside Tributaries for January–June 2-19
2.2-1	Quartile Distributions of U.S. Bureau of Reclamation Estimates of Historical and Unimpaired Shasta Reservoir Inflow 2-20
2.2-2	Annual Total Observed Imports from the Trinity River to the Sacramento Watershed via the Clear Creek Tunnel for Water Years 1986 through 2021 2-21
2.2-3	Sacramento River below Keswick Reservoir Simulated Current Conditions (gray) and Unimpaired (white) Monthly Flows 2-23
2.2-4	Daily Hydrograph of the Sacramento River below Keswick Reservoir for Water Year 2011 with Unimpaired Flow and Observed Flow 2-25
2.2-5	Daily Hydrograph of the Sacramento River below Keswick Reservoir for Water Year 2007 with Unimpaired Flow and Observed Flow 2-26

2.2-6	Sacramento River at Freeport Simulated Current Conditions (gray) and Unimpaired (white) Monthly Flows	2-27
2.2-7	Battle Creek Simulated Current Conditions (gray) and Unimpaired (white) Monthly Flows	2-30
2.2-8	Cow Creek Simulated Current Conditions (gray) and Unimpaired (white) Monthly Flows	2-32
2.2-9	Antelope Creek Simulated Current Conditions (gray) and Unimpaired (white) Monthly Flows	2-35
2.2-10	Deer Creek Simulated Current Conditions (gray) and Unimpaired (white) Monthly Flows	2-38
2.2-11	Mill Creek Simulated Current Conditions (gray) and Unimpaired (white) Monthly Flows.....	2-41
2.2-12	Clear Creek Simulated Current Conditions (gray) and Unimpaired (white) Monthly Flows	2-44
2.2-13	Butte Creek Simulated Current Conditions (gray) and Unimpaired (white) Monthly Flows	2-47
2.2-14	Feather River above Confluence with the Yuba River Simulated Current Conditions (gray) and Unimpaired (white) Monthly Flows	2-51
2.2-15	Feather River at Confluence with the Sacramento River Simulated Current Conditions (gray) and Unimpaired (white) Monthly Flows	2-53
2.2-16	Yuba River Simulated Current Conditions (gray) and Unimpaired (white) Monthly Flows.....	2-57
2.2-17	Bear River Simulated Current Conditions (gray) and Unimpaired (white) Monthly Flows.....	2-59
2.2-18	American River Simulated Current Conditions (gray) and Unimpaired (white) Monthly Flows	2-62
2.2-19	Mokelumne River Simulated Current Conditions (gray) and Unimpaired (white) Monthly Flows	2-65
2.2-20	Cosumnes River Simulated Current Conditions (gray) and Unimpaired (white) Monthly Flows	2-68
2.2-21	Calaveras River Simulated Current Conditions (gray) and Unimpaired (white) Monthly Flows	2-71
2.2-22	Stony Creek Simulated Current Conditions (gray) and Unimpaired (white) Monthly Flows	2-73

2.2-23	Cottonwood Creek Simulated Current Conditions (gray) and Unimpaired (white) Monthly Flows	2-75
2.2-24	Thomes Creek Simulated Current Conditions (gray) and Unimpaired (white) Monthly Flows	2-77
2.2-25	Cache Creek Simulated Current Conditions (gray) and Unimpaired (white) Monthly Flows	2-80
2.2-26	Putah Creek Simulated Current Conditions (gray) and Unimpaired (white) Monthly Flows	2-83
2.3-1	Flood Control Facilities in the Sacramento River, Sutter and Yolo Bypasses, and Major Tributaries in the Sacramento River Basin	2-86
2.3-2	Sutter Bypass Simulated Current Conditions (gray) and Unimpaired (white) Monthly Flows	2-89
2.3-3	Yolo Bypass Simulated Current Conditions (gray) and Unimpaired (white) Monthly Flows	2-93
2.4-1	Generalized Delta Map.....	2-96
2.4-2	Delta Inflow Simulated Current Conditions (gray) and Unimpaired (white) Monthly Flows	2-98
2.4-3	Flow Direction in the South Delta showing the natural east-to-west flow pattern in the pane on the left and a typical summer flow pattern under current conditions on the right	2-101
2.4-4	Total Seasonal SWP and CVP South Delta Exports by Decade	2-104
2.4-5	Cumulative Probability of OMR Flows.....	2-105
2.4-6	Delta Tidal Flows over a 25-Hour Cycle in Summer Conditions (values in cubic feet per second)	2-107
2.4-7	Seasonal Net Delta Outflow Index by Decade.....	2-109
2.4-8	Delta Outflow Simulated Current Conditions (gray) and Unimpaired (white) Monthly Flows	2-109
2.4-9	Time Series of X2 (thin line, left axis, scale reversed) and Outflow (heavy line, right axis, log scale), Annual Averages for January to June.....	2-112
2.4-10	Cumulative Probability of Daily X2 Locations.....	2-113
2.4-11	Exceedance Frequency Distribution of Daily X2 Positions	2-114
2.4-12	Time Series of Fall X2 since 1967	2-115

2.4-13	Dayflow Flow-Based Estimation of X2 and California Data Exchange Center Water-Quality Based X2 Values.....	2-115
2.8-1a	Plan Area and Study Area Geographic Regions.....	follows page 2-125
2.8-1b	Study Area Geographic Regions and DWR Hydrologic Regions	follows page 2-125
2.8-2	Population Centers in the Study Area	follows page 2-125
2.8-3a	Conveyances and Facilities (northern)	follows page 2-125
2.8-3b	Conveyances and Facilities (San Francisco Bay Area)	follows page 2-125
2.8-3c	Conveyances and Facilities (southern)	follows page 2-125
3.2-1	Variation in the Position and Extent of Low Salinity Habitat as a Function of X2	3-9
3.4-1	California Commercial and Recreational Chinook Salmon Ocean Catch, 1975– 2014 with 40-Year Mean (gray line)	3-17
3.4-2	Annual Winter-Run Chinook Salmon Escapement from the Sacramento River Basin from 1975 to 2014 and the 40-Year Mean Population Size (gray line)	3-26
3.4-3	Estimated Yearly Adult Natural Production and In-River Adult Escapement of Winter-Run Chinook Salmon in Central Valley Rivers and Streams	3-26
3.4-4	Annual Spring-Run Chinook Salmon Escapement to Sacramento River Tributaries from 1975 to 2014 and the 40-Year Mean (gray line).....	3-28
3.4-5	Estimated Yearly Adult Natural Production and In-River Adult Escapement of Spring-Run Chinook Salmon in the Central Valley Rivers and Streams.....	3-28
3.4-6	Estimated Yearly Adult Natural Production and In-River Adult Escapement of Late-Fall-Run Chinook Salmon in Central Valley Rivers and Streams	3-30
3.4-7	Annual Late-Fall-Run Chinook Salmon Escapement to the Sacramento River Watershed from 1975 to 2014 and 40-Year Mean (gray line)	3-30
3.4-8	San Joaquin River Basin Smolt Emigration Pattern (1988–2004).....	3-32
3.4-9	Annual Fall-Run Chinook Salmon Escapement to the Sacramento River Watershed from 1975 to 2014 and 40-Year Mean (gray line)	3-33
3.4-10	Estimated Yearly Adult Natural Production and In-River Adult Escapement of Fall-Run Chinook Salmon in the Mainstem Sacramento River.....	3-33
3.4-11	Estimated Yearly Natural Production and Instream Escapement of San Joaquin Adult Fall-Run Chinook Salmon	3-34

3.4-12	Mean Catch of Unmarked Chinook Salmon Smolt per Cubic Meter (x 1,000) in the Midwater Trawl at Chipps Island between April and June versus Mean Daily Sacramento River Flow (cfs) at Rio Vista between April and June from (a) 1978 through 1997 and (b) 1976 through 2015.....	3-49
3.4-13	Relationship between the Mean Proportion of Flow Diverted into the Interior Delta in January and the Proportion of Juvenile Winter-Run Lost at the CVP and SWP Pumping Facilities October 1 through May 31, 1996–2006	3-51
3.4-14	Relationship between the Mean Proportion of Flow Diverted into the Interior Delta in December and the Proportion of Juvenile Winter-Run Chinook Salmon Lost at the CVP and SWP Pumping Facilities October 1 through May 31, 1995–2006.....	3-52
3.4-15	Relationship between Old and Middle Rivers Reverse Flows and Entrainment at the Federal Pumping Facility, 1995–2007	3-57
3.4-16	Relationship between Old and Middle Rivers Reverse Flows and Entrainment at the State Pumping Facility, 1995–2007.....	3-57
3.4-17	Temperature Corrected (to 61°F) Survival Indices for Coded Wire-Tagged Salmon Smolt Released at Jersey Point and Recovered at Chipps Island between 1989 and 1991	3-58
3.5-1	Interannual Trend in the Fall Midwater Trawl Index for Longfin Smelt, 1967–2016.....	3-61
3.5-2	Fall Midwater Trawl Index Values for Longfin Smelt Regressed against January through June Average Daily Delta Outflow for 1967–2016 with Step Changes following 1987 and 2002	3-62
3.5-3	Probability of Positive Longfin Smelt Population Growth and 95-Percent Confidence Limits as a Function of January–June Average Daily Delta Outflow, 1967–2016.....	3-63
3.5-4	Total Salvage of Longfin Smelt between December and March as a Function of Average Old and Middle River Flows during the Same Period for Water Years 1982–1992 (squares) and 1993–2007 (diamonds).....	3-65
3.5-5	(A) Relationship between Average OMR Reverse Flows in April to June and the Sum of SWP and CVP Juvenile (age-0) Longfin Smelt Salvage during the Same Time Period, 1993–2007; (B) Same Regression as (A) excluding 1998	3-66
3.5-6	(A) Relationship between the Average Location of X2 between January and May and the Sum of Juvenile (age-0) Longfin Smelt Salvage between March and July at the SWP and CVP; (B) Relationship between the Average Location of X2 in April and June and the Sum of Juvenile (age-0) Longfin Smelt Salvage for April to June at the SWP and CVP	3-67

3.6-1	White Sturgeon Year Class Indices for San Francisco Bay, 1980–2015.....	3-72
3.6-2	White Sturgeon Year Class Index from San Francisco Bay Study Otter Trawl Catch versus Mean Daily Delta Outflow from November through February.....	3-73
3.6-3	White Sturgeon Year Class Index from San Francisco Bay Study Otter Trawl Catches versus Mean Daily Delta Outflow for March through July	3-74
3.7-1	Sacramento Splittail Population Recruitment as Measured in the Fall Midwater Trawl Survey, 1967–2016	3-76
3.7-2	Correlation between the Sacramento Splittail Fall Midwater Trawl Index (1967– 2016) and Average Daily Outflow (cfs) between February and May	3-77
3.7-3	Cumulative Frequency Distribution of Average Daily Outflow between February and May, 1967–1983.....	3-78
3.8-1	Interannual Trend in the Fall Midwater Trawl Index for Delta Smelt, 1967–2016	3-81
3.8-2	Adult (panel a, SKT) and Sub-Adult (panel b, FMWT from previous year) to Larval (20-mm Survey) Recruitment Indices as a Function of Spring X2 (February–June)	3-83
3.8-3	Delta Smelt Survival in Fall as a Function of Monthly Mean Delta Outflow (cubic feet per second), for July (top left), August (top right) and September (bottom)	3-84
3.8-4	Plot of the Delta Smelt 20-mm Survey Abundance Index as a Function of the Location of the Previous Year’s Fall X2.....	3-86
3.8-5	Cumulative Proportional Adult Delta Smelt Salvage by Week, 1993–2006.....	3-87
3.8-6	Eight-Day Running Averages of Adult Delta Smelt Salvage, Total Outflow (m ³ /s), Turbidity for the Eight Most Abundant Delta Smelt Salvage Years between December 1992 and April 2005 at the SWP and CVP	3-88
3.8-7	Salvage of Adult Delta Smelt as a Function of Old and Middle Rivers Reverse Flows for December through March	3-89
3.9-1	Population Abundance of Age-1 Starry Flounder as Measured in the San Francisco Bay Study, 1980–2014.....	3-91
3.9-2	Correlation between the Starry Flounder Bay Study Otter Trawl Age-1 Index (1980–2015) and Average Daily Outflow (cfs) between March and June	3-92
3.9-3	Cumulative Frequency Distribution of Monthly Average Daily Delta Outflow for March through June, 1994–2013	3-93
3.10-1	Index of Juvenile Crangon franciscorum Abundance as Measured in the San Francisco Bay Otter Trawl Survey, 1980–2015	3-95

3.10-2	Relationship between Juvenile California Bay Shrimp Abundance, as Measured by the San Francisco Bay Otter Trawl Survey (1980–2013), and Average Daily Outflow (cfs) between March and May of the Same Year	3-96
3.10-3	Cumulative Frequency Distribution of Average Daily Outflow for March–May, 1980–2013.....	3-97
3.10-4	Probability of Juvenile California Bay Shrimp Population Growth as a Function of Delta Outflow from a Logistic Regression Analysis ($P < 0.01$).....	3-98
3.11-1	Mean Abundance (CPUE) in the Entrapment Zone as a Function of Delta Outflow (cfs) for <i>E. affinis</i> Adults and <i>Eurytemora</i> spp. Juveniles from March through June, 1994–2015	3-101
3.11-2	Mean Suisun Bay Abundance (CPUE) as a Function of Delta Outflow (cfs) for Adult <i>P. forbesi</i> and Juvenile <i>Pseudodiaptomus</i> spp. from June to September, 1989–2015.....	3-103
3.14-1	Comparison of the Change in Magnitude of Fall Midwater Trawl Indices for Delta Smelt, Longfin Smelt, and Sacramento Splittail in Wet and Dry Water Years	3-117
3.14-2	Frequency of Meeting April–June Sacramento River at Rio Vista Flows of 20,000 cfs for Current Conditions	3-120
3.14-3	Frequency of Meeting February–April Sacramento River at Rio Vista Flows of 20,000 cfs for Current Conditions	3-120
3.14-4	Exceedance Frequency of Monthly Flow at Freeport on the Sacramento River for November–May under Current Conditions.....	3-122
3.14-5	Seasonal Comparisons of Minimum Required Delta Outflow (orange line), SacWAM Modeled Delta Outflow (black line), and Observed Delta Outflow. Observed Delta outflow is divided into four historical periods: prior to the completion of Shasta Reservoir (1930-1945, purple line), prior to the completion of Oroville Reservoir (1946-1967, cyan line), prior to the adoption of D-1641 (1968-1999, green line), and following the adoption of D-1641 (2000-2016, red line) (^DWR 2017a).	3-126
3.14-6	Frequency of Meeting January–June Delta Outflows to Benefit Estuarine Low Salinity Zone Habitat and Longfin Smelt for Minimum Required Delta Outflow	3-128
3.14-7	Frequency of Meeting March–May Delta Outflows to Benefit California Bay Shrimp for Minimum Required Delta Outflow	3-129
3.14-8	Frequency of Meeting March–June Delta Outflows to Benefit Starry Flounder for Minimum Required Delta Outflow	3-129
3.14-9	Frequency of Meeting February–May Delta Outflows to Benefit Sacramento Splittail for Minimum Required Delta Outflow	3-130

