

1.0 Introduction

This Biological Assessment (BA) evaluates the effects of implementing the 2-Gates Fish Protection Demonstration Project (2-Gates Project and/or the Project) in compliance with the federal Endangered Species Act (ESA). The Project would be located in the Sacramento-San Joaquin River Delta (Delta), which is a vital diversion point to provide drinking water for over 23-25 million Californians and supports more than 1.3 million acres of irrigated agricultural lands. The 2-Gates Project will install and operate removable gates in two key channels in the central Delta (Old River and Connection Slough). ~~The Project goal is for a five-year period in order to control flows in a manner that provides equal or improved protection from entrainment to modify the distribution of delta smelt (*Hypomesus transpacificus*) at habitat and thereby help reduce entrainment of delta smelt by the State Water Project (SWP) and Central Valley Project (CVP) export facilities, while allowing higher than the minimum water exports described in the Operations Criteria and Plan (OCAP) Biological Opinions (BOs) Reasonable and Prudent Alternatives (RPAs) of the U.S. Fish and Wildlife Service (USFWS 2008) and National Marine Fisheries Service (NMFS 2009). The Project will operate within other water management requirements (e.g. D 1641). This BA addresses baseline hydrodynamic conditions inherent in CVP and SWP operations, as well as baseline ecological interactions.~~

The combination of tidal flows, channel geometry and connections of Franks Tract, Old River and Middle River (OMR), export pumping at the CVP and SWP facilities near Tracy, along with salinity, temperature, and turbidity gradients conducive to delta smelt movement can all influence the movement of delta smelt into the south Delta toward the export facilities. This movement makes these sensitive fish more vulnerable to entrainment. The 2-Gates Project seeks to demonstrate that operable barriers can control delta smelt entrainment by the state and federal facilities and, once demonstrated, allow for an increased ability to deliver water within existing permits and other conditions.

~~Another goal of the 2-Gates Project is also to minimize adverse affects to other federal or State listed species in the Delta, including Sacramento River winter-run Chinook salmon (*Oncorhynchus tshawytscha*), Central Valley spring run Chinook salmon (*O. tshawytscha*), Central Valley Steelhead (*O. mykiss*), North American green sturgeon (*Acipenser medirostris*), and longfin smelt (*Spirinchus thaleichthys*). In addition to federally or State listed threatened or endangered aquatic species, this BA addresses the anticipated effects of the Project on the following terrestrial species: giant garter snake (*Thamnophis gigas*), vernal pool fairy shrimp (*Branchinecta lynchi*), conservancy fairy shrimp (*B. conservatio*), vernal pool tadpole shrimp (*Lepidurus packardii*), Swainson's hawk (*Buteo swainsoni*), and California black rail (*Laterallus jamaicensis coturniculus*).~~

The purpose of this BA is to review the 2-Gates Project in sufficient detail to determine to what extent it may ~~adversely affect any of the federally listed endangered or threatened;~~ endangeredspecies, proposed, or sensitive species and/or adversely modify designated or

1 proposed critical habitats for these species found in the Action Area¹. In addition to delta smelt,
2 this BA addresses the anticipated effects of the 2-Gates Project on Sacramento River winter-run
3 Chinook salmon (*Oncorhynchus tshawytscha*), Central Valley spring-run Chinook salmon (*O.*
4 *tshawytscha*), Central Valley Steelhead (*O. mykiss*), North American green sturgeon (*Acipenser*
5 *medirostris*), giant garter snake (*Thamnophis gigas*), vernal pool fairy shrimp (*Branchinecta*
6 *lynchi*), conservancy fairy shrimp (*B. conservatio*), and vernal pool tadpole shrimp (*Lepidurus*
7 *packardii*). Designated critical habitat for delta smelt, Sacramento River winter-run Chinook
8 salmon, Central Valley spring-run Chinook salmon, Central Valley steelhead, vernal pool fairy
9 shrimp, vernal pool tadpole shrimp, and conservancy fairy shrimp along with proposed critical
10 habitat for North American green sturgeon also occurs within the 2-Gate Project action area.
11 The information in this BA is provided to comply with statutory requirements to use the best
12 scientific and commercial information available when assessing the risks posed to listed and/or
13 proposed species and designated and/or proposed critical habitat by federal actions. This BA is
14 prepared in accordance with legal requirements set forth under regulations implementing ESA
15 Section 7 (50 CFR 402; 16 United States Code 1536 (c)).

