

TABLE OF CONTENTS

Volume I

1.0 INTRODUCTION.....	1-1
1.1 PROJECT BACKGROUND.....	1-1
1.2 OVERVIEW OF THE PLANNING PROCESS	1-2
1.2.1 Plan Participants	1-2
1.2.2 Steering Committee	1-2
1.2.2.1 Steering Committee Goals and Issues	1-3
1.2.3 Science Advisors	1-4
1.2.4 Resource Agencies.....	1-5
1.3 PURPOSE AND GUIDING PRINCIPLES.....	1-5
1.3.1 Purpose.....	1-6
1.3.2 Guiding Principles	1-6
1.4 COVERED SPECIES	1-7
1.5 PERMIT HOLDERS/PERMIT DURATION.....	1-10
1.6 SOLANO HCP PLAN AREA.....	1-13
1.7 REGULATORY FRAMEWORK.....	1-15
1.7.1 Federal Endangered Species Act.....	1-16
1.7.2 The Section 10 Process – Habitat Conservation Plan Requirements and Guidelines.....	1-16
1.7.3 National Environmental Policy Act.....	1-18
1.7.4 California Endangered Species Act.....	1-18
1.7.5 California Environmental Quality Act.....	1-18
1.7.6 Migratory Bird Treaty Act.....	1-19
1.7.7 Lake and Streambed Alteration Agreement.....	1-20
1.7.8 Migratory and Nesting Birds and Birds of Prey (Fish and Game Codes 3503, 3503.5, and 3513)	1-21
1.7.9 California Fully Protected Species (Fish and Game Code Sections 3511, 4700, 5050 and 5515).....	1-21
1.7.10 Section 404 of the Federal Clean Water Act.....	1-21
1.7.11 Section 10 of the Rivers and Harbors Act	1-22
1.7.12 Section 401 of the Federal Clean Water Act/State Porter-Cologne Water Quality Control Act.....	1-22
1.7.13 Suisun Marsh Protection Plan	1-22
1.8 HCP ORGANIZATION.....	1-23
2.0 LAND USE AND COVERED ACTIVITIES.....	2-1
2.1 OVERVIEW	2-1
2.2 BACKGROUND.....	2-1
2.2.1 Land Uses	2-1
2.2.1.1 Cities.....	2-2
2.2.1.2 Agriculture	2-2
2.2.1.3 Open Space and Conservation Lands	2-2
2.2.1.4 Travis Air Force Base.....	2-3
2.2.2 Population.....	2-3
2.2.3 Economy	2-4



2.3 PLAN PARTICIPANT EXISTING AND DESIGNATED LAND USES AND FACILITIES.....	2-5
2.3.1 Urban Development.....	2-5
2.3.1.1 City of Fairfield.....	2-6
2.3.1.2 City of Suisun City	2-7
2.3.1.3 City of Vacaville	2-8
2.3.1.4 City of Vallejo.....	2-8
2.3.1.5 City of Dixon	2-9
2.3.1.6 City of Rio Vista	2-9
2.3.2 SCWA and Participating Irrigation, Reclamation, and Special Districts	2-10
2.3.2.1 Solano County Water Agency.....	2-10
2.3.2.2 Solano Irrigation District.....	2-11
2.3.2.3 Maine Prairie Water District.....	2-12
2.3.2.4 Dixon Regional Watershed Joint Powers Authority.....	2-12
2.3.2.5 Dixon Resource Conservation District	2-12
2.3.2.6 Reclamation District No. 2068.....	2-13
2.3.2.7 Vallejo Sanitation and Flood Control District	2-13
2.3.2.8 Fairfield-Suisun Sewer District.....	2-13
2.4 COVERED ACTIVITY ZONES.....	2-13
2.4.1 Covered Activity Zone 1 – Urban Zone.....	2-14
2.4.2 Covered Activity Zone 2 – SCWA, Irrigation, Reclamation, and Special District Zone	2-15
2.4.3 Covered Activity Zone 3 – Remainder of the County	2-15
2.5 COVERED ACTIVITIES.....	2-16
2.5.1 Development.....	2-16
2.5.1.1 Development within the Urban Zone (Zone 1 only).....	2-16
2.5.1.2 City Activities Outside of Urban Growth Boundaries (Covered Activity Zone 2).....	2-17
2.5.2 Construction of New Irrigation and Flood Control Facilities to Support Inclusions, Expansions, and Annexations for the Irrigation, Reclamation, and Special District Service Areas (Covered Activity Zones 1 and 2)	2-18
2.5.3 Operation and Maintenance of Plan Participant Facilities (Covered Activity Zones 1 and 2).....	2-20
2.5.4 Compatible Activities on Designated Reserves, Mitigation Sites/ Banks, Open Space Lands, and Adjacent Lands (Covered Activity Zones 1, 2, and 3)	2-20
2.6 PROJECTS AND ACTIVITIES NOT COVERED BY THIS HCP	2-21
3.0 ENVIRONMENTAL SETTING, BIOLOGICAL RESOURCES AND COVERED SPECIES.....	3-1
3.1 REGIONAL AND HISTORICAL CONTEXT	3-1
3.1.1 Regional Biodiversity	3-1
3.1.2 Geography and Geology	3-1
3.1.2.1 Coast Range Uplands and Foothill Terraces.....	3-2
3.1.2.2 Montezuma Hills and Potrero Hills	3-2
3.1.2.3 Alluvial Fans, Terraces, and Basins	3-2
3.1.2.4 Delta Marshlands.....	3-3
3.1.2.5 Suisun Bay Marshlands	3-4



3.2	CLIMATE AND HYDROLOGY.....	3-4
3.2.1	Climate	3-4
3.2.2	Hydrology	3-5
3.3	BIOLOGICAL RESOURCES	3-5
3.3.1	Vegetation and Cover Types.....	3-5
3.3.1.1	Vegetation Mapping and Classification.....	3-6
3.3.1.2	California Vegetation Alliances	3-6
3.3.2	Natural Community and Vegetation Descriptions.....	3-6
3.3.2.1	Valley Floor Grassland and Vernal Pool Natural Community.....	3-7
3.3.2.2	Inner Coast Range.....	3-11
3.3.2.3	Riparian, Stream and Freshwater Marsh Natural Community.....	3-16
3.3.2.4	Coastal Marsh Natural Community	3-20
3.3.2.5	Agricultural Lands	3-23
3.3.2.6	Developed Areas.....	3-24
3.4	COVERED SPECIES	3-25
3.4.1	Species Covered Under the State Incidental Take Permit	3-27
3.4.2	Special Management Species.....	3-33
3.5	EXISTING PRESERVES/RESERVES	3-34
3.6	RISK ANALYSIS	3-44
3.6.1	Additional City-Adopted Measures.....	3-47
3.6.1.1	Tri-City and County Cooperative Plan.....	3-47
3.6.1.2	Fairfield General Plan Amendment	3-47
3.6.1.3	City of Benicia Measure K.....	3-47
3.6.2	Collinsville-Montezuma Hills Wind Resource Area	3-48
4.0	CONSERVATION ANALYSIS.....	4-1
4.1	PURPOSE.....	4-1
4.2	RESERVE DESIGN PRINCIPLES.....	4-2
4.3	CONSERVATION ANALYSIS BY NATURAL COMMUNITY.....	4-6
4.3.1	Landscape Level Key Conservation Elements.....	4-6
4.3.1.1	Corridors	4-7
4.3.1.2	Rarity-Weighted Richness Index	4-8
4.3.1.3	Climate Change	4-9
4.3.2	Valley Floor Grassland and Vernal Pools	4-11
4.3.2.1	Associated Covered Species and Special Management Species	4-12
4.3.2.2	Key Conservation Elements	4-12
4.3.2.3	Conservation Areas.....	4-17
4.3.3	Inner Coast Range.....	4-20
4.3.3.1	Associated Covered and Special Management Species.....	4-20
4.3.3.2	Key Conservation Elements	4-21
4.3.3.3	Conservation Areas.....	4-24
4.3.4	California Red-Legged Frog	4-26
4.3.4.1	Associated Natural Communities, Covered Species, and Special Management Species	4-27
4.3.4.2	Key Conservation Elements	4-27
4.3.4.3	Conservation Areas.....	4-30