3.14-10	Frequency of Meeting March–July Delta Outflows to Benefit White and Green Sturgeon for Minimum Required Delta Outflow	3-130
3.14-11	Frequency of Meeting Old and Middle River Reverse Flow Thresholds to Protect Salmonids and Estuarine-Dependent Fish Species during December through June under Range of Flow Scenarios	3-134
3.14-12	Frequency of Meeting Positive Flows on the San Joaquin River at Jersey Point during November through June under Range of Flow Scenarios	3-135
3.14-13	Median (across All Years Modeled) Spawning Habitat (acres)	3-137
3.14-14	Median (across All Years Modeled) Rearing Habitat (acres) for Each Watershed, Including Both Floodplain and Instream Rearing Habitat	3-139
3.15-1	Trends over Time in Indices of Abundance for Native Fish and Invertebrate Species from the San Francisco Estuary	3-146
4.2-1	Comparison of Historical and Modern Delta Waterways, Tidal Wetland, and Upland Areas	4-5
4.3-1	Least Squares Regressions with 95 Percent Confidence Intervals for Fall Midwater Trawl Species Abundance as a Function of Annual Pyrethroid Pesticide Use in Six Delta Counties (1978–2014)	4-12
4.4-1	Clam Abundance and Chlorophyll Concentrations in the Low-Salinity Zone before and after the Invasion of the Clam <i>Potamocorbula</i> in 1987 (vertical dashed line)	4-27
4.6-1	Declining Trend in April–July Contribution to Total Water Year Runoff in the Sacramento River System, 1907–2010	4-39
5-1	Locations of Active Observed and Unimpaired Flow Stations Available on CDEC (California Data Exchange Center), within the Sacramento and San Joaquin Rivers Hydrologic Regions	5-54
6.1-1	Generic Boxplot Example	6-3
6.1-2	Generic Exceedance Curve Example	6-4
6.3-1	Changes in Hydrology across the Scenarios for the American River above the Sacramento River	6-12
6.3-2	Changes in Hydrology across the Scenarios for the Feather River above the Sacramento River	6-13
6.3-3	Changes in Hydrology across the Scenarios for the Sacramento River below Keswick Reservoir	6-14
6.3-4	Changes in Hydrology across the Scenarios for the Sacramento River at Freeport	6-14

6.3-5	Changes in Hydrology across the Scenarios for the North Fork Yuba River above New Bullards Bar Reservoir	6-15
6.3-6	Changes in Hydrology across the Scenarios for the South Fork Yuba River above Englebright Reservoir	6-16
6.3-7	Changes in Hydrology across the Scenarios for the Yuba River above the Feather River.....	6-17
6.3-8	Changes in Hydrology across the Scenarios for the Bear River above the Feather River.....	6-18
6.3-9	Changes in Hydrology across the Scenarios for the Mokelumne River above the Confluence with the Cosumnes River	6-19
6.3-10	Changes in Hydrology across the Scenarios for the Calaveras River Inflow to the Delta	6-20
6.3-11	Changes in Hydrology across the Scenarios for Putah Creek above the Yolo Bypass.....	6-21
6.3-12	Changes in Hydrology across the Scenarios for Cache Creek above the Yolo Bypass.....	6-22
6.3-13	Changes in Hydrology across the Scenarios for the Cosumnes River	6-23
6.3-14	Changes in Hydrology across the Scenarios for Mill Creek	6-24
6.3-15	Changes in Hydrology across the Scenarios for Antelope Creek.....	6-24
6.3-16	Changes in Hydrology across the Scenarios on Butte Creek near Chico.....	6-25
6.3-17	Changes in Hydrology across the Scenarios for Butte Creek near Butte Slough.....	6-26
6.3-18	Changes in Hydrology across the Scenarios for Yolo Bypass below Putah Creek Inflow.....	6-27
6.3-19	Changes in Delta Inflow across the Scenarios	6-28
6.3-20	Changes in Delta Outflow across the Scenarios	6-29
6.3-21	Exceedance of Spring Average X2 Position	6-30
6.3-22	Monthly Exceedance Frequency Distribution of Old and Middle River Net Flow for December through June (cubic feet per second) Changes in Interbasin Diversions	6-31
6.3-23	Example of an Interbasin Diversion (Yuba-Bear Project)	6-32
6.3-24	Exceedance Frequency Distribution of Annual Drum Canal Total Inflow (thousand acre-feet).....	6-34
6.3-25	Reservoirs in the Sacramento/Delta	6-39

6.3-26	Clear Lake Reservoir End-of-April and End-of-September Carryover Storage	6-43
6.3-27	Oroville Reservoir End-of-April and End-of-September Carryover Storage	6-44
6.3-28	Shasta Reservoir End-of-April and End-of-September Carryover Storage	6-45
6.3-29	Camp Far West Reservoir End-of-April and End-of-September Carryover Storage	6-46
6.3-30	Black Butte Reservoir End-of-April and End-of-September Carryover Storage	6-46
6.3-31	Bowman Reservoir End-of-April and End-of-September Carryover Storage	6-47
6.3-32	Historical Storage and Water Level Fluctuation in Lake Cachuma (CDEC Station CCH)	6-51
6.4-1	Annual Sacramento/Delta Supply	6-56
6.4-2	Annual Total Sacramento/Delta Supply to the Sacramento River Watershed	6-59
6.4-3	Annual Sacramento/Delta Supply to Agriculture in the Sacramento River Watershed	6-60
6.4-4	Annual Sacramento/Delta Supply to Municipal and Industrial Use in the Sacramento River Watershed	6-61
6.4-5	Annual Sacramento/Delta Supply to Wildlife Refuges in the Sacramento River Watershed	6-62
6.4-6	Annual Sacramento/Delta Supply to the Delta Eastside Tributaries Region	6-63
6.4-7	Annual Sacramento/Delta Supply to the Delta Region	6-66
6.4-8	Annual Sacramento/Delta Supply to the San Francisco Bay Area Region	6-68
6.4-9	Annual Sacramento/Delta Supply to the Central Coast Region	6-70
6.4-10	Annual Sacramento/Delta Supply to the San Joaquin Valley Region	6-74
6.4-11	Sacramento/Delta Supply to Agriculture in the San Joaquin Valley Region	6-75
6.4-12	Sacramento/Delta Supply to Urban Use in the San Joaquin Valley Region	6-76
6.4-13	Sacramento/Delta Supply to Wildlife Refuges in the San Joaquin Valley Region	6-77
6.4-14	Sacramento/Delta Supply to the Southern California Region	6-78
6.6-1	Total Volume Traded by Buyer Sector—All Areas, 2007–2016	6-87
6.6-2	Reuse in California from 1970 to 2021 by Regional Water Board	6-91
6.6-3	2019–2021 Recycled Water Comparison	6-91
6.6-4	2021 Recycled Water Use by Regional Water Board	6-92

6.6-5	Past and Forecasted Statewide Urban Water Use, in Gallons per Capita per Day, with and without the Proposed Regulation	6-94
7.1-1a	Sacramento/Delta Tributaries	follows page 7.1-6
7.1-1b	Plan Area	follows page 7.1-11
7.1-1c	Study Area Geographic Regions	follows page 7.1-11
7.3-1a	Aesthetics, Cultural, and Recreation Areas in the Study Area (northern)	follows page 7.3-2
7.3-1b	Aesthetics, Cultural, and Recreation Areas in the Study Area (central)	follows page 7.3-2
7.3-1c	Aesthetics, Cultural, and Recreation Areas in the Study Area (southern)	follows page 7.3-2
7.3-2a	State Scenic Highways and National Byways in the Study Area (northern)	follows page 7.3-2
7.3-2b	State Scenic Highways and National Byways in the Study Area (southern)	follows page 7.3-2
7.4-1a	Important Farmland in the Study Area (northern)	follows page 7.4-3
7.4-1b	Important Farmland in the Study Area (southern)	follows page 7.4-3
7.4-2a	Williamson Act and Farmland Security Zones in the Study Area (northern)	follows page 7.4-5
7.4-2b	Williamson Act and Farmland Security Zones in the Study Area (southern)	follows page 7.4-5
7.4-3a	Land Cover and Forest in the Study Area (northern)	follows page 7.4-7
7.4-3b	Land Cover and Forest in the Study Area (southern)	follows page 7.4-7
7.4-4a	Crops in the Study Area (northern)	follows page 7.4-15
7.4-4b	Crops in the Study Area (southern)	follows page 7.4-15
7.4-5	Crops and Statewide Agricultural Production (SWAP) Region in the Study Area	follows page 7.4-15
7.4-6	Top-Producing Crops and Total of All Crops, by Acreage in the Sacramento/Delta (2010–2015)	7.4-17
7.4-7	Top-Producing Crops and Total of All Crops, by Acreage, San Joaquin Valley Region (2010–2015)	7.4-25
7.4-8	Proportion of Average Annual Agricultural Water Use by Crop Category, Sacramento/Delta	7.4-42
7.4-9	Proportion of Average Annual Agricultural Water Use by Crop Category, San Joaquin Valley Region	7.4-43
7.4-10	Irrigated Crop Acreage by Flow Scenario, Sacramento/Delta, SWAP Model Analysis	7.4-45

7.4-11	Average Year: Changes in Crop Acreage, Sacramento/Delta, SWAP Model Analysis, No Replacement Groundwater	7.4-48
7.4-12	Dry Year: Changes in Crop Acreage, Sacramento/Delta, SWAP Model Analysis, No Replacement Groundwater	7.4-51
7.4-13	Irrigated Crop Acreage by Flow Scenario, San Joaquin Valley, SWAP Model Analysis.....	7.4-56
7.4-14	Average Year: Changes in Crop Acreage, San Joaquin Valley, SWAP Model Analysis, No Replacement Groundwater	7.4-59
7.4-15	Dry Year: Changes in Crop Acreage, San Joaquin Valley, SWAP Model Analysis, No Replacement Groundwater	7.4-61
7.4-16	Average Year: Changes in Crop Acreage by Scenario, Westlands Water District, SWAP Model Analysis, No Replacement Groundwater	7.4-62
7.4-17	Dry Year: Changes in Crop Acreage by Scenario, Westlands Water District, SWAP Model Analysis, No Replacement Groundwater	7.4-63
7.4-18	Average Year: Changes in Crop Acreage by Scenario, Southern San Joaquin Valley, SWAP Model Analysis, No Replacement Groundwater.....	7.4-64
7.4-19	Dry Year: Changes in Crop Acreage by Scenario, Southern San Joaquin Valley, SWAP Model Analysis, No Replacement Groundwater	7.4-65
7.4-20	Annual Total Exchange Contractor Shortages Percent Exceedance by Scenario.....	7.4-66
7.4-21	Average Year: Changes in Crop Acreage by Scenario, Friant Division (northern), SWAP Model Analysis, No Replacement Groundwater	7.4-68
7.4-22	Dry Year: Changes in Crop Acreage by Scenario, Friant Division (northern), SWAP Model Analysis, No Replacement Groundwater	7.4-69
7.4-23	Average Year: Changes in Crop Acreage by Scenario, Friant Division (southern), SWAP Model Analysis, No Replacement Groundwater	7.4-70
7.4-24	Dry Year: Changes in Crop Acreage by Scenario, Friant Division (southern), SWAP Model Analysis, No Replacement Groundwater	7.4-70
7.4-25	Trends in Crop Acres Production, Four-County Region (Fresno, Kings, Madera, and Tulare), 2010–2016	7.4-72
7.4-26	Trends in Crop Production Value, Four-County Area (Fresno, Kings, Madera, and Tulare), 2010–2016	7.4-73
7.4-27	Average Year: Changes in Crop Acreage by Scenario, San Francisco Bay Area.....	7.4-79
7.4-28	Dry Year: Changes in Crop Acreage by Scenario, San Francisco Bay Area	7.4-79
7.4-29	Average Year: Changes in Crop Acreage by Scenario, Central Coast	7.4-83

7.4-30	Dry Year: Changes in Crop Acreage by Scenario, Central Coast.....	7.4-83
7.4-31	Average Year: Changes in Crop Acreage by Scenario, Southern California.....	7.4-87
7.4-32	Dry Year: Changes in Crop Acreage by Scenario, Southern California	7.4-87
7.4-33	Bypass at Sacramento Slough, Changes in Flows across the Scenarios for Sutter Bypass.....	7.4-95
7.4-34	Changes in Flows Across the Scenarios for Yolo Bypass below Putah Creek Inflow	7.4-96
7.6.1-1a	Natural Communities in the Sacramento River Watershed	follows page 7.6.1-2
7.6.1-1b	Natural Communities in the Delta Eastside Tributaries	follows page 7.6.1-2
7.6.1-1c	Natural Communities in the Delta.....	follows page 7.6.1-3
7.6.1-1d	Natural Communities in the San Joaquin Valley	follows page 7.6.1-3
7.6.1-1e	Natural Communities in the San Francisco Bay Area	follows page 7.6.1-3
7.6.1-1f	Natural Communities in the Central Coast.....	follows page 7.6.1-3
7.6.1-1g	Natural Communities in Southern California	follows page 7.6.1-3
7.6.1-2	Giant Gartersnake Habitat Change from Baseline in the Sacramento/Delta and San Joaquin Valley Region	7.6.1-63
7.6.1-3	Swainson’s Hawk Habitat Change from Baseline in the Sacramento/Delta and San Joaquin Valley Region	7.6.1-65
7.6.1-4	Greater Sandhill Crane Habitat Change from Baseline in the Sacramento/Delta and San Joaquin Valley Region	7.6.1-66
7.6.1-5	Tricolored Blackbird Habitat Change from Baseline in the Sacramento/Delta and San Joaquin Valley Region	7.6.1-68
7.6.2-1a	Critical Habitat in the Study Area (northern)	follows page 7.6.2-4
7.6.2-1b	Critical Habitat in the Study Area (southern)	follows page 7.6.2-9
7.6.2-2	X2 Position for Baseline and Flow Scenarios Presented as Median of the January through June Average Values.....	follows page 7.6.2-38
7.6.2-3	Frequency of Meeting January–June Delta Outflows Corresponding to Estuarine Habitat Conditions.....	7.6.2-40
7.6.2-4	SacWAM Results for July–September Average X2 Positions for Baseline and 35 to 75 Scenarios	7.6.2-41
7.6.2-5	SacWAM Results for September–December Average X2 Position for Baseline and 35 to 75 Scenarios	7.6.2-41