16 1.1 ESA Requirements

17 Federal Agencies have an obligation to ensure that any discretionary action they authorize, fund,
18 or carry out is not likely to jeopardize the continued existence of any endangered or threatened
19 species or destroy or adversely modify its critical habitat unless that activity is exempt pursuant
20 to the Federal ESA 16 United States Code §(a)(2); 50 Code of Federal Regulations (CFR) §
21 402.03. Under Section 7(a)(2), a discretionary agency action jeopardizes the continued existence
22 of a species if it “reasonably would be expected, directly or indirectly, to reduce appreciably the
23 survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or
24 distribution of the species” 50 CFR 402.02.

25 The U.S. Bureau of Reclamation (Reclamation) will comply with its obligations under ESA,
26 namely, to: (1) avoid any discretionary action that is likely to jeopardize continued existence of
27 listed species or adversely affect designated critical habitat; (2) take listed species only as
28 permitted by the relevant Service; (3) and use Reclamation’s authorities to conserve listed
29 species. Through this BA, Reclamation will evaluate anticipated effects of the proposed 2-Gates
30 Project and is proposing actions to minimize adverse effects to listed species, and designated
31 critical habitat, under its existing authorities and consistent with its 7(a)(1) obligation to conserve
32 and protect listed species. Section 7(a)(1) alone does not give Reclamation additional authority to
33 undertake any particular action, regardless of its potential benefit for listed species. The Project
34 operations will be coordinated with SWP and CVP operations and as such, are consulted on as
35 part of the proposed action described in this BA.

¹ The action area includes all areas to be affected directly or indirectly by the action, not merely the immediate area involved in the action.

1.2 Background

The Delta is at the confluence area of the Sacramento and San Joaquin rivers and composed of an extensive, tidally influenced network of interconnecting channels surrounding Delta islands or bordering adjacent uplands. The Delta also includes the lower channels of the Mokelumne River and the confluences of the Cosumnes and Calaveras rivers, and the area collectively receives runoff from 40 percent of the land area of the state. While there are several definitions of the area included in the Delta, it generally extends from just west of Pittsburg to Sacramento in the north and Vernalis on the San Joaquin River in the south. The specifically defined “Legal Delta” covers 738,000 acres, of which about 8.3 percent is water. Much of the land is located in islands or tracts that are below sea level and are collectively protected by over a thousand miles of levees. Channel flow in the Delta is influenced by inflow from upstream rivers, tidal flows, diversion for in-Delta agriculture and exports at the state and federal facilities. Water quality is influenced by upstream water development, including reservoir storage, flood control, diversion and water transfers, return flows from upstream and in-Delta agriculture, and municipal and industrial wastewater releases. The Delta is often referred to as the upper estuary associated with San Francisco Bay and is connected hydrodynamically with the Bay through San Pablo Bay, Carquinez Straits, and Suisun and Honker bays. The western edge of the Delta is about 53 miles from the Golden Gate. The Delta is also a key resource for water management activities in California. Over the last three decades, the CVP and SWP pumping plants have, on average, exported 5.1 million acre-feet (MAF) of water from the Delta to irrigate lands in the San Joaquin Valley and provide water to about 25 million people in the Bay Area, Central Valley, and Southern California (Reclamation 2008).

The CVP is operated by Reclamation and includes several reservoirs, hydroelectric plants, and pumping plants, including the Jones Pumping Plant in the south Delta near Tracy. The CVP’s major storage facilities are Shasta, Trinity, Folsom, and New Melones. The upstream reservoirs release water to provide water for the Delta, of which a portion is exported through Jones Pumping Plant for storage in San Luis Reservoir (jointly operated by the CVP and SWP) or delivered down the Delta Mendota Canal to south of Delta contractors. The California Department of Water Resources (DWR) and Reclamation collectively have built water conservation and water delivery facilities in the Central Valley in order to deliver water supplies to water rights holders as well as CVP and SWP contractors. Some CVP facilities were developed in coordination with the SWP. Both the CVP and the SWP use the San Luis Reservoir, O’Neill Forebay, and more than 100 miles of the California Aqueduct and its related pumping and generating facilities. The SWP is operated to provide flood control and water supply for agricultural, municipal, industrial, recreational, and environmental purposes. DWR has State Water Resources Control Board (SWRCB) permits and licenses to appropriate and divert (or redivert) water for the SWP. Water is conserved in the Oroville Reservoir and released to three Upper Feather River area contractors, two contractors served by the North Bay Aqueduct, and the Harvey O. Banks Pumping Plant (Banks) in the Delta, after which it is delivered to the remaining 24 contractors in the SWP service areas south of the Delta. In addition, Banks pumps water from other sources entering the Delta (i.e., the Sacramento River, San Joaquin River, and Mokelumne River). The current operations of the SWP reservoirs, pumping plants, and aqueducts vary throughout the year based on changing hydrologic and