4.3.5	Callippe Silverspot Butterfly	4-30
4.3.5.1	Associated Natural Communities, Covered Species and Special Management Species.....	4-30
4.3.5.2	Key Conservation Elements	4-30
4.3.5.3	Conservation Areas.....	4-31
4.3.6	Riparian, Stream, and Freshwater Marsh Natural Community.....	4-31
4.3.6.1	Associated Covered Species and Special Management Species	4-31
4.3.6.2	Key Conservation Elements	4-32
4.3.6.3	Conservation Areas.....	4-37
4.3.7	Giant Garter Snake.....	4-40
4.3.7.1	Associated Natural Communities, Covered Species, and Special Management Species.....	4-40
4.3.7.2	Giant Garter Snake Habitat Model	4-40
4.3.7.3	Conservation Areas.....	4-42
4.3.8	Coastal Marsh.....	4-42
4.3.8.1	Associated Covered Species and Special Management Species	4-43
4.3.8.2	Conservation Background	4-43
4.3.8.3	Key Conservation Elements	4-44
4.3.8.4	Conservation Areas.....	4-46
4.3.9	Swainson's Hawk	4-47
4.3.9.1	Associated Covered Species and Special Management Species	4-47
4.3.9.2	Key Conservation Elements	4-47
4.3.9.3	Conservation Areas.....	4-48
4.3.10	Burrowing Owl.....	4-49
4.3.10.1	Associated Covered Species and Special Management Species	4-49
4.3.10.2	Key Conservation Elements	4-49
4.3.10.3	Conservation Areas.....	4-50
4.4	LANDSCAPE LEVEL CONSERVATION ANALYSIS.....	4-50
4.4.1	Methods.....	4-50
4.4.2	Results.....	4-52
4.5	CONSERVATION TARGETS	4-53
4.5.1	The Species-Area Relationship Model.....	4-53
4.5.2	Valley Floor Grassland and Vernal Pool Natural Community	4-55
4.5.2.1	Vernal Pool Ecosystems.....	4-55
4.5.2.2	Contra Costa Goldfields	4-56
4.5.2.3	Valley Floor Grassland	4-58
4.5.3	Inner Coast Range.....	4-59
4.5.4	California Red-Legged Frog.....	4-60
4.5.5	Callippe Silverspot Butterfly	4-61
4.5.6	Riparian, Stream, and Freshwater Marsh.....	4-62
4.5.7	Giant Garter Snake.....	4-63
4.5.8	Coastal Marsh.....	4-64
4.5.9	Swainson's Hawk.....	4-64
4.5.10	Burrowing Owl.....	4-65



4.6	RESERVE DESIGN AND CONSERVATION APPROACH	4-65
4.6.1	Valley Floor Grassland and Vernal Pool Natural Community.....	4-66
4.6.2	Inner Coast Range.....	4-67
4.6.3	California Red-Legged Frog.....	4-67
4.6.4	Callippe Silverspot Butterfly	4-69
4.6.5	Riparian, Stream, and Freshwater Marsh.....	4-69
4.6.6	Giant Garter Snake.....	4-71
4.6.7	Coastal Marsh.....	4-71
4.6.8	Swainson's Hawk.....	4-72
4.6.8.1	Potential Reserve Areas.....	4-72
4.6.8.2	Criteria for Establishment of Agricultural Reserves.....	4-73
4.6.8.3	Tree Planting Criteria	4-74
4.6.9	Burrowing Owl.....	4-75
5.0	CONSERVATION STRATEGY	5-1
5.1	OVERVIEW	5-1
5.2	RESERVE SYSTEM.....	5-2
5.2.1	Reserve Design Model	5-2
5.2.2	Reserve Approval and Implementation	5-3
5.3	VALLEY FLOOR GRASSLAND AND VERNAL POOL CONSERVATION STRATEGY	5-4
5.3.1	Valley Floor Grassland and Vernal Pool Natural Community Goals and Objectives	5-6
5.3.1.1	Goal VPG 1	5-6
5.3.2	Species Goals and Objectives	5-8
5.3.2.1	Goal VPG 2	5-8
5.4	CALIFORNIA RED-LEGGED FROG CONSERVATION STRATEGY	5-11
5.4.1	California Red-Legged Frog Goals and Objectives	5-12
5.5	CALLIPPE SILVERSPOT BUTTERFLY CONSERVATION STRATEGY	5-14
5.5.1	Callippe Silverspot Butterfly Goals and Objectives	5-14
5.6	RIPARIAN, STREAM, AND FRESHWATER MARSH CONSERVATION STRATEGY	5-15
5.6.1	Riparian, Stream, and Freshwater Marsh Natural Community Goals and Objectives	5-16
5.6.2	Covered Species Goals and Objectives	5-16
5.7	GIANT GARTER SNAKE CONSERVATION STRATEGY	5-17
5.7.1	Giant Garter Snake Goals and Objectives	5-18
5.8	COASTAL MARSH CONSERVATION STRATEGY	5-19
5.8.1	Coastal Marsh Natural Community Goals and Objectives	5-20
5.8.2	Species Goals and Objectives	5-21
5.9	SWAINSON'S HAWK CONSERVATION STRATEGY	5-21
5.9.1	Swainson's Hawk Goals and Objectives	5-23
5.10	BURROWING OWL CONSERVATION STRATEGY	5-25
5.10.1	Burrowing Owl Goals and Objectives	5-26
5.11	SPECIAL MANAGEMENT SPECIES MANAGEMENT REQUIREMENTS.....	5-29
5.11.1	Northern Harrier and Short-Eared Owl Special Management Requirements	5-29
5.11.2	Loggerhead Shrike Special Management Requirements	5-30
5.11.3	Grasshopper Sparrow Special Management Requirements	5-31
5.11.4	Native Perennial Grassland Special Management Requirements	5-31



6.0 AVOIDANCE, MINIMIZATION, AND MITIGATION MEASURES.....	6-1
6.1 OVERVIEW.....	6-1
6.1.1 Mitigation Standards.....	6-2
6.2 PRE-APPLICATION SURVEYS AND BIOLOGICAL RESOURCES REPORT	6-4
6.2.1 Pre-Application Requirements.....	6-4
6.2.2 Biological Resources Report	6-5
6.2.2.1 Minimum Requirements for All Projects	6-6
6.2.2.2 Valley Floor Grassland and Vernal Pool Natural Community Pre-Application Survey Requirements	6-7
6.2.2.3 California Red-Legged Frog Pre-Application Survey Requirements	6-8
6.2.2.4 Callippe Silverspot Butterfly Pre-Application Survey Requirements	6-9
6.2.2.5 Riparian, Stream, and Freshwater Marsh Pre-Application Survey Requirements	6-9
6.2.2.6 Giant Garter Snake Pre-Application Survey Requirements	6-9
6.2.2.7 Coastal Marsh Pre-Application Survey Requirements	6-9
6.2.2.8 Swainson's Hawk Pre-Application Survey Requirements	6-10
6.2.2.9 Burrowing Owl Pre-Application Survey Requirements.....	6-10
6.2.2.10 Special Management Species Pre-Application Survey Requirements	6-10
6.3 AVOIDANCE AND MINIMIZATION MEASURES.....	6-10
6.3.1 General Avoidance and Minimization Measures for Operation, Maintenance, and Construction Activities	6-12
6.3.2 Valley Floor Grassland and Vernal Pool Avoidance and Minimization Measures	6-17
6.3.2.1 Site Design and Pre-Project Approval	6-17
6.3.2.2 Project Implementation and Construction	6-20
6.3.3 California Red-Legged Frog Avoidance and Minimization Measures	6-22
6.3.3.1 Site Design and Pre-Project Approval	6-23
6.3.3.2 Project Implementation and Construction	6-24
6.3.4 Callippe Silverspot Butterfly Avoidance and Minimization Measures	6-26
6.3.4.1 Site Design and Pre-Project Approval	6-26
6.3.4.2 Project Implementation and Construction	6-27
6.3.5 Riparian, Stream, and Freshwater Marsh Avoidance and Minimization Measures	6-27
6.3.5.1 Site Design and Pre-Project Approval	6-28
6.3.5.2 Project Implementation and Construction	6-29
6.3.6 Giant Garter Snake Avoidance and Minimization Measures	6-36
6.3.6.1 Site Design and Pre-Project Approval	6-36
6.3.6.2 Project Implementation and Construction	6-36
6.3.7 Coastal Marsh Avoidance and Minimization Measures.....	6-37
6.3.7.1 Site Design and Pre-Project Approval	6-37
6.3.7.2 Project Implementation and Construction	6-38