7.6.2-6	SacWAM Results for Feather River Flows (SWRCB Feather River) for Baseline Condition and 35 to 75 Scenarios	7.6.2-47
7.6.2-7	SacWAM Results for Lower Clear Creek Flows (SWRCB Clear Creek) for Baseline Condition and 35 to 75 Scenarios	7.6.2-48
7.6.2-8	SacWAM Results for Lower Yuba River Flows (SWRCB Yuba River) for Baseline Condition and 35 to 75 Scenarios	7.6.2-49
7.6.2-9	SacWAM Results for Feather River above Oroville Reservoir (SWRCB Oroville Inflow)	7.6.2-50
7.6.2-10	SacWAM Results for South Yuba River above Englebright Reservoir Flows (SWRCB S Yuba Inflow) for Baseline Condition and 35 to 75 Scenarios.....	7.6.2-51
7.6.2-11	SacWAM Results for Battle Creek Flows (SWRCB Battle Creek) for Baseline Condition and 35 to 75 Scenarios	7.6.2-52
7.6.2-12	SacWAM Results for Mill Creek Flows (SWRCB Mill Creek) for Baseline Condition and 35 to 75 Scenarios	7.6.2-53
7.6.2-13	SacWAM Results for Antelope Creek Flows (SWRCB Antelope Creek) for Baseline Condition and 35 to 75 Scenarios	7.6.2-53
7.6.2-14	Relationship between Delta Inflow and Surface Water Temperature	7.6.2-92
7.7.1a	Aesthetics, Cultural, and Recreation Areas in the Study Area (northern)	follows page 7.7-8
7.7.1b	Aesthetics, Cultural, and Recreation Areas in the Study Area (central).....	follows page 7.7-13
7.7.1c	Aesthetics, Cultural, and Recreation Areas in the Study Area (southern) ...	follows page 7.7-13
7.8-1	California Energy Consumption by End Use Sector, 2020.....	7.8-3
7.8-2	California Energy Consumption Estimates by Type of Energy Source, 2020	7.8-4
7.8-3	Stages of the Water Cycle with Embedded Energy—California Water Sector.....	7.8-5
7.8-4	The Largest Hydroelectric Facilities in the Sacramento/Delta	follows page 7.8-2
7.8-5	2011 and 2015 Monthly Generation—Shasta, Hyatt, Colgate, and Folsom Hydropower Plants.....	7.8-10
7.8-6	2011 and 2015 Monthly Generation for Hydropower Plants in the Sacramento River Watershed and Delta Eastside Tributaries Regions	7.8-11
7.8-7	Annual Hydropower Generation for Facilities in the Sacramento River Watershed and Delta Eastside Tributaries Regions	7.8-11
7.8-8	Example of California Electrical Forecasted Demand and Actual Demand July 1–4, 2021	7.8-14

7.8-9	Monthly Natural Gas, Conventional Hydropower, and Other Renewable Electrical Production in California 2007–2021	7.8-15
7.8-10	Monthly Hydropower Generation for Sacramento River Watershed and Delta Eastside Tributaries Regions—Facilities Potentially Subject to Changes in Flow as Simulated by SacWAM	7.8-20
7.8-11	Annual Hydropower Generation for Sacramento River Watershed and Delta Eastside Tributaries Regions—Facilities Potentially Subject to Changes in Flow as Simulated by the Sacramento Water Allocation Model.....	7.8-21
7.8-12	Estimated Monthly Changes in Energy Required for CVP and SWP Exports.....	7.8-22
7.8-13	Estimated Annual Changes in Energy Required for CVP and SWP Exports	7.8-23
7.8-14	Estimated Average Change in Hydropower Generation for the 55 Scenario at Individual Hydropower Facilities	7.8-26
7.8-15	California Energy Commission California Renewables Portfolio Standard Progress.....	7.8-32
7.9-1	Faults and Fault Classifications in the Study Area	follows page 7.9-3
7.9-2	Recent and Historical Land Subsidence.....	follows page 7.9-5
7.12.1-1	Water Quality Compliance Sites in the Delta Region	follows page 7.12.1-35
7.12.1-2a	FEMA 100-Year Flood Hazard (northern)	follows page 7.12.1-46
7.12.1-2b	FEMA 100-Year Flood Hazard (southern)	follows page 7.12.1-46
7.12.1-3	Average Fish Mercury Concentrations Relative to Average Annual Reservoir Fluctuation in 65 California Reservoirs.....	7.12.1-65
7.12.1-4	Average Monthly DSM2 Electrical Conductivity Values for Emmaton under Baseline and Flow Scenarios (Water Years 1976–1991)	7.12.1-81
7.12.1-5	Average Monthly DSM2 Electrical Conductivity Values for Chipps Island near Mallard Slough under Baseline and Flow Scenarios (Water Years 1976–1991)	7.12.1-82
7.12.1-6	Average Monthly DSM2 Electrical Conductivity Values for Collinsville under Baseline and Flow Scenarios (Water Years 1976–1991)	7.12.1-83
7.12.1-7	Average Monthly DSM2 Electrical Conductivity Values for SWP Exports under Baseline and Flow Scenarios (Water Years 1976–1991)	7.12.1-84
7.12.1-8	Average Monthly DSM2 Electrical Conductivity Values for CVP Exports under Baseline and Flow Scenarios (Water Years 1976–1991)	7.12.1-85
7.12.1-9	Average Monthly DSM2 Electrical Conductivity Values for Old River at Tracy Boulevard under Baseline and Flow Scenarios (Water Years 1976–1991)	7.12.1-87
7.12.2-1a	Groundwater Basins and Subbasins in the Study Area (northern)	follows page 7.12.2-3

7.12.2-1b	Groundwater Basins and Subbasins in the Study Area (southern)	follows page 7.12.2-3
7.12.2-2	Adjudicated Groundwater Basins in the Study Area	follows page 7.12.2-3
7.12.2-3	Change in Groundwater Elevation from Spring 2010 to Spring 2020 in the Sacramento/Delta	follows page 7.12.2-19
7.12.2-4	Groundwater Elevations in the Sacramento/Delta	follows page 7.12.2-19
7.18-1a	Aesthetics, Cultural, and Recreation Areas in the Study Area (northern)	7.18-2
7.18-1b	Aesthetics, Cultural, and Recreation Areas in the Study Area (central).....	7.18-2
7.18-1c	Aesthetics, Cultural, and Recreation Areas in the Study Area (southern)	7.18-2
7.19-1a	Transportation Systems in the Study Area (northern)	follows page 7.19-2
7.19-1b	Transportation Systems in the Study Area (southern)	follows page 7.19-2
7.24-1	SacWAM Modeled D-1641–Required Delta Outflow and Existing Average Unprotected Delta Outflow (January–June) by Water Year Type	7.24-6
8.2-1	Estimated Annual Water Use by Crop Category, Sacramento/Delta	8-13
8.2-2	Estimated Annual Water Use by Crop Category, San Joaquin Valley	8-13
8.2-3	Number of Dairies and Dairy Cows, California (2011–2016).....	8-21
8.2-4	Number of Dairies and Dairy Cows in the San Joaquin Valley (2011–2016)	8-22
8.2-5	Percentage of Commodities Exported, by Value, California (2011–2016).....	8-23
8.4-1	Top-Producing Commodities and Total of All Commodities, Sacramento/Delta, by Revenue (2011–2016).....	8-47
8.4-2	Changes in Crop Revenue, Sacramento/Delta, SWAP Model Analysis, Average Year, No Replacement Groundwater Pumping	8-49
8.4-3	Changes in Crop Revenue, Sacramento/Delta, SWAP Model Analysis, Dry Year, No Replacement Groundwater Pumping	8-49
8.4-4	Top-Producing Commodities, and Total of All Commodities, by Revenue in San Joaquin Valley (2011–2016)	8-56
8.4-5	Changes in Crop Revenue, San Joaquin Valley, SWAP Model Analysis, Average Year, No Replacement Groundwater Pumping	8-57
8.4-6	Changes in Crop Revenue, San Joaquin Valley, SWAP Model Analysis, Dry Year, No Replacement Groundwater Pumping	8-58
8.4-7	Top-Producing Commodities, and Total of All Commodities, by Revenue in the San Francisco Bay Area (2011–2016)	8-65

8.4-8	Changes in Crop Revenue, San Francisco Bay Area, CASRAA Model Analysis, Average Year, No Replacement Groundwater Pumping	8-66
8.4-9	Changes in Crop Revenue, San Francisco Bay Area, CASRAA Model Analysis, Dry Year, No Replacement Groundwater Pumping	8-67
8.4-10	Top-Producing Commodities, and Total of All Commodities, by Value in Central Coast (2011–2016)	8-70
8.4-11	Changes in Crop Revenue, Central Coast, CASRAA Model Analysis, Average Year, No Replacement Groundwater Pumping	8-72
8.4-12	Changes in Crop Revenue, Central Coast, CASRAA Model Analysis, Dry Year, No Replacement Groundwater Pumping.....	8-72
8.4-13	Top-Producing Commodities, and Total of All Commodities, by Revenue in Southern California (2011–2016)	8-75
8.4-14	Changes in Crop Revenue, Southern California, CASRAA Model Analysis, Average Year, No Replacement Groundwater Pumping	8-77
8.4-15	Changes in Crop Revenue, Southern California, CASRAA Model Analysis, Dry Year, No Replacement Groundwater Pumping	8-77
8.4-16	Disadvantaged Communities Census Blocks within the Study Area	follows page 8-88
8.6-1	Chinook Salmon Landings in West Coast States in 2022 (Millions 2023\$).....	8-110
8.6-2	California Commercial Troll Chinook Salmon Landings and Total Ex-Vessel Value, 1976–2023.....	8-115
8.6-3	California Commercial Troll Chinook Salmon Landings and Price Per Pound, 1976–2023.....	8-115
8.6-4	California Ocean Recreational Chinook Salmon Landings, 1976–2023.....	8-124
8.7-1	Estimates of Willingness to Pay Value to Recreational Anglers Visiting the Sacramento River (in 2007 Dollars)	8-139
8.7-2	Average Price (in dollars per megawatt hours) for Generated Power, by Month of Calendar Year	8-143
9.3-1	Monthly Delta Outflow for Baseline, the 2008–2009 BiOps Condition, and 2019 BiOps Condition	9-15
9.3-2	Monthly CVP and SWP Total South of Delta Exports for Baseline, the 2008–2009 BiOps Condition, and 2019 BiOps Condition	9-15
9.5-1	Change in Shasta Reservoir End of April and End of September Carryover Storage under Baseline and Proposed VAs	9-21

9.5-2	Monthly Streamflow of the Sacramento River below Keswick Reservoir under Baseline and Proposed VAs	9-22
9.5-3	Sacramento River Inflow under Baseline and Proposed VAs	9-23
9.5-4	Monthly Streamflow for the Sacramento River at Freeport under Baseline and Proposed VAs	9-25
9.5-5	Monthly Streamflow over the Tisdale Weir into the Sutter Bypass under Baseline and the Proposed VAs	9-27
9.5-6	Monthly Streamflow at Sacramento Slough (Downstream End of Sutter Bypass) under Baseline and Proposed VA	9-28
9.5-7	Oroville Reservoir End of April and End of September Carryover Storage under Baseline and Proposed VAs	9-29
9.5-8	Monthly Streamflow for the Feather River in the High Flow Channel under Baseline and the Proposed VAs.....	9-30
9.5-9	Instream Flows for the Feather River above the Sacramento River under Baseline and Proposed VAs	9-31
9.5-10	New Bullards Bar Reservoir End of April and End of September Carryover Storage under Baseline and Proposed VAs	9-32
9.5-11	Monthly Streamflow for the Yuba River above the Feather River under Baseline and Proposed VAs	9-33
9.5-12	Folsom Reservoir End of April and End of September Carryover Storage under Baseline and Proposed VAs	9-35
9.5-13	Monthly Streamflow for the American River above the Sacramento River under Baseline and Proposed VAs	9-36
9.5-14	Camanche Reservoir End of April and End of September Carryover Storage under Baseline and Proposed VAs	9-37
9.5-15	Monthly Streamflow for the Mokelumne River above the Confluence with the Cosumnes River under Baseline and Proposed VAs.....	9-38
9.5-16	Lake Berryessa end of April and End of September Carryover Storage under Baseline and Proposed VAs	9-39
9.5-17	Monthly Streamflow for Putah Creek above the Yolo Bypass under Baseline and Proposed VAs	9-40
9.5-18	Monthly Total Delta Inflow under Baseline, 2008–2009 BiOps, VA, and VA High Inflow Scenarios	9-43