1 environmental factors, as well as regulations and agreements governing the operation of the
2 SWP.

3 ~~Through the CVP and SWP, Reclamation and DWR have collectively built water storage and~~
4 ~~conveyance facilities in the Central Valley in order to deliver water supplies to water rights~~
5 ~~holders as well as CVP and SWP water contractors throughout California. A substantial amount~~
6 ~~of the water exported from the Delta is conveyed by SWP and CVP facilities.~~

7 Both Reclamation's and DWR's water rights are conditioned by the California State Water
8 Resources Control Board (SWRCB) to protect the beneficial uses² of water within each
9 respective project and jointly for the protection of beneficial uses in the Sacramento Valley and
10 the Sacramento-San Joaquin Delta Estuary. The Coordinated Operations Agreement (COA) was
11 signed in 1986 and defines ~~the project~~both CVP and SWP facilities and their water supplies, sets
12 forth procedures for coordination of operations, identifies formulas for sharing joint
13 responsibilities for meeting Delta standards, as the standards existed in the SWRCB Water
14 Rights Decision 1485 (D-1485), and other legal uses of water, identifies how unstored flow will
15 be shared, sets up a framework for exchange of water and services between the two projects, and
16 provides for periodic review of the Agreement. Additional water management restrictions are
17 included in the SWRCB Water Rights Decision 1641 (D-1641) ~~and in other permits, decisions,~~
18 ~~and biological opinions (i.e. USFWS 2008 and NMFS 2009).~~

19 ~~The SWP is operated to provide flood control and water supply for agricultural, municipal,~~
20 ~~industrial, recreational, and environmental purposes. The DWR has SWRCB permits and~~
21 ~~licenses to appropriate and divert (or redivert) water for the SWP. Water is stored in Oroville~~
22 ~~Reservoir, on the Feather River, and released to three Upper Feather River area contractors, two~~
23 ~~contractors served by the North Bay Aqueduct, and the State's Harvey O. Banks Pumping Plant~~
24 ~~in the south Delta, near Tracy, California, after which it is delivered to the remaining 24~~
25 ~~contractors in the SWP service areas south of the Delta. In addition, the Banks Pumping Plant~~
26 ~~pumps water from other sources entering the Delta (i.e., the Sacramento River, San Joaquin~~
27 ~~River, and Mokelumne River). The current operations of SWP reservoirs, pumping plants, and~~
28 ~~aqueducts vary throughout the year based on changing hydrologic and environmental factors, as~~
29 ~~well as regulations and agreements governing the operation of the Project.~~

30 ~~The CVP is operated by Reclamation and includes several large storage reservoirs, associated~~
31 ~~hydroelectric plants, and pumping plants, including the C. W. "Bill" Jones Pumping Plant in the~~
32 ~~south Delta near Tracy. The CVP's major storage facilities are Shasta, Trinity, Whiskeytown,~~
33 ~~Folsom, New Melones, and Millerton. The upstream reservoirs release water to provide water for~~
34 ~~the Delta, of which a portion is exported through the Jones Pumping Plant for storage in San Luis~~
35 ~~Reservoir and its associated O'Neal Forebay, in the western San Joaquin Valley, or delivered~~
36 ~~down the Delta Mendota Canal to water contractors south of the Delta. Both the CVP and the~~
37 ~~SWP use the San Luis Reservoir, O'Neill Forebay, and more than 100 miles of the California~~

² A water quality control plan must establish beneficial uses. (Wat. Code § 13050(j)) Beneficial uses serve as a basis for establishing water quality objectives. The beneficial uses to be protected were established in the 1978 Delta Plan and the 1991 Bay-Delta Plan and no subsequent requests were made to change the beneficial uses so these uses are carried over into the current plan. The beneficial uses protected by this plan are: Municipal and Domestic Supply; Industrial Service Supply; Industrial Process Supply; Agricultural Supply; Ground Water Recharge; Navigation; Water Contact and Non-Contact Water Recreation; Shellfish Harvesting; Commercial and Sportfishing; Warm Freshwater Habitat; Cold Freshwater Habitat; Migration of Aquatic Organisms; Spawning, Reproduction, and/or Early Development; Estuarine Habitat; Wildlife Habitat; and Rare, Threatened, or Endangered Species.