6.3.8	Swainson's Hawk Avoidance and Minimization Measures.....	6-42
6.3.8.1	Site Design and Pre-Project Approval.....	6-42
6.3.8.2	Project Implementation and Construction.....	6-43
6.3.9	Burrowing Owl Avoidance and Minimization Measures.....	6-44
6.3.9.1	Site Design and Pre-Project Approval.....	6-44
6.3.9.2	Project Implementation and Construction.....	6-45
6.3.10	Special Management Species Avoidance and Minimization Measures.....	6-47
6.4	MITIGATION REQUIREMENTS.....	6-48
6.4.1	Assessing Impact and Mitigation Requirements	6-48
6.4.2	Valley Floor Grassland and Vernal Pool Mitigation Requirements	6-49
6.4.2.1	Natural Community Mitigation Measures	6-50
6.4.2.2	Covered Species Mitigation Requirements.....	6-52
6.4.3	California Red-Legged Frog Mitigation Requirements	6-55
6.4.4	Callippe Silverspot Butterfly Mitigation Requirements.....	6-57
6.4.5	Riparian, Stream, and Freshwater Marsh Mitigation Requirements.....	6-58
6.4.5.1	Natural Community Mitigation Measures	6-58
6.4.5.2	Species-Specific Mitigation Measures	6-63
6.4.6	Giant Garter Snake Mitigation Measures.....	6-65
6.4.7	Coastal Marsh Mitigation Requirements.....	6-66
6.4.7.1	Natural Community Mitigation Requirements	6-66
6.4.7.2	Species-Specific Mitigation Measures	6-67
6.4.8	Swainson's Hawk Mitigation Requirements.....	6-68
6.4.8.1	Foraging Habitat	6-68
6.4.8.2	Nesting Habitat.....	6-69
6.4.9	Burrowing Owl Mitigation Measures	6-70
6.4.10	Special Management Species Mitigation Requirements	6-73
7.0	MONITORING AND ADAPTIVE MANAGEMENT	7-1
7.1	OVERVIEW	7-1
7.1.1	Adaptive Management	7-1
7.1.2	Monitoring	7-2
7.1.3	Scientific Principles	7-2
7.2	STRUCTURE OF MONITORING AND ADAPTIVE MANAGEMENT FOR THE SOLANO HCP RESERVE SYSTEM	7-3
7.2.1	Framework for Adaptive Management on Reserves.....	7-4
7.3	INDIVIDUAL RESERVE MONITORING AND ADAPTIVE MANAGEMENT	7-4
7.3.1	Resource Management Plans	7-5
7.3.1.1	General Requirements	7-5
7.3.1.2	Additional Management Requirements for Natural Communities and Covered Species.....	7-8
7.3.2	Restoration and Enhancement.....	7-9
7.3.2.1	Restoration and Enhancement Plans	7-10
7.3.2.2	Species Relocation and Establishment Plans	7-12
7.3.3	Valley Floor Grassland and Vernal Pool.....	7-12
7.3.3.1	Management.....	7-13
7.3.3.2	Effectiveness Monitoring.....	7-13
7.3.4	California Red-Legged Frog.....	7-14
7.3.4.1	Management.....	7-14



7.3.4.2	Effectiveness Monitoring	7-15
7.3.5	Callippe Silverspot Butterfly.....	7-16
7.3.5.1	Management	7-16
7.3.5.2	Effectiveness Monitoring	7-16
7.3.6	Riparian, Stream, and Freshwater Marsh.....	7-17
7.3.6.1	Management	7-17
7.3.6.2	Effectiveness Monitoring	7-17
7.3.7	Giant Garter Snake.....	7-18
7.3.7.1	Management	7-18
7.3.7.2	Effectiveness Monitoring	7-18
7.3.8	Coastal Marsh.....	7-19
7.3.8.1	Management	7-19
7.3.8.2	Effectiveness Monitoring	7-19
7.3.9	Swainson's Hawk.....	7-20
7.3.9.1	Management	7-20
7.3.9.2	Effectiveness Monitoring	7-21
7.3.10	Burrowing Owl.....	7-21
7.3.10.1	Management	7-21
7.3.10.2	Effectiveness Monitoring	7-22
7.3.11	Special Management Species	7-23
7.3.11.1	Northern Harrier and Short-Eared Owl.....	7-23
7.3.11.2	Loggerhead Shrike.....	7-24
7.3.11.3	Grasshopper Sparrow.....	7-25
7.3.11.4	Native Perennial Grassland	7-25
7.4	BIOLOGICAL EFFECTIVENESS MONITORING PROGRAM	
	ADMINISTERED BY SCWA	7-26
7.4.1	Implementation Schedule	7-26
7.4.1.1	Phase 1 – Develop and Test Monitoring Protocols	7-26
7.4.1.2	Phase 2 – Intensive Monitoring Period	7-27
7.4.1.3	Phase 3 - Long-Term Monitoring.....	7-27
7.4.1.4	Programmatic Review of Monitoring and Adaptive Management Program.....	7-27
7.4.2	Monitoring Components	7-28
7.4.2.1	Landscape-Level Monitoring.....	7-28
7.4.2.2	Natural Community-Level Monitoring.....	7-28
7.4.2.3	Species-Level Monitoring	7-29
7.4.2.4	Targeted Studies	7-30
7.4.3	General Monitoring Design	7-30
7.4.4	Landscape-Level Monitoring	7-32
7.4.4.1	Targeted Studies	7-33
7.4.5	Valley Floor Grassland and Vernal Pool	7-34
7.4.5.1	Natural Community Monitoring.....	7-34
7.4.5.2	Covered Species Monitoring	7-37
7.4.5.3	Targeted Studies	7-42
7.4.6	California Red-Legged Frog.....	7-44
7.4.6.1	Targeted Studies	7-47
7.4.7	Callippe Silverspot Butterfly	7-47
7.4.7.1	Targeted Studies	7-49



7.4.8	Riparian, Stream, and Freshwater Marsh.....	7-50
7.4.8.1	Natural Community Monitoring	7-50
7.4.8.2	Covered Species Monitoring.....	7-54
7.4.8.3	Targeted Studies	7-58
7.4.9	Giant Garter Snake.....	7-59
7.4.9.1	Targeted Studies	7-60
7.4.10	Coastal Marsh.....	7-61
7.4.10.1	Natural Community Monitoring	7-61
7.4.10.2	Covered Species Monitoring.....	7-62
7.4.10.3	Targeted Studies	7-65
7.4.11	Swainson's Hawk.....	7-66
7.4.11.1	Targeted Studies	7-69
7.4.12	Burrowing Owl.....	7-70
7.4.12.1	Targeted Studies	7-72
7.5	DATABASE DEVELOPMENT AND REPORTING.....	7-73
7.5.1	Database Development.....	7-73
7.5.2	Reporting	7-74
7.5.3	Conservation Strategy Modification	7-75
8.0	IMPACT ASSESSMENT	8-1
8.1	OVERVIEW	8-1
8.1.1	Methods for Calculating Incidental Take	8-2
8.1.1.1	Development Effects (Covered Activity Zone 1)	8-2
8.1.1.2	Development Effects (Covered Activity Zone 2)	8-3
8.1.1.3	Irrigation and Reclamation District Construction and Annexation Effects (Covered Activity Zones 1 and 2)	8-3
8.1.1.4	Operation and Maintenance Activity Effects (Covered Activity Zones 1 and 2)	8-3
8.1.1.5	Activities on Preserves and Reserves.....	8-3
8.1.2	Incidental Take Analysis	8-3
8.1.2.1	Development Effects (Covered Activity Zone 1)	8-4
8.1.2.2	Development Effects (Covered Activity Zone 2)	8-4
8.1.2.3	Irrigation and Reclamation District Construction and Annexation Effects (Covered Activity Zones 1 and 2)	8-5
8.1.2.4	Operation and Maintenance Activity Effects (Covered Activity Zones 1 and 2)	8-6
8.1.2.5	Activities on Preserves and Reserves (Covered Activity Zones 1, 2, and 3).....	8-7
8.2	VALLEY FLOOR GRASSLAND AND VERNAL POOL NATURAL COMMUNITY IMPACT ASSESSMENT.....	8-7
8.2.1	Methods for Calculating Incidental Take	8-7
8.2.1.1	Development Effects (Covered Activity Zone 1)	8-8
8.2.1.2	Development Effects (Covered Activity Zone 2)	8-9
8.2.1.3	Irrigation and Reclamation District Construction and Annexation Effects (Covered Activity Zones 1 and 2)	8-9
8.2.1.4	Operations and Maintenance Activity Effects (Covered Activity Zones 1 and 2)	8-10
8.2.2	Development Effects (Covered Activity Zone 1).....	8-10
8.2.2.1	Direct Effects.....	8-10
8.2.2.2	Indirect Effects	8-13