9.5-19	Monthly South of Delta Exports for Baseline, 2008–2009 BiOps Condition, VA, and VA High Export Cuts Scenarios	9-47
9.5-20	Monthly Exceedance Frequency Distribution of Old and Middle River Net Flow (cfs) for December–June under Baseline, 2008–2009 BiOps Condition, VA, and VA High Export Cuts Scenarios	9-51
9.5-21	QWEST under Baseline, 2008–2009 BiOps Condition, VA, and VA High Export Cuts Scenarios	9-52
9.5-22	Monthly Total Delta Outflow for Baseline, 2008–2009 BiOps Condition, VA, and VA without San Joaquin Contributions Scenarios	9-54
9.5-23	Annual Total Sacramento/Delta Surface Water Supply Under Baseline and Proposed VAs	9-60
9.5-24	Annual Total Sacramento/Delta Supply to the Sacramento/Delta Watershed under Baseline and Proposed VAs	9-61
9.5-25	Annual Sacramento/Delta Supply to Agriculture in the Sacramento/Delta Watershed under Baseline and Proposed VAs.....	9-62
9.5-26	Annual Sacramento/Delta Supply to Municipal and Industrial Uses in the Sacramento/Delta Watershed under Baseline and Proposed VAs	9-63
9.5-27	Annual Sacramento/Delta Supply to Wildlife Refuges in the Sacramento/Delta Watershed under Baseline and Proposed VAs.....	9-64
9.5-28	Annual Sacramento/Delta Supply to the San Joaquin Valley Region under Baseline and Proposed VAs	9-66
9.5-29	Annual Sacramento/Delta Supply to Agriculture in the San Joaquin Valley Region under Baseline and Proposed VAs	9-67
9.5-30	Annual Sacramento/Delta Supply to Municipal and Industrial Uses in the San Joaquin Valley Region under Baseline and Proposed VAs	9-68
9.5-31	Annual Sacramento/Delta Supply to San Francisco Bay Area, Central Coast and Southern California Regions under Baseline and Proposed VAs.....	9-70
9.5-32	Annual Sacramento/Delta Supply to Agriculture in the San Francisco Bay Area, Central Coast, and Southern California Regions under Baseline and Proposed VAs.....	9-71
9.5-33	Annual Sacramento/Delta Supply to Municipal and Industrial Uses in the San Francisco Bay Area, Central Coast, and Southern California Regions under Baseline and Proposed VAs	9-72
9.6-1	Median (across All Years) Spawning Habitat (Acres) under the 2008–2009 BiOps Condition and VA Scenarios for Each Watershed	9-75

9.6-2	Median (across All Years) Rearing Habitat (Acres) under 2008–2009 BiOps Condition and VA Scenarios for Each Watershed, Including Both Floodplain and In-Channel Rearing Habitat	9-76
9.6-3	Total Suitable Estuarine Habitat Area Expected for Each Species, Scenario, and Water Year Type	9-78
9.6-4	Potential Percent Increase (Median Prediction $\pm$ 95% Confidence Intervals) in Abundance Indices Relative to Baseline and 2008–2009 BiOps Condition.....	9-81
9.7-1	X2 Position for Baseline and VA Flow Scenarios Presented as Median of the January through June Average Values	9-116
9.7-2	Monthly Hydropower Generation for Sacramento River Watershed and Delta Eastside Tributaries Regions.....	9-123
9.7-3	Annual Hydropower Generation for Sacramento River Watershed and Delta Eastside Tributaries Regions.....	9-125
9.7-4	Estimated Average Change in Hydropower Generation for the VAs at Individual Hydroelectric Facilities	9-127
10-1	Disadvantaged Communities within the Study Area.....	follows page 10-2
10-2	2023 Drinking Water Risk Assessment – Status of Disadvantaged and Severely Disadvantaged Communities.....	follows page 10-3
10-3	2023 Level of Water Quality Risk Assessment – Status of Disadvantaged and Severely Disadvantaged Communities	follows page 10-4
13.4-1	Monthly Streamflow for the American River above the Sacramento River under Baseline and 55 w/WSAs Scenarios.....	13.4-16
13.4-2	Monthly Streamflow for the American River above the Sacramento River under the Baseline and VA Scenarios	13.4-18
13.4-3	Monthly Streamflow for the Feather River above the Sacramento River under the Baseline and 55 w/WSAs Scenarios	13.4-20
13.4-4	Monthly Streamflow for the Feather River above the Sacramento River under the Baseline and VA Scenarios	13.4-22
13.4-5	Monthly Streamflow for the Sacramento River below Keswick Reservoir under the Baseline and 55 w/WSAs Scenarios	13.4-24
13.4-6	Monthly Streamflow for the Sacramento River at Freeport under the Baseline and 55 w/WSAs Scenarios	13.4-26
13.4-7	Monthly Streamflow for the Sacramento River below Keswick Reservoir under the Baseline and VA Scenarios	13.4-28

13.4-8	Monthly Streamflow for the Sacramento River at Freeport under the Baseline and VA Scenarios	13.4-29
13.4-9	Monthly Streamflow for the Yuba River above the Feather River under Baseline and 55 w/WSAs	13.4-31
13.4-10	Monthly Streamflow for the Yuba River above the Feather River under the Baseline and VA Scenarios.....	13.4-33
13.4-11	Monthly Streamflow for the Bear River above the Feather River under the Baseline and 55 w/WSAs Scenarios.....	13.4-35
13.4-12	Monthly Streamflow for the Mokelumne River above the Confluence with the Cosumnes River under the Baseline and 55 w/WSAs Scenarios	13.4-37
13.4-13	Monthly Streamflow for the Mokelumne River above the Confluence with the Cosumnes River under the Baseline and VA Scenarios	13.4-39
13.4-14	Monthly Streamflow for the Calaveras River Inflow to the Delta under the Baseline and 55 w/WSAs Scenarios.....	13.4-41
13.4-15	Monthly Streamflow for Putah Creek above the Yolo Bypass under Baseline and 55 w/WSAs Scenarios	13.4-43
13.4-16	Monthly Streamflow for Putah Creek above the Yolo Bypass under the Baseline and VA Scenarios	13.4-45
13.4-17	Monthly Streamflow for Cache Creek above the Yolo Bypass under the Baseline and 55 w/WSAs Scenarios	13.4-47
13.4-18	Monthly Streamflow for the Cosumnes River under the Baseline and 55 w/WSAs Scenarios	13.4-49
13.4-19	Monthly Streamflow for Mill Creek under the Baseline and 55 w/WSAs Scenarios	13.4-50
13.4-20	Monthly Streamflow for Deer Creek under the Baseline and 55 w/WSAs Scenarios	13.4-50
13.4-21	Monthly Streamflow for Antelope Creek under the Baseline and 55 w/WSAs Scenarios	13.4-51
13.4-22	Monthly Streamflow for Yolo Bypass below Putah Creek Inflow under the Baseline and 55 w/WSAs Scenarios.....	13.4-52
13.4-23	Monthly Streamflow over the Tisdale Weir into the Sutter Bypass under the Baseline and 55 w/WSAs Scenarios.....	13.4-54
13.4-24	Monthly Streamflow at Sacramento Slough (Downstream End of Sutter Bypass) under the Baseline and 55 w/WSAs Scenarios.....	13.4-56

13.4-25	Monthly Streamflow for Yolo Bypass below Putah Creek Inflow under the Baseline and VA Scenarios.....	13.4-58
13.4-26	Monthly Streamflow over the Tisdale Weir into the Sutter Bypass under the Baseline and VA Scenarios.....	13.4-59
13.4-27	Monthly Streamflow at Sacramento Slough (Downstream End of Sutter Bypass) under the Baseline and VA Scenarios.....	13.4-61
13.4-28	Monthly Delta Inflow under the Baseline and 55 w/WSAs Scenarios	13.4-63
13.4-29	Monthly Delta Inflow under the Baseline and VA Scenarios	13.4-64
13.4-30	Monthly South of Delta Exports for the Baseline and 55 w/WSAs Scenarios	13.4-66
13.4-31	Monthly South of Delta Exports for the Baseline and VA Scenarios	13.4-68
13.4-32	Monthly Exceedance Frequency Distribution of Old and Middle River Net Flow (cfs) for December–June under the Baseline and 55 w/WSAs Scenarios	13.4-70
13.4-33	QWEST under the Baseline and 55 w/WSAs Scenarios.....	13.4-71
13.4-34	Monthly Exceedance Frequency Distribution of Old and Middle River Net Flow (cfs) for December–June under the Baseline and VA Scenarios	13.4-72
13.4-35	QWEST under the Baseline and VA Scenarios.....	13.4-73
13.4-36	Monthly Delta Outflow under the Baseline and 55 w/WSAs Scenarios	13.4-75
13.4-37	Monthly Delta Outflow under the Baseline and VA Scenarios	13.4-77
13.4-38	Black Butte Reservoir End-of-April and End-of-September Carryover Storage under the Baseline and 55 w/WSAs Scenarios.....	13.4-85
13.4-39	Camanche Reservoir End-of-April and End-of-September Carryover Storage under the Baseline and 55 w/WSAs Scenarios.....	13.4-86
13.4-40	Camp Far West Reservoir End-of-April and End-of-September Carryover Storage under the Baseline and 55 w/WSAs Scenarios.....	13.4-87
13.4-41	Clear Lake End-of-April and End-of-September Carryover Storage under the Baseline and 55 w/WSAs Scenarios.....	13.4-88
13.4-42	Folsom Lake End-of-April and End-of-September Carryover Storage under the Baseline and 55 w/WSAs Scenarios.....	13.4-89
13.4-43	Lake Berryessa End-of-April and End-of-September Carryover Storage under the Baseline and 55 w/WSAs Scenarios.....	13.4-90
13.4-44	New Bullards Bar Reservoir End-of-April and End-of-September Carryover Storage under the Baseline and 55 w/WSAs Scenarios	13.4-91

13.4-45	New Hogan Reservoir End-of-April and End-of-September Carryover Storage under the Baseline and 55 w/WSAs Scenarios.....	13.4-92
13.4-46	Oroville Reservoir End-of-April and End-of-September Carryover Storage under the Baseline and 55 w/WSAs Scenarios	13.4-93
13.4-47	Pardee Reservoir End-of-April and End-of-September Carryover Storage under the Baseline and 55 w/WSAs Scenarios	13.4-94
13.4-48	Shasta Reservoir End-of-April and End-of-September Carryover Storage under the Baseline and 55 w/WSAs Scenarios	13.4-95
13.4-49	Whiskeytown Reservoir End-of-April and End-of-September Carryover Storage under the Baseline and 55 w/WSAs Scenarios.....	13.4-96
13.4-50	Camanche Reservoir End-of-April and End-of-September Carryover Storage under the Baseline and VA Scenarios.....	13.4-98
13.4-51	Folsom Lake End-of-April and End-of-September Carryover Storage under the Baseline and VA Scenarios.....	13.4-99
13.4-52	Lake Berryessa End-of-April and End-of-September Carryover Storage under the Baseline and VA Scenarios.....	13.4-99
13.4-53	New Bullards Bar Reservoir End-of-April and End-of-September Carryover Storage under the Baseline and VA Scenarios	13.4-100
13.4-54	Oroville Reservoir End-of-April and End-of-September Carryover Storage under the Baseline and VA Scenarios	13.4-101
13.4-55	Shasta Reservoir End-of-April and End-of-September Carryover Storage under the Baseline and VA Scenarios	13.4-102
13.4-56	Bowman Reservoir End-of-April and End-of-September Carryover Storage	13.4-103
13.4-57	Annual Total Sacramento/Delta Supply for Baseline and 55 w/WSAs Scenarios	13.4-112
13.4-58	Annual Total Sacramento/Delta Supply for Baseline and VA Scenarios	13.4-113
13.4-59	Annual Total Sacramento/Delta Supply to the Sacramento River Watershed for Baseline and 55 w/WSAs Scenarios.....	13.4-115
13.4-60	Annual Sacramento/Delta Supply to Agriculture in the Sacramento River Watershed for Baseline and 55 w/WSAs Scenarios	13.4-116
13.4-61	Annual Sacramento/Delta Supply to Municipal and Industrial Use in the Sacramento River Watershed for Baseline and 55 w/WSAs Scenarios.....	13.4-117
13.4-62	Annual Sacramento/Delta Supply to Wildlife Refuges in the Sacramento River Watershed for Baseline and 55 w/WSAs Scenarios	13.4-118

13.4-63	Annual Total Sacramento/Delta Supply to the Sacramento River Watershed for Baseline and VA Scenarios.....	13.4-119
13.4-64	Annual Sacramento/Delta Supply to Agriculture in the Sacramento River Watershed for Baseline and VA Scenarios	13.4-120
13.4-65	Annual Sacramento/Delta Supply to Municipal and Industrial Use in the Sacramento River Watershed for Baseline and VA Scenarios.....	13.4-121
13.4-66	Annual Sacramento/Delta Supply to Wildlife Refuges in the Sacramento River Watershed for Baseline and VA Scenarios	13.4-122
13.4-67	Annual Total Sacramento/Delta Supply to the Delta Eastside Tributaries Region for Baseline and 55 w/WSAs Scenarios	13.4-123
13.4-68	Annual Total Sacramento/Delta Supply to the Delta Eastside Tributaries Region for Baseline and VA Scenarios	13.4-125
13.4-69	Annual Total Sacramento/Delta Supply to the Delta Region for Baseline and 55 w/WSAs Scenarios	13.4-127
13.4-70	Annual Total Sacramento/Delta Supply to the Delta Region for Baseline and VA Scenarios	13.4-129
13.4-71	Annual Total Sacramento/Delta Supply to the San Joaquin Valley Region for Baseline and 55 w/WSAs Scenarios.....	13.4-131
13.4-72	Annual Sacramento/Delta Supply to Agriculture in the San Joaquin Valley Region for Baseline and 55 w/WSAs Scenarios	13.4-132
13.4-73	Annual Sacramento/Delta Supply to Municipal and Industrial Use in the San Joaquin Valley Region for Baseline and 55 w/WSAs Scenarios.....	13.4-133
13.4-74	Annual Sacramento/Delta Supply to Wildlife Refuges in the San Joaquin Valley Region for Baseline and 55 w/WSAs Scenarios.....	13.4-135
13.4-75	Annual Total Sacramento/Delta Supply to the San Joaquin Valley Region for Baseline and VA Scenarios.....	13.4-136
13.4-76	Annual Sacramento/Delta Supply to Agriculture in the San Joaquin Valley Region for Baseline and VA Scenarios	13.4-137
13.4-77	Annual Sacramento/Delta Supply to Municipal and Industrial Use in the San Joaquin Valley Region for Baseline and VA Scenarios.....	13.4-138
13.4-78	Annual Sacramento/Delta Supply to Wildlife Refuges in the San Joaquin Valley Region for Baseline and VA Scenarios.....	13.4-139
13.4-79	Annual Total Sacramento/Delta Supply to the San Francisco Bay Area Region for Baseline and 55 w/WSAs Scenarios.....	13.4-141