1 ~~Aqueduct and its related pumping and generating facilities to store and convey water to~~
 2 ~~contractors south of the Delta.~~

3 ~~Delta smelt is currently a federally listed threatened species, although, the USFWS is considering~~
 4 ~~a petition to change its status to endangered. The California Department of Fish and Game~~
 5 ~~changed the status of delta smelt to ‘endangered’ on March 4, 2009. Many factors individually or~~
 6 ~~in combination influence the movement of delta smelt into the south Delta toward the State and~~
 7 ~~federal water export pumps. This movement can be influenced by Delta inflow, tidal flows,~~
 8 ~~pumping at the CVP and SWP south Delta facilities, channel geometry and connections of~~
 9 ~~Franks Tract, Old River and Middle River, along with salinity, temperature, and turbidity~~
 10 ~~gradients. The southward movement of water, influenced significantly by pumping at the CVP~~
 11 ~~and SWP water export facilities, makes these sensitive fish more vulnerable to entrainment and~~
 12 ~~increases the risk to the long term survival of the species. Biological Opinion’s (BOs) by the U.S.~~
 13 ~~Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS)~~
 14 ~~regarding the Coordinated Operations of the Central Valley Project and State Water Project~~
 15 ~~(CVP/SWP Operations BOs) further constrain the operation of these facilities for the protection~~
 16 ~~of delta smelt, listed salmonids and green sturgeon (USFWS 2008, NMFS 2009). These BOs~~
 17 ~~thoroughly describe the components of the CVP and SWP and evaluate the operation of these~~
 18 ~~components for species listed under the federal Endangered Species Act (ESA). Each of these~~
 19 ~~BOs also identifies modified operations of the CVP and SWP as a “Reasonable and Prudent~~
 20 ~~Alternative” (RPA) to current operations. The RPAs form the basis for an incidental take~~
 21 ~~statement under Section 7 of the ESA and generally form the basis for CVP and SWP operations~~
 22 ~~in compliance with the ESA. The relevant RPA actions included in the USFWS and NMFS BOs~~
 23 ~~are summarized in Table 1-1.~~

Table 1-1 Summary of USFWS and NMFS BO RPA Actions¹

Month	USFWS Action 1	USFWS Action 2	USFWS Action 3	NMFS Action IV. 2.1	NMFS Action IV. 2.3
	<u>Adult delta smelt migration and entrainment (first flush)</u>	<u>Adult delta smelt migration and entrainment (extended protection)</u>	<u>Entrainment protection of larval delta smelt</u>	<u>Maintain San Joaquin River inflow/export ratio</u>	<u>Reduced exports to limit negative OMR² flows depending on presence of salmonids</u>
<u>Dec</u>	<u>December – March</u> <u>Limit exports to limit negative OMR flows (-2,000 to -2,500 cubic feet per second [cfs]), until water temperature ≥12 degrees Celsius (°C) or spawning detected.</u>	<u>December – March</u> <u>Limit exports to limit negative OMR flows (-1,250 to -5,000 cfs), until water temperature ≥12°C or spawning detected.</u>			
<u>Jan</u>					<u>January 1 – June 15</u> <u>OMR flow (-5,000 to -2,500 cfs) until after June 1 water temperature at Mossdale ≥ 22°C for 7 days.</u>
<u>Feb</u>					
<u>Mar</u>			<u>Early/ mid-March – June 30</u>		
<u>April</u>			<u>Once temperature ≥12°C or spawning</u>	<u>April 1 – May 31</u> <u>Maintain Vernalis</u>	