8.2.3	Development Effects (Covered Activity Zone 2)	8-15
8.2.3.1	Direct Effects.....	8-15
8.2.3.2	Indirect Effects.....	8-15
8.2.4	Irrigation and Reclamation District Construction and Annexation Effects (Covered Activity Zones 1 and 2).....	8-15
8.2.4.1	Direct Effects.....	8-15
8.2.4.2	Indirect Effects.....	8-15
8.2.5	Operation and Maintenance Activity Effects (Covered Activity Zones 1 and 2)	8-16
8.2.5.1	Direct Effects.....	8-16
8.2.5.2	Indirect Effects.....	8-16
8.2.6	Activities on Preserves and Reserves (Covered Activity Zones 1, 2, and 3)	8-16
8.2.6.1	Direct Effects	8-16
8.2.6.2	Indirect Effects.....	8-17
8.2.7	Requested Take Summary.....	8-17
8.2.8	Conservation Summary.....	8-17
8.2.9	Effects on Covered Species.....	8-18
8.2.9.1	Contra Costa Goldfields	8-18
8.2.9.2	Alkali Milk-Vetch	8-22
8.2.9.3	Bogg's Lake Hedge-Hyssop.....	8-23
8.2.9.4	Colusa Grass.....	8-24
8.2.9.5	Ferris's Milk-Vetch	8-26
8.2.9.6	Legenere.....	8-27
8.2.9.7	San Joaquin Valley Orcutt Grass.....	8-28
8.2.9.8	Solano Grass	8-29
8.2.9.9	Vernal Pool Smallscale	8-31
8.2.9.10	Delta Green Ground Beetle	8-33
8.2.9.11	Conservancy Fairy Shrimp	8-35
8.2.9.12	Vernal Pool Fairy Shrimp.....	8-37
8.2.9.13	Vernal Pool Tadpole Shrimp	8-39
8.2.9.14	California Tiger Salamander.....	8-41
8.3	CALIFORNIA RED-LEGGED FROG IMPACT ASSESSMENT	8-44
8.3.1	Development Effects (Zones 1 and 2)	8-45
8.3.1.1	Direct Effects	8-45
8.3.1.2	Indirect Effects.....	8-46
8.3.2	Irrigation and Reclamation District Construction and Annexation Effects (Covered Activity Zones 1 and 2).....	8-46
8.3.2.1	Direct Effects	8-46
8.3.2.2	Indirect Effects.....	8-46
8.3.3	Operation and Maintenance Activity Effects (Covered Activity Zones 1 and 2)	8-46
8.3.3.1	Direct Effects	8-46
8.3.3.2	Indirect Effects.....	8-47
8.3.4	Activities on Preserves and Reserves (Covered Activity Zones 1, 2, and 3)	8-47
8.3.4.1	Direct Effects	8-47
8.3.4.2	Indirect Effects.....	8-48



8.3.5	Requested Take Summary	8-48
8.3.6	Conservation Summary	8-48
8.4	CALLIPPE SILVERSPOT BUTTERFLY IMPACT ASSESSMENT	8-49
8.4.1	Development Effects (Covered Activity Zones 1 and 2)	8-49
8.4.1.1	Direct Effects.....	8-50
8.4.1.2	Indirect Effects	8-50
8.4.2	Irrigation and Reclamation District Construction and Annexation Effects (Covered Activity Zones 1 and 2).....	8-51
8.4.2.1	Direct Effects.....	8-51
8.4.2.2	Indirect Effects	8-51
8.4.3	Operation and Maintenance Activity Effects (Covered Activity Zones 1 and 2).....	8-51
8.4.3.1	Direct Effects.....	8-51
8.4.3.2	Indirect Effects	8-51
8.4.4	Activities on Preserves and Reserves (Covered Activity Zones 1, 2, and 3).....	8-52
8.4.4.1	Direct Effects.....	8-52
8.4.4.2	Indirect Effects	8-52
8.4.5	Requested Take Summary	8-52
8.4.6	Conservation Summary	8-52
8.5	RIPARIAN, STREAM, AND FRESHWATER MARSH NATURAL COMMUNITY IMPACT ASSESSMENT	8-53
8.5.1	Development Effects (Covered Activity Zones 1 and 2)	8-53
8.5.1.1	Direct Effects.....	8-53
8.5.1.2	Indirect Effects	8-53
8.5.2	Irrigation and Reclamation District Construction and Annexation Effects (Covered Activity Zones 1 and 2).....	8-53
8.5.2.1	Direct Effects.....	8-54
8.5.2.2	Indirect Effects	8-54
8.5.3	Operation and Maintenance Activity Effects (Covered Activity Zones 1 and 2).....	8-54
8.5.3.1	Direct Effects.....	8-54
8.5.3.2	Indirect Effects	8-54
8.5.4	Activities on Preserves and Reserves (Covered Activity Zones 1, 2, and 3).....	8-54
8.5.4.1	Direct Effects.....	8-55
8.5.4.2	Indirect Effects	8-55
8.5.5	Requested Take Summary	8-55
8.5.6	Conservation Summary	8-56
8.5.7	Effects on Covered Species	8-57
8.5.7.1	Valley Elderberry Longhorn Beetle	8-58
8.5.7.2	Steelhead.....	8-61
8.5.7.3	Chinook Salmon	8-63
8.5.7.4	Tricolored Blackbird	8-65
8.6	GIANT GARTER SNAKE IMPACT ASSESSMENT	8-68
8.6.1	Development Effects (Covered Activity Zones 1 and 2)	8-68
8.6.1.1	Direct Effects.....	8-68
8.6.1.2	Indirect Effects	8-68



8.6.2	Irrigation and Reclamation District Construction and Annexation Effects (Covered Activity Zones 1 and 2).....	8-69
8.6.2.1	Direct Effects.....	8-69
8.6.2.2	Indirect Effects.....	8-69
8.6.3	Operations and Maintenance Activity Effects (Covered Activity Zones 1 and 2)	8-69
8.6.3.1	Direct Effects	8-70
8.6.3.2	Indirect Effects.....	8-70
8.6.4	Activities on Preserves and Reserves (Covered Activity Zones 1, 2, and 3).....	8-70
8.6.4.1	Direct Effects	8-71
8.6.4.2	Indirect Effects.....	8-71
8.6.5	Requested Take Summary.....	8-71
8.6.6	Conservation Summary.....	8-71
8.7	COASTAL MARSH NATURAL COMMUNITY IMPACT ASSESSMENT	8-72
8.7.1	Development Effects (Covered Activity Zones 1 and 2).....	8-72
8.7.1.1	Direct Effects	8-72
8.7.1.2	Indirect Effects.....	8-73
8.7.2	Irrigation and Reclamation District Construction and Annexation Effects (Covered Activity Zones 1 and 2).....	8-74
8.7.2.1	Direct Effects	8-74
8.7.2.2	Indirect Effects.....	8-74
8.7.3	Operation and Maintenance Activity Effects (Covered Activity Zones 1 and 2)	8-74
8.7.3.1	Direct Effects	8-74
8.7.3.2	Indirect Effects.....	8-75
8.7.4	Activities on Preserves and Reserves (Covered Activity Zones 1, 2, and 3).....	8-75
8.7.4.1	Direct Effects	8-75
8.7.4.2	Indirect Effects.....	8-75
8.7.5	Requested Take Summary.....	8-75
8.7.6	Conservation Summary.....	8-76
8.7.7	Effects on Covered Species.....	8-76
8.7.7.1	Suisun Thistle.....	8-76
8.7.7.2	Soft Bird's-Beak.....	8-77
8.7.7.3	Mason's Lilaeopsis	8-79
8.7.7.4	California Black Rail	8-82
8.7.7.5	California Clapper Rail	8-83
8.7.7.6	Salt Marsh Harvest Mouse	8-85
8.7.7.7	Delta Smelt	8-87
8.7.7.8	Sacramento Splittail.....	8-88
8.7.7.9	Longfin Smelt	8-90
8.7.7.10	Green Sturgeon.....	8-91
8.8	SWAINSON'S HAWK IMPACT ASSESSMENT	8-92
8.8.1	Development Effects (Covered Activity Zones 1 and 2).....	8-92
8.8.1.1	Direct Effects	8-92
8.8.1.2	Indirect Effects.....	8-93
8.8.2	Irrigation and Reclamation District Construction and Annexation Effects (Covered Activity Zones 1 and 2).....	8-93



8.8.2.1	Direct Effects.....	8-93
8.8.2.2	Indirect Effects	8-94
8.8.3	Operation and Maintenance Activity Effects (Covered Activity Zones 1 and 2).....	8-94
8.8.3.1	Direct Effects.....	8-94
8.8.3.2	Indirect Effects	8-94
8.8.4	Activities on Preserves and Reserves (Covered Activity Zones 1, 2, and 3).....	8-94
8.8.4.1	Direct Effects.....	8-94
8.8.4.2	Indirect Effects	8-95
8.8.5	Requested Take Summary.....	8-95
8.8.6	Conservation Summary	8-95
8.9	BURROWING OWL IMPACT ASSESSMENT.....	8-96
8.9.1	Development Effects (Covered Activity Zones 1 and 2).....	8-96
8.9.1.1	Direct Effects.....	8-96
8.9.1.2	Indirect Effects	8-96
8.9.2	Irrigation and Reclamation District Construction and Annexation Effects (Covered Activity Zones 1 and 2).....	8-97
8.9.2.1	Direct Effects.....	8-97
8.9.2.2	Indirect Effects	8-97
8.9.3	Operation and Maintenance Activity Effects (Covered Activity Zones 1 and 2).....	8-97
8.9.3.1	Direct Effects.....	8-97
8.9.3.2	Indirect Effects	8-98
8.9.4	Activities on Preserves and Reserves (Covered Activity Zones 1, 2, and 3).....	8-98
8.9.4.1	Direct Effects.....	8-98
8.9.4.2	Indirect Effects	8-98
8.9.5	Requested Take Summary.....	8-98
8.9.6	Conservation Summary	8-98
9.0	ALTERNATIVES.....	9-1
9.1	SUMMARY.....	9-1
9.2	ALTERNATIVE 1: NO ACTION ALTERNATIVE.....	9-2
9.2.1	Alternative Description	9-2
9.2.2	Valley Floor Grassland and Vernal Pool Natural Community and Associated Species.....	9-3
9.2.2.1	Urban Development Impacts.....	9-3
9.2.2.2	Construction, Operation, and Maintenance of Facilities	9-6
9.2.2.3	Activities on Preserves and Reserves.....	9-6
9.2.3	California Red-Legged Frog.....	9-6
9.2.3.1	Urban Development Impacts.....	9-6
9.2.3.2	Construction, Operation, and Maintenance of Facilities	9-7
9.2.3.3	Activities on Preserves and Reserves.....	9-7
9.2.4	Callippe Silverspot Butterfly	9-7
9.2.4.1	Urban Development Impacts.....	9-7
9.2.4.2	Construction, Operation, and Maintenance of Facilities	9-7
9.2.4.3	Activities on Preserves and Reserves.....	9-8
9.2.5	Stream and Riparian Associated Species.....	9-8
9.2.5.1	Urban Development Impacts.....	9-8