13.4-80	Annual Total Sacramento/Delta Supply to the San Francisco Bay Area Region for Baseline and VA Scenarios.....	13.4-143
13.4-81	Annual Total Sacramento/Delta Supply to the Central Coast Region for Baseline and 55 w/WSAs Scenarios.....	13.4-145
13.4-82	Annual Total Sacramento/Delta Supply to the Central Coast Region for Baseline and VA Scenarios.....	13.4-147
13.4-83	Annual Total Sacramento/Delta Supply to the Southern California Region for Baseline and 55 w/WSAs Scenarios.....	13.4-149
13.4-84	Annual Total Sacramento/Delta Supply to the Southern California Region for Baseline and VA Scenarios.....	13.4-151
13.5-1	Median (across All Years Modeled) Spawning Habitat (acres)	13.5-7
13.5-2	Median (across All Years Modeled) Rearing Habitat (acres).....	13.5-8
13.5-3	Total Suitable Estuarine Habitat Area Expected for Each Species, Scenario, and Water Year Type.....	13.5-12
13.5-4	Potential Percent Increase (Median Prediction $\pm$ 95% Confidence Intervals) in Abundance Indices Relative to Baseline.....	13.5-14
13.5-5	Median (across All Years Modeled) Spawning Habitat (acres)	13.5-15
13.5-6	Median (across All Years Modeled) Rearing Habitat (acres).....	13.5-17
13.5-7	Total Suitable Estuarine Habitat Area Expected for Each Species, Scenario, and Water Year Type.....	13.5-19
13.5-8	Potential Percent Increase (Median Prediction $\pm$ 95% Confidence Intervals) in Abundance Indices Relative to Baseline.....	13.5-21
13.7-1a	Sacramento/Delta Tributaries	13.7-4
13.7-1b	Plan Area	13.7-5
13.7.6.2-1a	X2 Position for Baseline and 55 w/WSAs Scenarios Presented as Median of the January through June Average and Critical Year Values	13.7-109
13.7.6.2-1b	X2 Position for Baseline and VA Scenarios Presented as Median of the January through June Average and Critical Year Values.....	13.7-111

Volume 2

List of Appendices

Appendix A	Modeling for the Unimpaired Flow Scenarios
Appendix A1	Sacramento Water Allocation Model Methods and Results
A1a	Methods for Estimating Regional Sacramento/Delta Surface Water Supply for Agricultural and Municipal Use
A1b	Methodology for Estimating Existing Water Supply from Historical Water Deliveries Data
A1c	Preliminary Assessment of Effect of Reservoir Storage on Reservoir Release Temperatures
Appendix A2	Delta Simulation Model II (DSM2) Methods and Results
Appendix A3	Agricultural Economic Analysis: SWAP Methodology and Modeling Results
Appendix A4	Regional Economic Analysis Modeling Procedure
Appendix A5	Hydropower, Energy Grid, and Export Energy Analyses
Appendix A6	Water Temperature Modeling and Fish Assessment for the Sacramento, Feather, and American Rivers
Appendix A7	Modeling Approaches Used to Develop Unimpaired Watershed Hydrology
Appendix A8	Salmonid Tributary Habitat Analysis
Appendix B	Scientific Basis Report in Support of New and Modified Requirements for Inflows from the Sacramento River and its Tributaries and Eastside Tributaries to the Delta, Delta Outflows, Cold Water Habitat, and Interior Delta Flows
Appendix C	Supplemental Special-Status Species Lists for Plants and Wildlife
Appendix D	Supplemental Municipal Supply Analysis Information
Appendix E	Regulatory Framework for Construction Projects
Appendix F	Impact Summary Tables for Alternatives 1, 2, and 3
Appendix G	Appendices for Chapter 9, proposed Voluntary Agreements
Appendix G1	Voluntary Agreement Proposal
Appendix G2	Final Scientific Basis Report Supplement in Support of Proposed Voluntary Agreements for the Sacramento River, Delta, and Tributaries Update to the San Francisco Bay/Sacramento-San Joaquin Delta Water Quality Control Plan

Appendix G3	Modeling for the Proposed Voluntary Agreement
G3a	Sacramento Water Allocation Model Methods and Results for the Proposed Voluntary Agreements
G3b	Delta Simulation Model II (DSM2) Methods and Results for the Proposed Voluntary Agreements
G3c	Economic Considerations for the Proposed Voluntary Agreements
G3d	Hydropower, Energy Grid, and Export Energy Analyses for the Proposed Voluntary Agreements
G3e	Water Temperature Modeling and Fish Assessment for the Sacramento, Feather, and American Rivers for the Proposed Voluntary Agreements
Appendix G4	Environmental Checklist for the Proposed Voluntary Agreements

Appendix H

Appendices for Chapter 13, Revised Proposed Plan Amendments

Appendix H1	Modeling for the Revised Proposed Plan Amendments
H1a	Sacramento Water Allocation Model Methods
H1a1	Assessment of Effect of Reservoir Storage on Reservoir Release Temperatures
H1a2	Sacramento Water Allocation Model Results for Revised Proposed Plan Amendments
H1a3	Sacramento Water Allocation Model Results for Updated Unimpaired Flow Scenarios
H1a4	Sacramento Water Allocation Model Results for CVP Export Constraint Sensitivity Analysis
H1a5	Sacramento Water Allocation Model Results for Export Constraint Sensitivity Analysis
H1a6	Sensitivity Analysis for 2025 Record of Decision and Incidental Take Permit Amendments
H1a7	Sacramento Water Allocation Model Results for 2025 Record of Decision and Incidental Take Permit Amendments
H1b	Water Temperature Modeling and Fish Assessment for the Sacramento, Feather, American, and Yuba Rivers
H1c	Beneficial Environmental Effects
Appendix H2	Environmental Checklists for the Revised Proposed Plan Amendments
Appendix H3	Mitigation Measures for the Revised Proposed Plan Amendments
Appendix H4	Impact Summary Table for Alternatives

Volume 3

Table of Contents

Chapter 1	Introduction to Responses to Comments	1-1
	Organization of This Volume	1-1
	Terminology.....	1-2
Chapter 2	Common Responses	2-1
	Common Responses	2-1
Common Response 1.1	General Comments	1
	Introduction.....	1
	Overview and Approach to Responses to Comments	5
	Requirements for Responding to Comments	6
	Individual Responses to Comments.....	7
	Common Responses to Comments.....	8
	Comments That Do Not Raise Specific Environmental Impacts or Economic Effects	9
	Comments On Other Projects	9
	Form Letters.....	10
	Attachments and Exhibits	10
	Adequacy of Public Process	11
	Length of Staff Report.....	11
	Public Comment and Outreach.....	13
	Release of Plan Separately from Staff Report.....	15
	VA Development Process.....	16
	Scope of Staff Report and Plan Flexibility	17
	Support and Opposition for Plan Amendments, VAs, and Other Flow Alternatives.....	20
	Proposed Plan Amendments and Other Flow Alternatives	21
	Proposed VAs (HRL Proposal)	22
	Revised Proposed Plan Amendments	23
	Water Supply	26
	Consistency with Other Laws, Policies, and Agreements.....	27
	Water Resources Programs	27
	Delta Reform Act and the Delta Plan	29
	Federal and State Endangered Species Acts.....	31
	Existing Efforts and Agreements.....	33
	References Cited.....	34

Common Response 1.2 Water Quality Control Planning Process	1
Introduction.....	1
State Water Board Authorities Related to the Water Quality Control Planning Process	5
Porter-Cologne Water Quality Control Act and the Clean Water Act	5
Water Rights	40
Fish and Game Code Section 5937	55
Enforcement Authority	58
Information Request Authority.....	61
Interaction with Other State Water Board Regulatory Activities.....	61
Water Quality Certification and the Federal Energy Regulatory Commission Process	62
2018 Lower San Joaquin River Flows and Southern Delta Salinity Update to the Bay-Delta Plan	63
References Cited.....	76
Common Response 1.3 Revised Proposed Plan Amendments.....	1
Introduction.....	1
Revised Proposed Plan Amendments.....	5
Project Description	5
Water Quality Objectives for Fish and Wildlife Uses	10
Regulatory Pathway	17
Voluntary Agreement Pathway.....	34
Implementation Methodology.....	71
Interior Delta Flows.....	77
Designation of Tribal Tradition and Culture (CUL) and Incorporation of Tribal and Subsistence Fishing Beneficial Uses	80
General Provisions	81
Monitoring and Evaluation	83
State Water Board Oversight	95
Responses to Comments	95
Interaction with Other Projects and Regulatory Processes	96
Temporary Urgency Change Petitions	97
2025 ROD and 2025 ITP and Other Regulatory Changes	99
Other Water Supply Projects	101
References Cited.....	103
Common Response 1.5 Trinity River.....	1
Introduction.....	1
Overview.....	4
How the Bay-Delta Plan Update Relates to the Trinity River	5

Modeling.....	7
Federal Laws that Apply to the Trinity River	8
State Law, including Order 90-5	8
Protection of the Trinity River Generally.....	11
Common Response 2.1 Presentation of Data and Results in the Staff Report and Responses to Comments	1
Introduction.....	1
Overview.....	4
Types of Data Presented in the Staff Report	5
Summary Statistics	6
Averages, Medians, Quartiles, and Percentages	6
Time Series and Frequency of Occurrence	7
Distribution-Based Presentations.....	8
Boxplots	8
Exceedance and Cumulative Distribution Plots and Tables.....	9
Water Year Types and Long-Term Hydrologic Variability	11
References Cited.....	12
Common Response 3.1 Fish Protection	1
Introduction.....	1
Staff Report Use of Best Available Science.....	4
Criteria for Best Available Science	4
2017 Scientific Basis Report.....	6
2026 Scientific Basis Report Supplement	7
Process for Updates to Literature in Chapters 3 and 4 of the Staff Report.....	8
Data Sources	9
Adequacy of Modeling to Support the Benefit Analyses	14
Flow Benefit Analyses	14
Habitat Benefit Analyses.....	26
Temperature Effects on Salmonid Fish	32
Flow Effects on Temperature.....	38
Fish Entrainment in the Delta.....	41
Entrainment into the Interior Delta and Export Operations (via Delta Cross Channel and Georgiana Slough).....	41
Fish Losses at the South Delta Export Facilities	46
Old and Middle River Flows and Fish Entrainment.....	49
Conclusion: Fish Entrainment in the Delta	52
References Cited.....	52

Common Response 4.1 Harmful Algal Blooms	1
Introduction.....	1
Background.....	5
Instream Flows and HABs	6
Flow Changes and HABs Under the Flow Scenarios	6
Environmental Mediation of HABs	9
State Water Board Commitments to Address HABs in the Delta.....	10
Water Quality Standards for Cyanotoxins.....	13
Nutrient Discharge and HABs	16
Air Quality.....	18
Economically Disadvantaged Communities	19
Existing HABs Effects on DACs	19
HABs in Reservoirs	22
HABs in the Delta	23
CEQA Thresholds for Recreation Impacts	24
California Native American Tribes	26
References Cited.....	27
Common Response 4.2 Drought and Climate Change	1
Introduction.....	1
Background.....	4
Climate Change.....	6
Consistency with Regulatory Requirements and Other Policies.....	6
Staff Report Modeling.....	9
Impact Analyses	12
Drought.....	14
Multi-year Drought Analysis	14
Drought Response Measures.....	17
References Cited.....	18
Common Response 6.1 Sacramento Water Allocation Model and Changes in Hydrology and Water Supply	1
Introduction.....	1
SacWAM Scope, Scale, and Application	6
SacWAM Assumptions.....	8
SacWAM Flow Scenario Assumptions.....	8
References Cited.....	22
Common Response 6.2 Baseline and No Project Alternative	1
Introduction.....	1

Overview of Project Baseline	4
SacWAM and Existing Conditions	5
Federal and State Endangered Species Act Requirements	7
Comments on Baseline Assumptions and Federal and State Endangered Species Act Requirements.....	13
Points of Comparison for VA Analyses	17
Vernalis Boundary Condition.....	20
Temporary Urgency Change Petitions.....	21
No Project Alternative	22
Trinity River	24
References Cited.....	25
Common Response 6.3 Water Supply and Other Water Management Actions	1
Introduction.....	1
Overview and Adequacy of the Analyses	5
Comments on Water Supply Impacts.....	15
Revised Proposed Plan Amendments in Response to Water Supply Concerns.....	19
Alternative Water Supplies	19
Groundwater.....	21
Other Water Management Actions.....	22
Groundwater Storage and Recovery	23
Water Transfers	24
Water Recycling	26
Water Conservation and Efficiency.....	26
New and Modified Facilities	28
References Cited.....	30
Common Response 7.1 General CEQA and Approach to the Analysis.....	1
Introduction.....	1
Overview and Approach to Analysis.....	4
Project in the Context of CEQA.....	4
Identification and Evaluation of Reasonably Foreseeable Methods of Compliance and Response Actions	6
Baseline	9
Recirculation	10
Adequacy of the Project Description.....	12
Description of the Proposed Plan Amendments and Proposed VAs	13
Scope and Character of Project Described and Analyzed	14
Scope and Level of Detail of the Analyses.....	15