Table 1-1 Summary of USFWS and NMFS BO RPA Actions¹

<u>May</u>			<u>detected, limit exports to limit negative OMR flows (-1.250 to -5.000) until June 30.</u>	<u>inflow/export ratio depending on water supply parameters (interim 2009-2011) or depending on water year (long term 2012+)</u>	
<u>June</u>					
<p><u>Note:</u> ¹ USFWS 2008b CVP/SWP Operations BO RPA Component 1 and NMFS 2009a SWP/CVP Operations BO RPA Action IV.2 ² OMR flows is defined as the combined net flow of Old and Middle Rivers.</p>					

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The description of existing conditions in this BA considers the various components of D-1641 and the Coordinated Operations Agreement (e.g., water quality standards, discharge requirements, and allowed diversions), as well as the permit conditions issued by others, particularly those contained in the USFWS and NMFS CVP/SWP Operations BOs. During certain time periods and environmental conditions, the components of D-1641 define the current operation practices, while during under other time periods and environmental conditions, the RPAs in the USFWS and NMFS CVP/SWP Operations BOs define these conditions.

1.3 Contents and Organization of the Biological Assessment

Contents and Organization of the Biological Assessment

Reclamation has the responsibility for the scope, content, and adequacy of this BA. The species addressed in the following sections ~~were~~ are evaluated in accordance with the federal ESA guidelines. This BA follows a structure similar to a BO and includes appendices which provide more details on the models used to evaluate effects. It also includes an operations plan that incorporates actions required through RPAs from the USFWS and NMFS ~~OCAP-CVP/SWP Operations BO's (USFWS 2008, NMFS 2009) and Conditions of Approval described in the CDFG Longfin smelt 2081 Incidental Take Permit (DFG 2009). The BA also include the monitoring plan, attached as one of the appendices, developed as part of the project to detect operational triggers and evaluate the effects of the 2-Gates Project on delta smelt and the other listed species.~~

This Biological Assessment is organized as follows:

- **Section 1.** Introduction: Presents the 2-Gates Project and the purpose of the BA.
- **Section 2.** Project Purpose and Description: Describes the purpose and need for the Project, its objectives, project description including the location and Action Area, construction details and schedule, operations and monitoring, protective measures for listed species, and mitigation measures incorporated as part of the Project.

- 1 • **Section 3.** Status of the Species: Describes the covered species status in the region, and in the
2 Action Area.
- 3 • **Section 4.** Environmental Baseline: Provides an environmental baseline identifying the
4 regulatory (including constraints established by the recent USFWS and NMFS BOs) and
5 environmental setting.
- 6 • **Section 5.** Effects of the Action: Describes the approach to the effects analysis, the models
7 used, and how the models were used to evaluate the operation of the Project.
- 8 • **Section 6.** Cumulative Effects: Lists other non-federal projects that may affect listed species
9 in the Action Area.
- 10 • **Section 7.** Summary and Conclusion: Discusses the overall effects of cumulative effects and
11 project actions.
- 12 • **Section 8.** References: Provides a detailed listing of the references cited in the BA.
- 13 • **Appendices.** Provides supporting materials for the BA including the operations plan, science
14 and monitoring plan, models used in the analysis, modeling results, and design plans for the
15 sites. The BA appendices are listed below.
 - 16 – Appendix A. Particle Tracking and Analysis of Adult and Larval/Juvenile Delta Smelt
 - 17 – Appendix B. Operations Plan
 - 18 – Appendix C. Science Investigation Program & Monitoring Plan
 - 19 ○ Attachment A. Sacramento-San Joaquin Delta Turbidity Modeling
 - 20 ○ Attachment B. Fixed-Site Monitoring as a Tool for Understanding
 - 21 ○ Attachment C. Monitoring and Analysis of Turbidities
 - 22 ○ Attachment D. Mokelumne Salmonid Monitoring Plan for 2-Gates Proposal
 - 23 – Appendix D. ~~95~~100% Design Plans for Old River Site & Connection Slough Sites
 - 24 – Appendix E. Hydrodynamic Analyses of 2-Gates Flood Stage Issues
 - 25 – Appendix F. Hydrodynamic Analysis of 2-Gates Near Field Effects
 - 26 – Appendix G. Consultation Letters
 - 27 – Appendix H. Dry-and Wet-Season Sampling for Federally Listed Large Branchiopods
 - 28 – Appendix I. Habitat Assessment for the Giant Garter Snake
 - 29 – Appendix J. Essential Fish Habitat
 - 30 – Appendix K. Delta Passage Model

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