9.2.5.2	Construction, Operation, and Maintenance of Facilities	9-9
9.2.5.3	Activities on Preserves and Reserves	9-9
9.2.6	Giant Garter Snake	9-9
9.2.6.1	Urban Development Impacts	9-9
9.2.6.2	Construction, Operation, and Maintenance of Facilities	9-10
9.2.6.3	Activities on Preserves and Reserves	9-10
9.2.7	Coastal Marsh Community	9-10
9.2.7.1	Urban Development Impacts	9-10
9.2.7.2	Construction, Operation, and Maintenance of Facilities	9-11
9.2.7.3	Activities on Preserves and Reserves	9-12
9.2.8	Swainson's Hawk	9-12
9.2.8.1	Urban Development Impacts	9-12
9.2.8.2	Construction, Operation, and Maintenance of Facilities	9-12
9.2.8.3	Activities on Preserves and Reserves	9-12
9.2.9	Burrowing Owl	9-13
9.2.9.1	Urban Development Impacts	9-13
9.2.9.2	Construction, Operation, and Maintenance of Facilities	9-13
9.2.9.3	Activities on Preserves and Reserves	9-13
9.2.10	Rationale for Rejection	9-13
9.3	ALTERNATIVE 2: COVERAGE OF SPECIES LISTED IN THE USFWS 1999 SOLANO PROJECT BIOLOGICAL OPINION ONLY ALTERNATIVE	9-14
9.3.1	Valley Floor Grassland and Vernal Pool Natural Community and Associated Species	9-15
9.3.1.1	Urban Development Impacts	9-15
9.3.1.2	Construction, Operation, and Maintenance of Facilities	9-16
9.3.1.3	Activities on Preserves and Reserves	9-16
9.3.2	California Red-Legged Frog	9-16
9.3.2.1	Urban Development Impacts	9-16
9.3.2.2	Construction, Operation, and Maintenance of Facilities	9-16
9.3.2.3	Activities on Preserves and Reserves	9-16
9.3.3	Callippe Silverspot Butterfly	9-16
9.3.3.1	Urban Development Impacts	9-16
9.3.3.2	Construction, Operation, and Maintenance of Facilities	9-17
9.3.3.3	Activities on Preserves and Reserves	9-17
9.3.4	Stream and Riparian Associated Species	9-17
9.3.4.1	Urban Development Impacts	9-17
9.3.4.2	Construction, Operation, and Maintenance of Facilities	9-17
9.3.4.3	Activities on Preserves and Reserves	9-17
9.3.5	Giant Garter Snake	9-18
9.3.5.1	Urban Development Impacts	9-18
9.3.5.2	Construction, Operation, and Maintenance of Facilities	9-18
9.3.5.3	Activities on Preserves and Reserves	9-18
9.3.6	Coastal Marsh Natural Community and Associated Species	9-18
9.3.6.1	Urban Development Impacts	9-19
9.3.6.2	Construction, Operation, and Maintenance of Facilities	9-19
9.3.6.3	Activities on Preserves and Reserves	9-19
9.3.7	Swainson's Hawk	9-19
9.3.7.1	Urban Development Impacts	9-19
9.3.7.2	Construction, Operation, and Maintenance of Facilities	9-19



9.3.8	9.3.7.3 Activities on Preserves and Reserves.....	9-19
	Burrowing Owl.....	9-20
	9.3.8.1 Urban Development Impacts.....	9-20
	9.3.8.2 Construction, Operation, and Maintenance of Facilities	9-20
	9.3.8.3 Activities on Preserves and Reserves.....	9-20
9.3.9	9.3.9 Rationale for Rejection.....	9-20
9.4	ALTERNATIVE 3: REDUCED POTENTIAL FOR INCIDENTAL TAKE	
	ALTERNATIVE	9-21
9.4.1	Delta Green Ground Beetle.....	9-22
9.4.2	Vernal Pool Fairy Shrimp, Vernal Pool Tadpole Shrimp, Conservancy Fairy Shrimp, and California Tiger Salamander	9-22
9.4.3	California Red-legged Frog	9-23
9.4.4	Callippe Silverspot Butterfly	9-23
9.4.5	Giant Garter Snake.....	9-23
9.4.6	California Clapper Rail	9-24
9.4.7	Salt Marsh Harvest Mouse.....	9-24
9.4.8	Delta Smelt	9-24
9.4.9	9.4.9 Rationale for Rejection.....	9-24
9.5	ALTERNATIVE 4: INCREASED CONSERVATION ALTERNATIVE – COMBINED HCP/NCCP ALTERNATIVE	9-25
10.0 PLAN IMPLEMENTATION		10-1
10.1	INTRODUCTION	10-1
10.2	PLAN PARTICIPANTS	10-1
10.2.1	Governance	10-1
10.2.2	Solano County Water Agency.....	10-2
10.2.3	Other Plan Participants	10-3
10.2.4	Plan Participant Committee	10-4
10.2.5	HCP Advisory Committee.....	10-4
10.2.6	HCP Technical Review Committee	10-4
10.2.7	Resource Agencies.....	10-5
10.2.8	Public	10-5
10.3	HCP INITIATING ACTIONS	10-5
10.4	AUTHORIZATION OF INCIDENTAL TAKE	10-6
10.4.1	Procedures for Determining Avoidance, Minimization, and Mitigation Measure Requirements.....	10-7
10.4.2	Appeals Process.....	10-10
10.4.3	Exemptions	10-11
10.5	DEVELOPMENT OF THE RESERVE SYSTEM	10-12
10.5.1	Reserve Land Acquisition.....	10-13
	10.5.1.1 Mitigation Bank and Reserve Certification.....	10-13
	10.5.1.2 Private, Project-Specific Mitigation Lands	10-16
	10.5.1.3 Minimum Reserve Design Criteria	10-17
10.5.2	Conservation Easements.....	10-19
10.5.3	Resource Management Plans	10-21
	10.5.3.1 General Requirements	10-22
	10.5.3.2 Additional Management Requirements for Natural Communities and Covered Species.....	10-23
10.5.4	Restoration and Enhancement.....	10-24
	10.5.4.1 Restoration and Enhancement Plans	10-25



10.5.4.2 Species Relocation and Establishment Plans	10-27
10.5.5 Framework for Adaptive Management on Reserves	10-27
10.5.6 Good Neighbor Policy	10-28
10.6 COMPLIANCE MONITORING AND REPORTING.....	10-29
10.6.1 Programmatic Review	10-31
10.6.2 SID Annexations	10-31
10.7 RIGHTS, OBLIGATIONS, ASSURANCES, AND CHANGED/UNFORESEEN CIRCUMSTANCES.....	10-31
10.7.1 Rights and Obligations of SCWA and Permittees	10-31
10.7.2 General Obligations	10-32
10.7.3 Assurances to Third Party Participants in the Event of a Finding of Unforeseen Circumstances.....	10-32
10.7.4 Interim Obligations upon a Finding of Unforeseen Circumstances.....	10-32
10.7.5 Federal Assurances.....	10-32
10.7.6 State Assurances	10-34
10.7.7 Future Federal Actions.....	10-35
10.7.7.1 Section 7 Consultations with the USFWS and NOAA NMFS.....	10-35
10.7.7.2 Designation of Critical Habitat	10-35
10.7.8 Consultations with the CDFG.....	10-36
10.7.9 Changed and Unforeseen Circumstances.....	10-37
10.7.9.1 Natural Communities Lost to Fire	10-37
10.7.9.2 Flooding	10-38
10.7.9.3 Natural Communities are Lost to Drought	10-38
10.7.9.4 Invasive Species	10-39
10.7.9.5 Significant Changes in County Land Use Patterns.....	10-40
10.7.9.6 Toxic Spills and Illegal Dumping of Toxic Wastes.....	10-41
10.7.9.7 Vandalism of Reserves.....	10-41
10.8 OTHER MEASURES AS REQUIRED BY DIRECTOR	10-41
10.9 REVISIONS AND AMENDMENTS.....	10-41
10.9.1 Minor Amendments	10-42
10.9.2 Major Amendments	10-44
10.9.2.1 Amendments to the Solano HCP.....	10-44
10.9.2.2 Amendments to the Section 10(a)(1)(B) Permit and 2081 Incidental Take Permit	10-45
10.9.3 Permit Renewal.....	10-45
10.10 SUSPENSION/REVOCATION	10-46
10.11 SEVERABILITY	10-46
11.0 HCP FUNDING.....	11-1
11.1 COST ANALYSIS.....	11-1
11.1.1 Program Administration Cost Overview.....	11-2
11.1.2 Costs for Fee-Based Conservation	11-3
11.1.3 Costs for Monitoring and Adaptive Management.....	11-5
11.1.4 Contingency.....	11-5
11.2 FUNDING SOURCES AND ASSURANCES.....	11-5
11.2.1 Fee Collection	11-6
11.2.2 Fee Adjustments	11-6
11.3 FUNDING ADEQUACY	11-7