General Methods and Modeling Approach	17
Impact Analysis.....	19
Enforceability of VA and Regulatory Pathway Habitat Restoration Measures.....	21
Mitigation Measures	21
Adequacy, Deferral, and/or Feasibility	22
Impacts of Mitigation.....	25
Funding for Mitigation Measures and Replacement Supplies.....	25
References Cited.....	27
Common Response 7.4 Agricultural Resources	1
Introduction.....	1
SWAP Model and Impacts to Agricultural Production	6
Assumptions about Baseline Cropping Patterns.....	8
Level and Scope of the SWAP Analysis	8
Assumptions about Groundwater Pumping in SWAP.....	9
Assumptions about Deficit Irrigation	10
Supplemental SWAP Modeling for Critically Dry Water Years and Multi-Year Drought.....	11
Supplemental SWAP Modeling for Critically Dry Water Year Type	12
Multi-Year Drought and Supplemental SWAP Modeling for Water Year 1977	16
Comparison of Supplemental SWAP Results for the 55 Scenario.....	21
Sacramento/Delta Water Supply for Rice Straw Decomposition.....	22
Agricultural Land Fallowing/Idling and Land Conversion	27
References Cited.....	28
Common Response 7.6.2 Aquatic Biological Resources and Cold Water Habitat	1
Introduction.....	1
Background.....	4
Cold Water Habitat as Part of the Project.....	5
Integration with Existing Temperature-Related Requirements	6
Scope of the Water Temperature Analysis	7
Implementation of the Cold Water Habitat Objective	8
Water Temperature and Fish Evaluation	12
Fish Assessment	13
Development and Refinement of Carryover Storage Target Ranges	14
Assessment of Upper Watershed Effects	16
Sensitivity of American River Temperature Model to Folsom Reservoir Temperature Targets.....	17
Background on Staff Report Approach to Defining Folsom Reservoir Target Temperatures.....	18

Adjusted Folsom Target for Sensitivity Analysis	19
HEC-5Q Performance Evaluation for the Sensitivity Analysis	22
Results of the Sensitivity Analysis	23
References Cited.....	25
Common Response 7.8 Energy and Hydropower	1
Introduction.....	1
Overview.....	6
Evaluation of Local Effects.....	7
Staff Report Analysis of Individual Facilities	7
Commenter Estimates of Local Effects	12
Grid Reliability	13
Power Flow Analysis	13
Peaking Power and Drought Conditions	14
Consideration of Rolling Blackouts	18
Future of the California Electrical Grid	19
Possible Energy Expenditure to Replace Surface Water Supplies, including Increased Groundwater Pumping	20
References Cited.....	21
Common Response 7.10 Greenhouse Gas Emissions and Mitigation	1
Introduction.....	1
GHG Emissions from Reduced Hydropower Generation	5
GHG Mitigation for Changes in Groundwater Pumping.....	8
References Cited.....	10
Common Response 7.12.2 Groundwater and Sustainable Groundwater Management Act	1
Introduction.....	1
Groundwater Impact Analysis	6
Groundwater Modeling, SWAP, and Agricultural Analysis	7
SacWAM Groundwater Considerations	11
Groundwater Mitigation Measures.....	15
Groundwater Substitution Transfers.....	17
Groundwater Recharge	18
Incidental Recharge	18
Recharge Opportunities	19
Groundwater Overdraft and Subsidence	21
Sacramento River and San Joaquin Hydrologic Region	22
Tulare Lake Hydrologic Region.....	26
Groundwater-Surface Water Interaction	28

Interconnected Surface Water	29
Groundwater Dependent Ecosystems	30
Groundwater Quality	30
Managed Groundwater Recharge Projects	31
Groundwater Substitutions	31
SGMA Considerations	32
2025 Status of SGMA Implementation	34
GSA Roles and Duties	65
Funding Assistance Programs for SGMA Implementation (and MAR)	66
Economically Disadvantaged Communities	67
References Cited	67
Common Response 7.20 Utilities and Service Systems	1
Introduction	1
Environmental Analysis and Changes in Water Supply	5
Approach to Analysis	6
Impacts to Individual Water Suppliers	14
Availability of Municipal Water and Alternative Water Supplies	15
Responses to Changes in Municipal Water Supply	16
Water Code Section 106 and Water for Minimum Health and Safety Needs	19
Urban Water Conservation	20
References Cited	21
Common Response 7.23 Cumulative Impact Analysis	1
Introduction	1
Scope and Adequacy of Cumulative Impact Analysis	4
Consideration and Analysis of 2018 LSJR/SD Plan Update	7
Consideration and Analysis of Delta Conveyance Project and Sites Reservoir Project	9
Consideration and Analysis of Other Past, Present, and Reasonably Foreseeable Probable Future Projects	10
Scope and Adequacy of Mitigation Measures	11
References Cited	12
Common Response 7.24 Alternatives Analysis	1
Introduction	1
Overview and Adequacy of Alternatives Analysis	5
Project Purposes and Goals, Ability of Revised Proposed Plan Amendments to Achieve Them	8
Description and Comparison of Alternatives	11
Analysis and Modeling of Alternatives	13

Range of Reasonable Alternatives.....	14
Comments on Specific Alternatives.....	16
No Project Alternative	16
Flow Alternatives	16
Proposed VA Alternatives	18
Interior Flows/Fall Delta Outflow Alternative.....	20
Drought Alternatives.....	23
Commenter Proposals	25
Environmentally Superior Alternative	25
References Cited.....	26
Common Response 8.1 Economic Analysis and Other Considerations.....	1
Introduction.....	1
Overview and Adequacy of Economic Analysis	5
Agricultural Economic Effects and the SWAP Model	10
SWAP Overview	11
Assumptions about Groundwater Pumping in SWAP	12
Assumptions about Deficit Irrigation	13
Assumptions about Baseline Cropping Patterns.....	13
SWAP Modeling and Other Water Management Actions	14
Supplemental SWAP Modeling for Critically Dry Water Years and Multi-Year Drought	15
Regional Economic Effects and the IMPLAN Model	29
IMPLAN Overview and Results.....	29
Recent Transformations in Use of Labor by California Agriculture	31
Third-Party Reports and Regarding Regional Economic Effects	32
Municipal Water Supply Economic Effects.....	35
Municipal Supply Analysis Approach	35
Replacement Water Supply Costs.....	47
Costs and Constraints Associated with New and Modified Municipal Infrastructure	51
Municipal Water Rates	52
Third-Party Economic Analysis.....	55
Potential Sources of Funding for Municipal Water Conservation and Alternative Water Supplies	59
Proposition 1.....	60
Drinking Water State Revolving Fund	60
WaterSMART Program.....	61
Proposition 4.....	61
Water Transfers.....	61

Economic Effects from Reduced Revenue of Hydropower Production and Water Sales	64
Yuba Water Agency.....	64
Nevada Irrigation District.....	66
Changes in Hydropower Revenues.....	68
Approach.....	68
Results.....	70
References Cited.....	72
Common Response 10.1 Economically Disadvantaged Communities	1
Introduction.....	1
Existing Environmental Conditions and CEQA Analysis.....	4
Benefits of Increased Flows and DACs	7
Fisheries Economic Analysis.....	7
Water Provider Comments and DACs	10
Small Drinking Water Systems in the Delta.....	13
State Water Board Racial Equity Resolution and Racial Equity Action Plan.....	15
Comments on the Voluntary Agreements.....	17
References Cited.....	19
Common Response 11.1 Tribal Engagement and Tribal Beneficial Uses	1
Introduction.....	1
Background.....	5
Tribal Outreach and Engagement.....	5
Traditional Ecological Knowledge/Tribal Knowledge	8
Tribal Outreach and Engagement Provisions of the Revised Proposed Plan Amendments	11
Summary of Tribal Outreach and Engagement Provisions	11
Responses to Comments	13
Tribal Beneficial Uses	15
Tribal Reserved Water Rights.....	18
CEQA and Assembly Bill 52.....	23
Tribal Comments on the Voluntary Agreements	24
References Cited.....	28
Chapter 3 Indices of Commenters.....	3-1
Index 1 Federal Agencies, Federal Elected Officials, and Tribal Governments	3-3
Index 2 State Agencies and Elected Officials	3-5
Index 3 Local Agencies and Elected Officials	3-6
Index 4 Other Governmental Organizations and Non-Governmental Organizations	3-8
Primary Forms	3-30
Index of Individual Commenters	3-30

Index 5 Individuals3-30

Chapter 4 Responses to Comments Tables

 Responses to Comments Tables

 References Cited

Volume 3

Tables

Table	Page
2-1 Summary of Common Responses.....	2-1
CR 1.3-1 Frequency of Newly Triggered Port Chicago Salinity Events and Instances Where the X2 Requirement Is Controlling (February–June) for the 45, 55, 55 w/WSAs and 65 scenarios.....	34
CR 1.3-2 VA Flow and Non-Flow Commitments	35
CR 1.3-3 HRL Habitat Restoration Commitments	55
CR 2.1-1 Sacramento Valley Water Year Hydrologic Classification	12
CR 3.1-1 Application of best available science criteria from the Bay-Delta Monitoring and Evaluation Program of the revised proposed Plan amendments	4
CR 4.1-1a U.S. Environmental Protection Agency’s Recommended Values for Recreational Criteria and Swimming Advisories for Cyanotoxins	13
CR 4.1-1b U.S. Environmental Protection Agency’s Drinking Water Health Advisories (10-day) for Cyanotoxins.....	13
CR 4.1-2 Cyanobacteria and Harmful Algal Bloom Network's Trigger Levels for Human and Animal Health	14
CR 7.4-1 Total Surface Water Supply for Agriculture in the SWAP Production Regions of the Sacramento River Watershed, Delta Eastside Tributaries, and Delta Regions, Critically Dry Water Year Type, SWAP Model Inputs for Baseline and Flow Scenario Runs (thousand acre-feet per year).....	12
CR 7.4-2 Critically Dry Year: Irrigated Crop Acreage in the Sacramento/Delta, SWAP Model Analysis, No Replacement Groundwater (acres)	13
CR 7.4-3 Total Surface Water Supply for Agriculture in the SWAP Production Regions of the San Joaquin Valley, Critically Dry Year Type, SWAP Model Inputs for Baseline and Flow Scenario Runs (thousand acre-feet per year)	14
CR 7.4-4 Critically Dry Year: Irrigated Crop Acreage in the San Joaquin Valley, SWAP Model Analysis, No Replacement Groundwater (acres)	15
CR 7.4-5 Total Surface Water Supply for Agriculture in the SWAP Production Regions of the Sacramento River Watershed, Delta Eastside Tributaries, and Delta Regions, Water Year 1977, SWAP Model Inputs for Baseline and Flow Scenario Runs (thousand acre-feet per year)	18

CR 7.4-6	Water Year 1977: Irrigated Crop Acreage in the Sacramento/Delta, SWAP Model Analysis, No Replacement Groundwater (acres)	18
CR 7.4-7	Total Surface Water Supply for Agriculture in the SWAP Production Regions of the San Joaquin Valley, Water Year 1977, SWAP Model Inputs for Baseline and Flow Scenario Runs (thousand acre-feet per year)	19
CR 7.4-8	Water Year 1977: Irrigated Crop Acreage in the San Joaquin Valley, SWAP Model Analysis, No Replacement Groundwater (acres)	20
CR 7.4-9	Comparing Different Model Runs for the 55 Scenario, No Replacement Groundwater, Sacramento/Delta.....	22
CR 7.4-10	Comparing Different Model Runs for the 55 Scenario, No Replacement Groundwater, San Joaquin Valley	22
CR 7.4-11	Average Year Irrigation Season and Fall/Winter Water Supply for Regions 3A, 4, 5, and 7: Percent Change from Baseline	25
CR 7.4-12	Dry Year Irrigation Season and Fall/Winter Water Supply for Regions 3A, 4, 5, and 7: Percent Change from Baseline	25
CR 7.6.2-1	Adjusted Folsom Reservoir Release Temperature Target (°F) used in the Sensitivity Analysis	21
CR 7.6.2-2	Model Performance for Temperatures in the American River below Folsom Dam (°F)	23
CR 7.6.2-3	Model Performance for Temperatures in the American River at Hazel Avenue (°F)	23
CR 7.6.2-4	Model Performance for Temperatures in the American River at Watt Avenue (°F).....	23
CR 7.6.2-5	Comparison of Modeled Baseline and Flow Scenario Monthly Temperature Distributions for the American River below Folsom Dam (“Adjusted” refers to scenarios executed using the adjusted temperature target for the sensitivity analysis).....	24
CR 7.10-1	Replacement Power due to Reductions in Hydropower Generation: Comparison of Net Annual Hydropower Generation and GHG Emissions from the Staff Report (as corrected) and Calculated Using Alternative Methodology (metric tons CO ₂ per year)	6
CR 7.10-2	Replacement Power due to Reductions in Hydropower Generation: Absolute and Percent Change in Net Annual Hydropower Generation and Net GHG Emissions between the Staff Report (as corrected) and as Calculated Using the Alternative Method	11
CR 7.12.2-1	Medium-Priority and High-Priority Groundwater Subbasins — Sacramento River Watershed	38

CR 7.12.2-2 Medium-Priority and High-Priority Groundwater Subbasins — Delta Eastside Tributaries Region	44
CR 7.12.2-3 Medium-Priority and High-Priority Groundwater Subbasins — Delta Region	45
CR 7.12.2-4 Medium-Priority and High-Priority Groundwater Subbasins — San Francisco Bay Area Region	46
CR 7.12.2-5 Medium-Priority and High-Priority Groundwater Subbasins — San Joaquin Valley.....	48
CR 7.12.2-6 Medium-Priority and High-Priority Groundwater Subbasins — Central Coast.....	55
CR 7.12.2-7 Medium-Priority and High-Priority Groundwater Subbasins—Southern California	58
CR 7.20-1 Average Annual Total Water Supply by Geographic Region and Sector (thousand acre-feet) (copy of Table 7.20-1 from Section 7.20, Utilities and Service Systems)	7
CR 7.20-2 Simulated Average Annual Sacramento/Delta Surface Water Supply by Geographic Region and Sector (thousand acre-feet) (copy of Table 7.20-3 from Section 7.20, Utilities and Service Systems).....	8
CR 7.20-3 Annual Average Surface Water and Groundwater Sources of Municipal Supply by region, and Annual Average Sacramento/Delta Supply and Percent of Total Supply for Municipal Use (thousand acre-feet per year) (copy of Table 7.20-4 from Section 7.20, Utilities and Service Systems)	9
CR 7.20-4 Change from Baseline Conditions: Annual Average Sacramento/Delta Supply for Municipal Use by Region and Scenario (thousand acre-feet per year) (copy of Table 7.20-6 from Section 7.20, Utilities and Service Systems)	10
CR 7.20-5 Change in Annual Average Sacramento/Delta Supply to Municipal Users by Region and Scenario, Percent of Total Municipal Supply (copy of Table 7.20-8 from Section 7.20, Utilities and Service Systems)	16
CR 8.1-1 Critically Dry Year: Crop Revenue in the Sacramento/Delta, SWAP Model Analysis, No Replacement Groundwater Pumping (\$)a	18
CR 8.1-2 Critically Dry Year: Crop Revenue in the San Joaquin Valley, SWAP Model Analysis, No Replacement Groundwater Pumping (\$)a	20
CR 8.1-3 Water Year 1977: Crop Revenue in the Sacramento/Delta, SWAP Model Analysis, No Replacement Groundwater Pumping (\$)a	24
CR 8.1-4 Water Year 1977: Crop Revenue in the San Joaquin Valley, SWAP Model Analysis, No Replacement Groundwater Pumping (\$)a	26
CR 8.1-5 Crop Revenue of Dry Year, Critically Dry Year, and Driest Water Year SWAP Model Runs for the 55 Scenario, No Replacement Groundwater, Sacramento/Delta	28