12.0 GLOSSARY.....	12-1
13.0 LITERATURE CITED AND PREPARATION STAFF.....	13-1
13.1 PREPARATION STAFF.....	13-1
13.1.1 Solano County Water Agency.....	13-1
13.1.2 Plan Participants	13-1
13.1.3 LSA Associates, Inc.....	13-1
13.2 LITERATURE CITED.....	13-2
APPENDIX A: ROUTINE OPERATIONS AND MAINTENANCE ACTIVITIES	A-1
A.1 INTRODUCTION	A-1
A.2 ROUTINE OPERATIONS AND MAINTENANCE ACTIVITIES	A-2
A.2.1 Flood Control Channel Maintenance	A-2
A.2.1.1 Bank Maintenance.....	A-2
A.2.1.2 Diversion Dam Construction.....	A-2
A.2.2 Sediment Removal.....	A-2
A.2.3 Bank Reconstruction, Protection, and Erosion Control Activities	A-3
A.2.4 Grading Access Roads	A-3
A.2.5 Fence and Access Gate Repair	A-3
A.2.6 Trash and Debris Removal	A-3
A.2.7 Vegetation Management.....	A-3
A.2.7.1 Control of Terrestrial Weeds.....	A-3
A.2.7.2 Control of Aquatic Weeds.....	A-4
A.2.7.3 Brush Removal and Pruning	A-4
A.2.7.4 Mowing.....	A-4
A.2.8 Fire Break Construction and Maintenance	A-4
A.3 FACILITY TYPES.....	A-5
A.3.1 Aquatic Linear Facilities	A-5
A.3.1.1 Unmodified Streams.....	A-5
A.3.1.2 Channelized Streams	A-6
A.3.1.3 Ditches	A-7
A.3.2 Basins	A-11
A.3.2.1 Storm Water Detention Basins	A-11
A.3.2.2 Irrigation Supply Pump Station Afterbay	A-12
A.3.2.3 Sewer Treatment Ponds and Sprayfields	A-13
A.3.3 Underground Facilities	A-13
A.3.3.1 Underground Irrigation Supply Piping.....	A-13
A.3.3.2 Underground Storm Drains	A-13
A.3.3.3 Underground Sanitary Sewers.....	A-14
A.3.3.4 Underground Sanitary Sewers – Treated Discharge	A-14
A.3.3.5 Pressurized Pipelines.....	A-14
A.3.3.6 Air Vacuum Relief Valves.....	A-14
A.3.3.7 Sewer Force Main Valves.....	A-15
A.3.3.8 Cathodic Protection Systems.....	A-15
A.3.3.9 Maintenance Activities	A-15
A.3.4 Facilities Appurtenant to Linear Features and Basins.....	A-16
A.3.4.1 Pipe Outfalls	A-16
A.3.4.2 Culvert, Bridge Crossings, or Undercrossings	A-17
A.3.4.3 Seasonal Dams.....	A-18
A.3.4.4 Irrigation Supply Check Structures.....	A-18
A.3.4.5 Headwalls.....	A-19



A.3.4.6	Valves and Water Gates.....	A-20
A.3.4.7	Pumps.....	A-20
A.3.4.8	Flashboard Risers	A-21
A.3.4.9	Water Gages.....	A-22
A.3.4.10	Screens.....	A-23
A.3.4.11	Weirs.....	A-23
A.3.4.12	Drop Structures	A-24
A.3.4.13	Gangways	A-24
A.3.5	Other Maintained Facilities	A-25
A.3.5.1	Roadways (Canal Roads, Drainage Roads, Right-of-Way Roads, and Access Roads).....	A-25
A.3.5.2	Fences and Gates.....	A-26
A.3.5.3	Municipal Groundwater Wells	A-26
A.3.5.4	Water Storage Tanks/ Reservoirs	A-27
A.4	PLAN PARTICIPANT FACILITIES AND SPECIFIC OPERATIONS AND MAINTENANCE ACTIVITIES	A-27
A.4.1	City of Fairfield.....	A-27
A.4.1.1	New Facilities	A-27
A.4.2	City of Suisun City	A-28
A.4.2.1	New Facilities	A-28
A.4.3	City of Vacaville	A-28
A.4.3.1	New Facilities	A-28
A.4.4	City of Vallejo	A-29
A.4.5	City of Dixon	A-30
A.4.5.1	New Facilities	A-30
A.4.6	City of Rio Vista	A-30
A.4.6.1	New Facilities	A-31
A.4.7	Solano County Water Agency (SCWA)	A-31
A.4.8	Solano Irrigation District (SID)	A-32
A.4.9	Maine Prairie Water District (MPWD).....	A-32
A.4.10	Dixon Regional Watershed Joint Powers Authority (DRW JPA).....	A-33
A.4.10.1	New Facilities	A-33
A.4.11	Dixon Resource Conservation District (Dixon RCD)	A-33
A.4.11.1	Expansion Area and Proposed New Facilities	A-34
A.4.12	Reclamation District No. 2068 (RD 2068).....	A-34
A.4.13	Vallejo Sanitation and Flood Control District (VSFCD).....	A-34
A.4.14	Fairfield-Suisun Sewer District (FSSD)	A-35

FIGURES

Figure 1-1: Regional Location.....	1-27
Figure 1-2: Solano Project Service Area and Voluntary Participants	1-29
Figure 1-3: Place and Location Names.....	1-31
Figure 1-4: Covered Activity Zones.....	1-33
Figure 2-1: Urban Growth Trends 1950 to 2025	2-23
Figure 2-2: Solano County 2008 General Plan Land Use Diagram.....	2-25
Figure 2-3: City of Fairfield Habitat Types and General Plan Land Use Designations	2-27
Figure 2-4: City of Suisun City Habitat Types and General Plan Land Use Designations	2-29
Figure 2-5: City of Vacaville Habitat Types and General Plan Land Use Designations	2-31



Figure 2-6: City of Vallejo Habitat Types and General Plan Land Use Designations	2-33
Figure 2-7: City of Dixon Habitat Types and General Plan Land Use Designations	2-35
Figure 2-8: City of Rio Vista Habitat Types and General Plan Land Use Designations	2-37
Figure 2-9: Service Areas for SCWA, SID, MPWD, DRW JPA, Dixon RCD, RD 2068, VSFCD, and FSSD.....	2-39
Figure 3-1: Biodiversity Hotspots in the Continental U.S. and Hawaii.....	3-49
Figure 3-2: Major Geographical Provinces in Solano County.....	3-51
Figure 3-3: Potential Historic Vegetation.....	3-53
Figure 3-4: Solano County Watersheds	3-55
Figure 3-5: Natural Communities.....	3-57
Figure 3-6: Vegetation and Cover Types	3-59
Figure 3-7: Historic and Current Extent of Vernal Pool Habitat in Solano County	3-61
Figure 3-8: Historic and Current Extent of Coastal Marsh Communities in Solano County	3-63
Figure 3-9: Solano County Agricultural Crop Trends 1990 to 2009	3-65
Figure 3-10: Habitat Protection in the Solano HCP Plan Area.....	3-67
Figure 3-11: Protected Lands within the Solano HCP Plan Area	3-69
Figure 3-12: Risk Analysis	3-71
Figure 3-13: Vegetation Categories and their Relative Risk of Conversion in the Solano HCP Plan Area	3-73
Figure 4-1: Overview of the Conservation Analysis	4-77
Figure 4-2: Key Corridors within the Plan Area	4-79
Figure 4-3: Rarity Weighted Richness Map of Covered Species and Special Management Species within the Plan Area.....	4-81
Figure 4-4: Vernal Pool Disturbance Results, Barriers and Development.....	4-83
Figure 4-5: Contra Costa Goldfield Population Areas.....	4-85
Figure 4-6: California Tiger Salamander Known and Potential Range	4-87
Figure 4-7: Distribution of Playa Pools and Vernal Pool Critical Habitat	4-89
Figure 4-8: Vernal Pool Conservation Areas.....	4-91
Figure 4-9: FRAP Vegetation Data, Barriers and Development.....	4-93
Figure 4-10: Priority Drainages and Watershed Conservation Areas.....	4-95
Figure 4-11: Percent of Development within Each Watershed/Subwatershed.....	4-97
Figure 4-12: Percent of Irrigated Agriculture within Each Watershed/Subwatershed	4-99
Figure 4-13: Callippe Silverspot Butterfly Conservation Areas.....	4-101
Figure 4-14: California Red-Legged Frog Conservation Area	4-103
Figure 4-15: California Red-Legged Frog Potential Breeding and Hydration Habitat.....	4-105
Figure 4-16: Location of Major Riparian Vegetation Stands Within the Plan Area	4-107
Figure 4-17: Covered Species, Special Management Species, and Streams	4-109
Figure 4-18: Giant Garter Snake Conservation Areas.....	4-111
Figure 4-19: Suisun Marsh Protection Plan Map and Suisun Tidal Wetland Restoration Projects.....	4-113
Figure 4-20: Coastal Marsh Conservation Areas and Designated Critical Habitat for Associated Covered Species	4-115
Figure 4-21: Swainson's Hawk Conservation Areas	4-117
Figure 4-22: Burrowing Owl Conservation Areas	4-119
Figure 4-23: Conservation Analysis	4-121
Figure 4-24: Vegetation Categories by Conservation Class.....	4-123
Figure 4-25: Relationship Between Habitat Area and Number of Species.....	4-125
Figure 4-26: Vernal Pool Potential Preserve and Reserve Areas.....	4-127
Figure 4-27: Swainson's Hawk Potential Reserve Areas	4-129



Figure 5-1: Alternative Configurations for Achieving Habitat Set-asides on Agricultural Reserves.....	5-33
Figure 6-1: Stream Order Designation	6-75
Figure 7-1: Adaptive Management Feedback Loop.....	7-77
Figure 7-2: Overview of the Monitoring and Adaptive Management Structure for the Solano HCP Reserve System	7-79
Figure 7-3: Individual Reserve Management and Monitoring Schedule	7-81
Figure 7-4: Planning and Implementation Schedule for Biological Monitoring Program	7-83
Figure A-1: Cities and Flood Control and Sewer Districts.....	A-37
Figure A-2: Irrigation and Reclamation Districts	A-39
Figure A-3: City of Fairfield Facilities.....	A-41
Figure A-4: City of Suisun City Facilities	A-43
Figure A-5: City of Vacaville Facilities	A-45
Figure A-6: City of Vallejo and Vallejo Sanitation and Flood Control Facilities	A-47
Figure A-7: City of Dixon Facilities	A-49
Figure A-8: City of Rio Vista Facilities	A-51
Figure A-9: Solano County Water Agency Facilities.....	A-53
Figure A-10a: Solano Irrigation District Facilities – Sacramento River/Delta Drainage Province	A-55
Figure A-10b: Solano Irrigation District Facilities – San Francisco Bay Drainage Province.....	A-57
Figure A-11: Maine Prairie Water District Facilities.....	A-59
Figure A-12: Dixon Regional Watershed Joint Powers Authority (JPA) Facilities	A-61
Figure A-13: Dixon Resource Conservation District Facilities.....	A-63
Figure A-14: Reclamation District No. 2068 Facilities.....	A-65
Figure A-15: Fairfield-Suisun Sewer District Facilities	A-67

TABLES

Table 1.1: Covered Species List and Associated Federal, State and CNPS Status.....	1-8
Table 1.2: Special Management Species	1-11
Table 2.1: Approximate Land Use in Solano County	2-1
Table 2.2: Agricultural Acreage in Solano County by Type	2-2
Table 2.3: Employment by Industry Type	2-4
Table 2.4: Solano Project Annual Entitlements.....	2-11
Table 2.5: Covered Activities by Covered Activity Zone	2-14
Table 2.6: Urban Development Land Conversions by City	2-17
Table 2.7: Land Conversion Impacts from Known Activities Outside Urban Zone by City	2-18
Table 2.8: New Irrigation and Flood Control Facilities for Special Districts	2-19
Table 3.1: Vegetation/Cover Types within the Solano HCP Plan Area.....	3-7
Table 3.2: California Vegetation Alliances Associated with the Valley Floor Grassland Vegetation Type.....	3-9
Table 3.3: California Vegetation Alliances associated with the Vernal Pool System Grassland Vegetation Type	3-11
Table 3.4: California Vegetation Alliances Associated with the Inner Coast Range Grassland Vegetation Type	3-13
Table 3.5: California Vegetation Alliances Associated with the Mixed Chaparral/Scrub Vegetation Type.....	3-14
Table 3.6: California Vegetation Alliances Associated with the Oak Savanna Vegetation Type.....	3-15



Table 3.7: California Vegetation Alliances Associated with the Oak Woodland Vegetation Type	3-16
Table 3.8: California Vegetation Alliances Associated with the Riparian Vegetation Type	3-18
Table 3.9: California Vegetation Alliances Associated with the Freshwater Marsh Vegetation Type	3-19
Table 3.10: California Vegetation Alliances Associated with the Marsh Vegetation Type	3-22
Table 3.11: California Vegetation Alliances Associated with the Tidal Flat Vegetation Type	3-22
Table 3.12: California Vegetation Alliances Associated with the Agricultural Cover Type	3-24
Table 3.13: Solano HCP Covered Species List.....	3-28
Table 3.14: Species Covered Under the State 2081 Permit.....	3-33
Table 3.15: Solano HCP Draft List of Special Management Species and Associated Habitats	3-35
Table 3.16: Protected Lands within the Solano HCP Plan Area	3-40
Table 4.1: Covered Species, Special Management Species, and Natural Community Associations	4-3
Table 4.2: Valley Floor Grassland and Vernal Pool Associated Covered and Special Management Species	4-13
Table 4.3: Summary of Protected Lands and County Zoning within the Vaca Mountains/Pleasants Valley/English Hills Conservation Area of the Inner Coast Range ¹	4-25
Table 4.4: Summary of Protected Lands and County Zoning within the West Hills/Green Valley Conservation Area of the Inner Coast Range.....	4-25
Table 4.5: Percent Development and Agriculture in Watersheds within the California Red-legged Frog Jameson Canyon Core Recovery Area ¹	4-28
Table 4.6: Impaired Waterways within the Plan Area.....	4-34
Table 4.7: Estimated Potential Giant Garter Snake Habitat within the HCP Plan Area	4-42
Table 4.8: Definitions of Distribution Types Found within the Solano HCP Plan Area ¹	4-55
Table 4.9: Conservation Targets for Natural Communities, Vegetation Types, and Covered Species	4-57
Table 4.10: Conservation Targets for Contra Costa Goldfields.....	4-59
Table 7.1: Monitoring Requirements for Individual Mitigation Banks and/or Private Project-Specific Mitigation Lands and the Associated Avoidance and Minimization Measures or Mitigation Measures	7-6
Table 7.2: General Monitoring Schedule for Natural Communities and Covered Species.....	7-31
Table 7.3: Monitoring Schedule for Riparian, Stream, and Freshwater Habitats	7-53
Table 8.1: Urban Development Land Conversions by City (Covered Activity Zone 1).....	8-4
Table 8.2: Land Conversion Impacts from Known Activities Outside Urban Growth Boundaries by City (Covered Activity Zone 2)	8-5
Table 8.3: New Irrigation and Flood Control Facilities for Special Districts	8-6
Table 8.4: Direct Impacts to Vernal Pool Habitat in Medium Value Conservation Areas by Plan Participant	8-12
Table 8.5: Indirect Effects to Valley Floor Grassland and Vernal Pool Habitat by Plan Participant.....	8-13
Table 8.6: Indirect Effects to High Value Vernal Pool Conservation Areas from Development in Covered Activity Zone 1.....	8-14
Table 8.7: Indirect Effects to Medium Value Vernal Pool Conservation Areas from Development in Covered Activity Zone 1.....	8-14
Table 8.8: Anticipated Valley Floor Grassland and Vernal Pool Habitat Preservation	8-18