CR 8.1-6	Crop Revenue of Dry Year, Critically Dry Year, and Driest Water Year SWAP Model Runs for the 55 Scenario, No Replacement Groundwater, San Joaquin Valley	28
CR 8.1-7	Range of Estimated Costs for Municipalities to Replace Reduced Supply by Region and Costs as a Share of Economic Output for the 55 Flow Scenario	38
CR 8.1-8	Summary of Planned Recycled Water Projects by Regional Water Board.....	43
CR 8.1-9	Water Costs for Alternative Water Supplies as Shown in Appendix D	51
CR 8.1-10	80th Percentile of Hourly Prices from 2006 and Adjusted to 2023 Dollars	70
CR 8.1-11	Cumulative Distribution of Annual Hydropower Revenues: Baseline Condition and Change from the Baseline Condition (\$ thousands).....	71
3-1	Summary of Indices	3-2
3-2	Summary of Primary Forms.....	3-30
4-1	Responses to Comments	

Volume 3

Figures

Figure	Page
CR 2.1-1 Daily Hydrograph of the Sacramento River below Keswick Reservoir for Water Year 2011 with Unimpaired Flow and Observed Flow (copy of Figure 2.2-4 from Chapter 2, <i>Hydrology and Water Supply</i>).....	7
CR 2.1-2 Generic Boxplot Example (copy of Figure 6.1-1 from Chapter 6, <i>Changes in Hydrology and Water Supply</i>)	8
CR 2.1-3 Changes in Hydrology across the Scenarios for the American River above the Sacramento River (copy of Figure 6.3-1 from Chapter 6, <i>Changes in Hydrology and Water Supply</i>).....	10
CR 2.1-5 Exceedance Frequency Distribution of Annual Drum Canal Total Inflow (thousand acre-feet) (copy of Figure 6.3-24 from Chapter 6, <i>Changes in Hydrology and Water Supply</i>)	10
CR 4.1-1 2016-2023 Reported Harmful Algal Blooms (HABs).....	21
CR 6.3-1 Study Area Geographic Regions (Copy of Figure 1-1c from Chapter 1, <i>Executive Summary</i>)	6
CR 7.4-1 Critically Dry Year: Changes in Crop Acreage, Sacramento/Delta, SWAP Model Analysis, No Replacement Groundwater	14
CR 7.4-2 Critically Dry Year: Changes in Crop Acreage, San Joaquin Valley, SWAP Model Analysis, No Replacement Groundwater	16
CR 7.4-3 Water Year 1977: Changes in Crop Acreage, Sacramento/Delta, SWAP Model Analysis, No Replacement Groundwater	19
CR 7.4-4 Water Year 1977: Changes in Crop Acreage, San Joaquin Valley, SWAP Model Analysis, No Replacement Groundwater	21
CR 7.6.2-1 Comparison of the Staff Report Baseline (red line) and 55 Flow Scenario (blue line) Folsom Reservoir Target Temperatures from 1920 to 2021. The 55 flow scenario target is frequently higher than baseline	20
CR 7.6.2-2 Folsom Reservoir historical daily release temperatures from 2010 through 2022 (thin lines); average daily release temperature (solid blue); the warmest and coolest DWR 2016d Appendix 5.C, Table 5.C-4 schedules (solid black); and the updated target used in the sensitivity analysis (dashed black).....	21

CR 7.8-1	Monthly Hydropower Generation for Sacramento River Watershed and Delta Eastside Tributaries Regions—Facilities Potentially Subject to Changes in Flow as Simulated by SacWAM (copy of Figure 7.8-10 from Section 7.8, Energy)	3
CR 7.8-2	Estimated Average Change in Hydropower Generation for the 55 Scenario at Individual Hydropower Facilities (copy of Figure 7.8-14 from Section 7.8, Energy)	9
CR 7.8-3	Hourly Power from Small and Large California Independent System Operator Hydropower Facilities during Summer 2015, 2016, and 2017 (copy of Figure A5-26 from Appendix A5, <i>Hydropower, Energy Grid, and Export Energy Analyses</i>	16
CR 7.12.2-1	American River Groundwater Basin End of Year Storage—Change from Baseline (TAF) (copy of Figure H1a2-241 from Appendix H1a2, Sacramento Water Allocation Model Results for Revised Proposed Plan Amendments).....	13
CR 7.12.2-2	Average Total Annual Groundwater Pumping for the Sacramento Watershed Region by WYT and Scenario (TAF/yr) (copy of Figure H1a3-232 from Appendix H1a3, Sacramento Water Allocation Model Results for Updated Unimpaired Flow Scenarios).....	14
CR 7.12.2-3	Surface water deliveries and simulated cumulative groundwater storage changes in the Central Valley(reproduced from Faunt et al. 2016, Figure 2)	24
CR 7.12.2-4	San Joaquin Valley harvested cropland acreage by USDA agricultural census year, 1929 through 2022. Sources: USDA (1930-2022).....	25
CR 7.12.2-5	San Joaquin Valley harvested cropland acreage by location and USDA agricultural census year, 1929 through 2022. Sources: USDA (1930-2022)	26
CR 8.1-1	Changes in Crop Revenue, Sacramento/Delta, SWAP Model Analysis, Critically Dry Year, No Replacement Groundwater Pumping	19
CR 8.1-2	Changes in Crop Revenue, San Joaquin Valley, SWAP Model Analysis, Critically Dry Year, No Replacement Groundwater Pumping	21
CR 8.1-3	Changes in Crop Revenue, Sacramento/Delta, SWAP Model Analysis, Water Year 1977, No Replacement Groundwater Pumping	25
CR 8.1-4	Changes in Crop Revenue, San Joaquin Valley, SWAP Model Analysis, Water Year 1977, No Replacement Groundwater Pumping	27
CR 8.1-5	Monthly Average Price and Median Monthly Average Price for 1998-2008	69

Acronyms and Abbreviations

Acronym	Definition
µg/L	micrograms per liter
µS/cm	microSiemens per centimeter
°F	Fahrenheit
2017 Scientific Basis Report	Scientific Basis Report in Support of New and Modified Requirements for Inflows from the Sacramento River and its Tributaries and Eastside Tributaries to the Delta, Delta Outflows, Cold Water Habitat, and Interior Delta Flows
2018 Framework	July 2018 Framework for the Sacramento/Delta Update to the Bay-Delta Plan
2022 IOP	interim operations plan for water year 2022
2024 draft Plan	Bay-Delta Plan in October 2024
2025 ROD/ITP	2025 Record of Decision and 2025 Incidental Take Permit
7DADM	7-day average of the daily maximum
A Delta Renewed	A Delta Renewed: A Guide to Science-Based Ecological Restoration in the Sacramento-San Joaquin Delta
AB	Assembly Bill
ACID	Anderson Cottonwood Irrigation District
ACL	administrative civil liability
ACWD	Alameda County Water District
ADMLP	Agricultural Drainage Management Loan Program
AF	acre-feet, acre-foot
AF/yr	acre-feet per year
AFRP	Anadromous Fish Restoration Program
AFSP	Anadromous Fish Screen Program
AIM	American Indian Movement
AIPCP	Aquatic Invasive Plant Control Program
AIS	Aquatic invasive species
ALA	acids alpha-linolenic acid
AN	Above Normal
ARA	acid arachidonic acid
AWCE	Agricultural Water Conservation and Efficiency
AWEP	Agricultural Water Enhancement Program
AWMP	agricultural water management plan
AWPF	Advanced Water Purification Facility
B.P.	Before Present
BA	biological assessment
Banks	Harvey O. Banks
BARR	Bay Area Regional Reliability
Basin Plan	Water Quality Control Plan

Acronym	Definition
Battle Creek Restoration Project	Battle Creek Salmon and Steelhead Restoration Project
BAWSCA	Bay Area Water Supply & Conservation Agency
Bay	San Francisco Bay
Bay Area	San Francisco Bay Area
Bay-Delta	San Francisco Bay/Sacramento-San Joaquin Delta
Bay-Delta Plan or Plan	Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary
BDI	Bay Delta Initiative
BDMEP	Bay-Delta Monitoring and Evaluation Program
bgs	below ground surface
BiOp	biological opinion
BIPOC	Black, Indigenous, and People of Color
BLM	Bureau of Land Management
BMP	best management practice
BN	Below Normal
BVR	Buena Vista Rancheria of Me-Wuk Indians
C	Critical
C.F.R.	Code of Federal Regulations
CAAQS	California Ambient Air Quality Standards
CAISO	California Independent System Operators
CAL FIRE	California Department of Forestry and Fire Protection
Cal. Code Regs.	California Code of Regulations
Cal/OSHA	California Division of Occupational Safety and Health
CalARP	California Accidental Release Prevention Program
CalEPA	California Environmental Protection Agency
CalGEM	California Geologic Energy Management Division
Cal-IPC	California Invasive Plant Council's
CalRecycle	California Department of Resources Recycling and Recovery
Caltrans	California Department of Transportation
CalWATRS	California Water Accounting, Tracking, and Reporting System
CAO	cleanup and abatement order
CAP	Climate Action Plan
CARB	California Air Resources Board
CARE	Collective Benefit, Authority to Control, Responsibility, Ethics
CAS	<i>California Climate Adaptation Strategy</i>
CASGEM	California Statewide Groundwater Elevation Monitoring
CASRAA	California Sub-Regional Agricultural Analysis
CBEWP	Chino Basin Conjunctive Use Environmental Water Storage/Exchange Program
CBWB	Chino Basin Water Bank
CCF	Clifton Court Forebay

Acronym	Definition
CCHAB	California Cyanobacteria and Harmful Algal Bloom
CCWA	Central Coast Water Authority
CCWD	Contra Costa Water District
CDBW	California Division of Boating and Waterways
CDEC	California Data Exchange Center
CDFA	California Department of Food and Agriculture
CDFW	California Department of Fish and Wildlife
CDO	cease and desist order
CDWA	Central Delta Water Agency
CEC	California Energy Commission
CEC	contaminant of emerging concern
CEC	chemicals of emerging concern
Central Valley Basin Plan	Water Quality Control Plan for the Sacramento River and San Joaquin River Basins
Central Valley Project Improvement Act	CVPIA
Central Valley Water Board	Central Valley Regional Water Quality Control Board
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFGC	California Fish and Game Commission
cfs	cubic feet per second
CH ₄	methane
CHAB	Cyanobacterial Harmful Algal Blooms
CHP	California Highway Patrol
CHRIS	California Historical Resources Information System
CIG	Conservation Innovation Grants
CII	commercial, industrial, and institutional
CIWQS	California Integrated Water Quality System
CNDDB	California Natural Diversity Database
CNPS	California Native Plant Society
CNRA	California Natural Resources Agency
CNRFC	California Nevada River Forecast Center
CO	carbon monoxide
CO ₂	carbon dioxide
CO ₂ e	carbon dioxide equivalent
COA	Coordinated Operation Agreement
COLD	Cold Freshwater Habitat
COMM	Commercial and Sport Fishing
CPUC	California Public Utilities Commission
CRHR	California Register of Historical Resources
CRMP	Cultural Resources Management Plan
CRPR	California Rare Plant Rank

Acronym	Definition
CSP	Conservation Stewardship Program
CUL	Tradition and Culture
CUL	Tribal Tradition and Culture
CVFPP 2022 Update	Central Valley Flood Protection Plan Update 2022
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
CV-SALTS	Central Valley Salinity Alternatives for Long-Term Sustainability
CVTEMP	Central Valley Temperature Mapping and Prediction
CWCWD	Contra Costa Water District
CWS	community water system
CWSRF	Clean Water State Revolving Fund
D	Dry
D-1641	State Water Board Water Right Decision 1641
DAC	disadvantaged communities
DAU	Detailed Analysis Units
dB	decibel
dBA	A-weighted decibels
DBP	disinfectant by-product
DCC	Delta Cross Channel
DCP	Delta Conveyance Project
DDT	diphenyl-trichloroethane
DDW	Division of Drinking Water
Delta	Sacramento-San Joaquin Delta
Delta Flow Criteria Report	<i>Development of Flow Criteria for the Sacramento-San Joaquin Delta Ecosystem</i>
Delta Reform Act	Sacramento-San Joaquin Delta Reform Act of 2009
DETAW	Delta Evapotranspiration of Applied Water
DFW	California Department of Fish and Wildlife
DG	doubling goal
DHA	docosahexaenoic acid
DJFMP	Delta Juvenile Fish Monitoring Program
DMC	Delta-Mendota Canal
DO	dissolved oxygen
DOC	California Department of Conservation
DOP	Directed Outflow Project
DPA	docosapentaenoic acid
DPM	diesel particulate matter
DPR	California Department of Pesticide Regulation
DPS	distinct population segment
dS/m	deciSiemens per meter
DSC	Delta Stewardship Council
DSM2	Delta Simulation Model II