Table 8.9: Riparian, Stream, Freshwater Marsh and Other Aquatic Habitat Impacted by Development in Covered Activity Zones 1 and 2 (acres).....	8-55
Table 8.10: Estimated Potential Giant Garter Snake Habitat in Covered Activity Zone 2.....	8-70
Table 8.11: Conversion of Swainson's Hawk Foraging Habitat in Covered Activity Zone 1 (acres).....	8-92
Table 8.12: Conversion of Swainson's Hawk Foraging Habitat from City Activities Outside of UGBs (Covered Activity Zone 2) (acres).....	8-93
Table 9.1: Relative Comparison of Conservation Benefit of the Alternatives Compared to the Proposed Solano HCP on Covered Natural Communities and Species.....	9-1
Table 9.2: Summary of Potential Additional Costs to Implement NCCP Recovery Conservation Standards	9-27
Table 11.1: Summary of Annual Monitoring Budgets by Implementation Phase.....	11-8
Table 11.2: Summary of Implementation Annual and Total Budget and Zone 1 Development Application Fee Calculation	11-10
Table A.1: Summary of Facilities Associated with Urban Development Maintained by Plan Participants.....	A-69
Table A.2: Summary of Facilities Associated with Agricultural Activities Maintained by Plan Participants	A-70
Table A.3: Routine Operation and Maintenance Activities for the City of Fairfield.....	A-71
Table A.4: Routine Operation and Maintenance Activities for the City of Suisun City	A-72
Table A.5: Routine Operation and Maintenance Activities for the City of Vacaville	A-73
Table A.6: Routine Operation and Maintenance Activities for the City of Vallejo.....	A-74
Table A.7: Routine Operation and Maintenance Activities for the City of Dixon	A-75
Table A.8: Routine Operation and Maintenance Activities for the City of Rio Vista	A-76
Table A.9: Routine Operation and Maintenance Activities for the Solano County Water Agency.....	A-77
Table A.10: Routine Operation and Maintenance Activities for the Solano Irrigation District	A-78
Table A.11: Routine Operation and Maintenance Activities for the Maine Prairie Water District	A-80
Table A.12: Routine Operation and Maintenance Activities for the Dixon Resource Conservation District.....	A-81
Table A.13: Routine Operation and Maintenance Activities for Reclamation District No. 2068.....	A-82
Table A.14: Routine Operation and Maintenance Activities for the Vallejo Sanitation and Flood Control District.....	A-83
Table A.15: Routine Operation and Maintenance Activities for the Fairfield-Suisun Sewer District (in urban and non-urban areas).....	A-84



LIST OF ACRONYMS

°F	degrees Fahrenheit
303(d) list	303(d) list of impaired waters
ABAG	Association of Bay Area Governments
ac	acres
af	acre-feet
AFB	Air Force Base
afy	acre-feet per year
ARMI	Amphibian Research and Monitoring Initiative
Bay Area	San Francisco Bay Area
BCDC	San Francisco Bay Conservation and Development Commission
BIOS	Biogeographic Information and Observation System
BLM	United States Department of the Interior, Bureau of Land Management
BMP	Best Management Practices
CAD	Computer-Aided Design
CAL FIRE	California Department of Forestry and Fire Protection
CalEPPC	California Exotic Pest Plant Council
CALFED	CALFED Bay-Delta Program???
Cal-IPC	California Invasive Plant Council
Caltrans	California Department of Transportation
CBD	Center for Biological Diversity
CBOC	California Burrowing Owl Consortium
CCR	California Code of Regulations
CDFA	California Department of Food and Agriculture
CDFG	California Department of Fish and Game
CDWR	California Department of Water Resources
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
cfs	cubic feet per second
cm	centimeters
CNDDDB	California Natural Diversity Database
CNEL	Community Noise Equivalent Level
CNPS	California Native Plant Society
CO2	carbon dioxide
COMTF	California Oak Mortality Task Force
Corps	United States Army Corps of Engineers



CPI	Consumer Price Index
CPIF	California Partners in Flight
CWA	Clean Water Act
CWHR	California Wildlife Habitat Relationship
dB	decibels
dbh	diameter at breast height
DCIA	directly connected impervious area
DDT	dichlorodiphenyltrichloroethane
DE Plant	Diatomaceous Earth Water Treatment Plant
DIF Update	Water Development Impact Fee Update
Dixon RCD	Dixon Resource Conservation District
DOQs	digital orthophoto quads
Drain	Dixon Drain
DRW JPA	Dixon Regional Watershed Joint Powers Authority
DWR	State of California, Department of Water Resources
EA	Environmental Assessment
EIR	Environmental Impact Report
EIR/EIS	Environmental Impact Report/Environmental Impact Statement
EIS	Environmental Impact Statement
EMP	Environmental Monitoring Program
EPA	United States Environmental Protection Agency
ESA	Environmental Science Associates
ESP	Environmental Stewardship & Planning
ESU	Evolutionarily Significant Unit
FESA	Federal Endangered Species Act
fps	feet per second
FR	Federal Register
FRAP	Fire and Resource Assessment Program
FSSD	Fairfield-Suisun Sewer District
ft	feet
GHG	greenhouse gas
GIS	geographic information system
GPS	global positioning system
Group	Tri-City and County Cooperative Planning Group
HCP	Habitat Conservation Plan
HCP Handbook	Habitat Conservation Planning and Incidental Take Permit Handbook
HCP/NCCP	Habitat Conservation Plan/Natural Community Conservation Plan
I-5	Interstate 5



— SCWA —

I-505	Interstate 505
I-680	Interstate 680
I-780	Interstate 780
I-80	Interstate 80
IA	Implementing Agreement
IBP	Institute for Bird Populations
IEP	Interagency Ecological Program for the San Francisco Estuary
IHRMP	Integrated Hardwood Range Management Program
IPCC	United Nations Intergovernmental Panel on Climate Change
ITFMWQ	Intergovernmental Task Force on Monitoring Water Quality
JPA	Joint Powers Authority
JSA	Jones and Stokes Associates, Inc.
km	kilometers
LAFCO	Local Agency Formation Commission
lbs	pounds
LOP	Letter of Permission
LTMS	Long-Term Management Strategy
m	meter
MBTA	Migratory Bird Treaty Act
MEP	maximum extent practicable
mgd	million gallons per day
MHHW	mean higher high water
MHW	mean high water
mi	mile
MLLW	mean lower low water
MLW	mean low water
mm	millimeters
MMRP	Mitigation Monitoring and Reporting Program
MPWD	Maine Prairie Water District
MS4	Municipal Separate Storm Sewer System
MSA	Municipal Service Area
MSP	Mean Seasonal Precipitation
MTL	mean tide line
MVRU	Mid-Valley Recovery Unit
NaHCO ₃	sodium bicarbonate
NBR Plant	North Bay Regional Water Treatment Plant
NCCP	Natural Community Conservation Plan
NCCPA	California Natural Community Conservation Planning Act

— LSA —

NEPA	National Environmental Policy Act
NGO	non-governmental organization
NOAA NMFS	National Oceanic and Atmospheric Administration, National Marine Fisheries Service
NPDES	National Pollutant Discharge Elimination System
NPPA	California Native Plant Protection Act of 1977
NRCS	Natural Resources Conservation Service
PAO	proportion of area occupied
PAR	Property Analysis Record
PCBs	polychlorinated biphenyls
PIER	Public Interest Energy Research
Porter-Cologne Act	Porter-Cologne Water Quality Control Act
POTWs	publicly owned treatment works
ppt	parts per thousand
PRBO	Point Reyes Bird Observatory
PRC	Public Resources Code
PVA	population viability analysis
RCD	Resource Conservation District
RD 2068	Reclamation District No. 2068
RDM	residual dry matter
Reserve System	Solano HCP Reserve System
Reuse Plan	Mare Island Final Reuse Plan
RGL	Regulatory Guidance Letter
RHJV	Riparian Habitat Joint Venture
RMP	Regional Monitoring Program
ROD	Record of Decision
RWQCB	Regional Water Quality Control Board
RWRI	rarity-weighted richness index
SANDAG	San Diego Association of Governments
SCFC&WCD	Solano County Flood Control and Water Conservation District
SCWA	Solano County Water Agency
SEL	sound exposure levels (SEL) shall not exceed 187 decibels (dB) measured at 10 meters for all listed fish, except
SER	Society for Ecological Restoration
sf	square feet
SFEI	San Francisco Estuary Institute
SHTAC	Swainson's Hawk Technical Advisory Committee
SIC	Standard Industrial Classification
SID	Solano Irrigation District



— SCWA —

SMP	Suisun Marsh Program
SOD	Sudden Oak Death
Solano Project Biological Opinion	Solano Project Water Service Contract Renewal Biological Opinion
sq mi	square miles
SR-113	State Route 113
SR-12	State Route 12
SR-37	State Route 37
SRCD	Suisun Resource Conservation District
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	State Water Resources Control Board
TBI	The Bay Institute
TDS	total dissolved solids
TMDL	Total Maximum Daily Load
TRA	Thomas Reid Associates
TRPA	Thomas R. Payne & Associates
U&JH/S	University and Jepson Herbaria., SMASCH Project
UGB	urban growth boundary
ULL	urban limit line
UPRR	Union Pacific Railroad
USBR	United States Department of the Interior, Bureau of Reclamation
USC	United States Code
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UV	ultraviolet
VCAP	Vacaville Comprehensive Annexation Plan
VSFCD	Vallejo Sanitation and Flood Control District
WRA	Collinsville-Montezuma Hills Wind Resource Area
WRDA	Water Resources Development Act

— LSA —

This page intentionally left blank