Acronym	Definition
DSOD	Division of Safety of Dams
DSP	Delta Science Panel
DSP	Delta Science Program
DWR	California Department of Water Resources
DWSC	Deep Water Ship Channel
DWSP	Delta Water Supply Project
DWSRF	Drinking Water State Revolving Fund
EA	environmental assessment
EBMUD	East Bay Municipal Utility District
EC	electrical conductivity
EchoWater Facility	EchoWater Resource Recovery Facility
EcoRestore	California EcoRestore
EDC	endocrine-disrupting chemical
EDSM	Enhanced Delta Smelt Monitoring
EFH	essential fish habitat
EIA	U.S. Energy Information Administration
EIR	Environmental Impact Report
EIS	environmental impact statement
EMP	Environmental Monitoring Program
EMWP	efficient water management practices
EO	Executive Order
EQIP	Environmental Quality Incentives Program
ERI	Eight River Index
ERP	Ecosystem Restoration Program
ESA	Endangered Species Act
EST	Estuarine Habitat
ESU	evolutionarily significant unit
ETAW	Evapotranspiration of Applied Water
FAS	Fully Appropriated Streams
FASS	Fully Appropriated Stream Systems
FC&WCD	Flood Control and Water Conservation District
FDPIR	Food Distribution Program on Indian Reservations
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FHAB	Freshwater and Estuarine Harmful Algal Bloom
FMMP	Farmland Mapping and Monitoring Program
FMS	Flow Management Standard
FMWT	Fall Midwater Trawl Survey
FPA	Federal Power Act
Framework	2018 State Water Board staff Framework for Possible Sacramento/Delta updates to the Bay-Delta Plan
FRP	Fish Restoration Program

Acronym	Definition
FRSA	Feather River Service Area
FSIP	Feasibility Study and Implementation Plan
FTE	full time equivalent
FTP	file transfer protocol
FY	fiscal year
GAC	Granular activated carbon
GAMA	Groundwater Ambient Monitoring and Assessment
GDE	groundwater dependent ecosystems
GDP	gross domestic product
GGRF	Greenhouse Gas Reduction Fund
GHG	greenhouse gas
GPCD	gallons per capita per day
gpf	gallons per flush
GRCD	Grasslands Resource Conservation District
GSA	groundwater sustainability agencies
GSP	groundwater sustainability plans
GW	gigawatt
GWh	gigawatt hour
GWh/month	GWh per month
GWP	Groundwater Replenishment
H ₂ S	hydrogen sulfide
HAB	harmful algal bloom
HCP	habitat conservation plan
HETs	high-efficiency toilets
HFC	high flow channel
HMMP	hazardous materials management plan
HORB	Head of Old River Barrier
HPMP	Historic Properties Management Plan
HRA	health risk assessment
HRL	Healthy Rivers and Landscapes
I-	Interstate
I:E	inflow to export
IEP	Interagency Ecological Program
IFR	Institute for Fisheries Resources
IID	Imperial Irrigation District
Important Farmland	Prime Farmland, Unique Farmland, or Farmland of Statewide Importance
IPM	Integrated Pest Management
ISAP	Independent Science Advisory Panel
ISB	Independent Science Board
ISR	independent science review

Acronym	Definition
ISWEBE	Inland Surface Waters, Enclosed Bays, and Estuaries of California—Tribal and Subsistence Fishing Beneficial Uses and Mercury Provisions
ITAG	Interagency Telemetry Advisory Group
ITP	Incidental Take Permit
JSA	Joint Settlement Agreement
July 2025 revised draft Plan	State Water Board released revised draft Plan updates in July 2025
KES	Keswick Reservoir
km	kilometers
kWh	kilowatt-hour
LCP	local coastal program
L_{dn}	day-night noise level
LEAPS	License Application for the Lake Elsinore Advanced Pump Storage Project
LESA	Land Evaluation and Site Assessment
LFC	low flow channel
LID	low impact development
LIRA	Low-Income Water Rate Assistance
L_{max}	maximum sound level
LOS	level of service
LSJR	Lower San Joaquin River
LSZ	low salinity zone
LTO	Long-Term Operations
LTO PA	2019 Long Term Operations Proposed Action
M&I	municipal and industrial
M1W	Monterey One Water
MA	Millennium Ecosystem Assessment
MAF	million acre-feet
MAF/yr	million acre-feet per year
MAR	managed aquifer recharge
MCL	maximum contaminant level
Metropolitan	Metropolitan Water District of Southern California
mg/l	milligrams per liter
MGD	million gallons per day
mgd	million gallons per day
MHI	median household income
MIGR	Migration of Aquatic Organisms
MLRP	Multibenefit Land Repurposing Program
MMBtu/AF	million British thermal units per acre-foot
mmhos/cm	millimhos per centimeter
MOU	Memorandum of Understanding

Acronym	Definition
MR	Middle River
MRDO	minimum required Delta outflow
MRZ	Mineral Resource Zone
MS4s	municipal separate storm sewer systems
MTCO _{2e}	metric tons of carbon dioxide equivalent
MW	megawatt
MWD	Metropolitan Water District
MWh	megawatt-hour
mycE	measured toxin biosynthesis genes
N ₂ O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NAHC	Native American Heritage Commission
NAV	Navigation
NAWMP	North American Waterfowl Management Plan
NCCP	natural community conservation plan
NDO	net Delta outflow
NDOI	Net Delta Outflow Index
NDWA	North Delta Water Agency
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Association
NH ₃	un-ionized ammonia
NH ₄	ammonium
NHPA	National Historic Preservation Act
NID	Nevada Irrigation District
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOP	Notice of Preparation
North Coast Water Board	North Coast Regional Water Quality Control Board
Notice	Notice of Opportunity to Provide Input to Inform the Development of the Program of Implementation for the Update of the Bay-Delta Plan
NO _x	nitrogen oxides
NPDES	National Pollutant Discharge Eliminate System
NPPA	Native Plant Protection Act
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NTMP	non-industrial timber management plan
NTU	nephelometric turbidity units
NWR	National Wildlife Refuge
OAL	Office of Administrative Law
OC	Organochlorine
Ocean Plan	Water Quality Control Plan for the Ocean Waters of California

Acronym	Definition
OEHHA	Office of Environmental Health Hazard Assessment
°F	degrees Fahrenheit
OHP	Office of Historic Preservation
OMR	Old and Middle River Requirements
ORT	Old River near Tracy
OSWS	Office of Sustainable Water Solutions
OWTS	On-site wastewater treatment system
PAH	polycyclic aromatic hydrocarbons
PBDEs	polybrominated diphenyl ethers
P-C	production-consumption
PCB	polychlorinated biphenyls
PCFFA	Pacific Coast Federation of Fishermen's Associations
PCPPs	personal care products and pharmaceuticals
PCWA	Placer County Water Agency
PFMC	Pacific Fishery Management Council
PG&E	Pacific Gas and Electric Company
PIA	Practicably Irrigable Acreage
PM	particulate matter
PM ₁₀	particulate matter less than 10 microns in aerodynamic diameter
PM _{2.5}	particulate matter less than 2.5 microns in aerodynamic diameter
POD	Pelagic Organism Decline
Porter-Cologne Act	Porter-Cologne Water Quality Control Act
POTW	publically owned wastewater treatment works
PPIC	Public Policy Institute of California
ppm	parts per million
ppt	parts per thousand
PPV	peak particle velocity
PRE	Pacheco Reservoir Expansion
previously, Santa Clara Valley Water District	San Francisco Bay, Valley Water
Procedures	State Wetland Definition and Procedures for Discharges of Dredged or Fill Material to Waters of the State
Protocol	Tribal Consultation Protocol
PUFAs	polyunsaturated fats
PWA	public water agency
PWS	public water system
QA	quality assurance
QC	quality control
QWEST	San Joaquin River at Jersey Point
RAFT	River Assessment for Forecasting Temperature
RARE	Rare, Threatened, or Endangered Species

Acronym	Definition
RBDD	Red Bluff Diversion Dam
RCPP	Regional Conservation Partnership Program
Reclamation	U.S. Bureau of Reclamation
Recycled Water Policy	State Water Board's Water Quality Control Policy for Recycled Water
Regional San	Sacramento Regional County Sanitation District
Regional Water Board	Regional Water Resources Control Board
Reporting Rule	Greenhouse Gas Reporting Rule
R-GPCD	residential gallons per capita per day
RM	river mile
RMPs	Regional Monitoring Programs
RMS	Report Management System
ROD	Record of Decision
ROG	reactive organic gases
RPA	Reasonable and Prudent Alternative
RPS	Renewables Portfolio Standard
RTOC	Regional Tribal Operations Committee
Sacramento/Delta	Sacramento River watershed valley floor, Delta eastside tributaries, Delta
SacSewer	Sacramento Area Sewer District
SacWAM	Sacramento Water Allocation Model
SADW or Fund	Safe and Affordable Drinking Water Fund
SAFER	Safe and Affordable Funding for Equity and Resilience
San Francisco Bay Water Board	San Francisco Bay Regional Water Quality Control Board
San Francisco Bay Water Board 2017Basin Plan	Water Quality Control Plan for the San Francisco Bay Basin
SAV	submerged aquatic vegetation
SB	Senate Bill
SCADA	supervisory control and data acquisition
SCAQMD	South Coast Air Quality Management District
Scientific Basis Report	Scientific Basis Report in Support of New and Modified Requirements for Inflows from the Sacramento River and its Tributaries and Eastside Tributaries to the Delta, Delta Outflows, Cold Water Habitat, and Interior Delta Flows
Scientific Basis Report Supplement	Scientific Basis Report Supplement in Support of Proposed Voluntary Agreements for the Sacramento River, Delta, and Tributaries Update to the San Francisco Bay/Sacramento-San Joaquin Delta Water Quality Control Plan
SCP	scientific collecting permit
SCVWD	Santa Clara Valley Water District
SDACs	severely disadvantaged communities
SDCWA	San Diego County Water Authority

Acronym	Definition
SDWA	Safe Drinking Water Act
SED	substitute environmental document
SEI	Stockholm Environment Institute
SEWD	Stockton East Water District
SFPUC	San Francisco Public Utilities Commission
SFWD	San Francisco Water Department
SGM	Sustainable Groundwater Management
SGMA	Sustainable Groundwater Management Act
SHELL	Shellfish Harvesting
SID	Solano Irrigation District
SJRA	San Joaquin River Agreement
SJRMEP	San Joaquin River Monitoring and Evaluation Program
SJRRP	San Joaquin River Restoration Program
SKT	Spring Kodiak Trawl
SLDMWA	San Luis Delta Mendota Water Authority
SLS	Smelt Larval Survey
SMARA	Surface Mining and Reclamation Act of 1975
SMART	specific, measurable, achievable, relevant, and time bound
SMP	Suisun Marsh Habitat Management, Preservation, and Restoration Plan
SMUD	Sacramento Municipal Utility District's
SMURRF	Santa Monica Urban Runoff Recycling Facility
SNMP	Salt and Nitrate Management Plan
SoCWA	Solano County Water Agency
SPW	supplemental project water
SPWN	Spawning, Reproduction, and/or Early Development of Fish
SR	State Route
SRA	State Recreation Area
SRFCP	Sacramento River Flood Control Project
SRSC	Sacramento River Settlement Contractors
SRWTP; renamed to EchoWater Resource Recovery Facility in 2023	Sacramento Regional Wastewater Treatment Plant
STAA	Surface Transportation Assistance Act
Staff Report	Staff Report/Substitute Environmental Document
State Parks	California Department of Parks and Recreation
State Water Board or Board	State Water Resources Control Board's
STN	Summer Townet Survey
STORMS	Strategy to Optimize Resource Management of Storm Water
SUB	Subsistence Fishing
Suisun Marsh Plan	Suisun Marsh Habitat Management, Preservation, and Restoration Plan

Acronym	Definition
Supplemental NOP	Supplemental Notice of Preparation and Notice of Scoping Meeting for Environmental Documentation for the Update and Implementation of the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary
SVP	Society of Vertebrate Paleontology
SWAMP	Surface Water Ambient Monitoring Program
SWAP	Statewide Agricultural Production Model
SWAP	Statewide Agricultural Production
SWEEP	State Water Efficiency and Enhancement Program
SWIS	Solid Waste Information System
SWMP	Stormwater Management Program
SWP	State Water Project
SWPPP	stormwater pollution prevention plan
TA	Technical Assistance
TAF	thousand acre-feet
TAF/yr	TAF per year
TAF/yr	thousand acre-feet per year
TARA	Transmission Adequacy and Reliability Assessment
TBEL	technology-based effluent limitation
TBUs	Tribal Beneficial Uses
TCD	temperature control device
TDC	Thiamine deficiency complex
TDS	total dissolved solids
Team	Tidal Wetland Monitoring Project Work Team
TEK	Traditional Ecological Knowledge
the Ocean Plan	State Water Board's Water Quality Control Plan for Ocean Waters of California
the Projects	SWP and the Projects' CVP
THP	timber harvesting plan
TMC	Trinity Management Council
TMDL	total maximum daily load
TMP	Traffic Management Plan
TMP	transportation management plan
Tribal Consultation Policy	State Water Board Tribal Consultation Policy
Tribal EPA	Tribal Environmental Protection Agency
TRRP	Trinity River Restoration Program
TSS	total suspended solids
T-SUB	Tribal Subsistence Fishing
TUCPs	temporary urgency change petitions
U.S. EPA	U.S. Environmental Protection Agency
U.S.C.	United States Code
UNC	University of North Carolina

Acronym	Definition
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.G. Geological Survey
UWCD	United Water Conservation District
UWMP	Urban Water Management Plans
VA	voluntary agreement
VA pathway	voluntary agreement pathway
Valley Water	Santa Clara Valley Water District
VAMP	Vernalis Adaptive Management Plan
VMT	vehicle miles traveled
VOC	volatile organic compound
VSP	viable salmonid population
W	Wet
WA	Wildlife Area
WAP	Water Acquisition Program
WAPA	Western Area Power Administration
WARM	Warm Freshwater Habitat
WBAs	Water Budget Areas
WCF	Wastewater Control Facility
WDR	Waste discharge requirements
WHO	World Health Organization
WID	Woodbridge Irrigation District
WILD	Wildlife Habitat
WQBEL	Water quality-based effluent limits
WSAs	water supply adjustments
WSCP	Water Shortage Contingency Plan
WTP	willingness-to-pay
WWTP	wastewater treatment plant
WYI	water year index
YBFMP	Yolo Bypass Fish Monitoring Program
YCFCWCD	Yolo County Flood Control and Water Conservation District
YRDP	Yuba River Development Project
Zone 7	Alameda County Flood Control and Water Conservation District