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1 S E C T I O N 8

2 **Essential Fish Habitat**

3 **8.1 ESSENTIAL FISH HABITAT BACKGROUND**

4 Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act, as amended (United
 5 States Code. 180 et seq.), requires Federal action agencies which fund, permit, or carry out activities that may
 6 adversely effect designated essential fish habitat (EFH) for Federally managed fish species to consult with the
 7 National Marine Fisheries Service (NMFS) regarding the potential adverse effects of their actions on EFH. In
 8 addition, this act also provides that the NMFS “shall coordinate with and provide information to other Federal
 9 agencies to further the conservation and enhancement of essential fish habitat” (16 United States Code.
 10 §1855(b)(1)(D). The EFH regulations also require that Federal action agencies obligated to consult on EFH
 11 also provide NMFS with a written assessment of the effects of their action on EFH (50 Code of Federal
 12 Regulations §600.920).

13 The objective of this EFH assessment is to describe potential adverse effects to designated EFH for Federally
 14 managed fish species anticipated to occur within the proposed 2-Gates Action Area. It also describes
 15 proposed conservation measures designed to avoid, minimize, or otherwise offset potential adverse effects to
 16 designated EFH resulting from the 2-Gates Fish Protection Demonstration Project.

17 **8.2 DESCRIPTION OF THE PROPOSED ACTION**

18 This EFH assessment is based on the description of the 2-Gates Project and the Action Area described
 19 previously in Section 2.3 Project Description and Section 2.5 Project Area and Action Area of this BA. For
 20 complete description of the proposed Project and the Action Area used in this EFH assessment see Sections
 21 2.3 and 2.5, respectively.

22 **8.3 IDENTIFICATION OF ESSENTIAL FISH HABITAT**

23 This section describes EFH designated by the Pacific Fishery Management Council (PFMC) within the
 24 Action Area for species managed under three different fishery management plans (FMPs). These FMPs are
 25 discussed in the following order: (1) the Pacific Groundfish FMP; (2) the Coastal Pelagic Species FMP; and,
 26 (3) the Pacific Salmon FMP. With regards to the Pacific salmon FMP, because previous sections of this BA
 27 provide habitat protection requirements for Sacramento River winter-run Chinook salmon and Central Valley
 28 spring-run Chinook salmon, this section pertains only to Central Valley fall and late-fall run Chinook salmon.
 29 Central Valley steelhead and Central California Coast steelhead are not managed by the PFMC and no EFH
 30 has been designated for these species.

31 EFH is defined as those waters and substrates necessary to fish for spawning, breeding, feeding, or growth to
 32 maturity. For the purposes of interpreting EFH, “waters” includes aquatic areas and their associated physical,
 33 chemical, and biological properties that are used by fish, and may include areas historically used by fish
 34 where appropriate; “substrate” includes sediment, hard bottom, structures underlying the waters, and
 35 associated biological communities; “necessary” means habitat required to support a sustainable fishery and a
 36 healthy ecosystem; and, “spawning, breeding, feeding, or growth to maturity” covers all habitat types used by
 37 a species throughout its life cycle. The Action Area considered for the proposed Project is within the region
 38 identified as EFH for starry flounder (*Platichthys stellatus*), in Amendment 11 of the Pacific Coast

39 Groundfish FMP, for Northern Anchovy (*Engraulis mordax*) in the Coastal Pelagic Species FMP, and for
 40 Pacific salmon in Amendment 14 of the Pacific Salmon FMP.

41 **8.3.1 Pacific Coast Groundfish Fishery Management Plan**

42 The Pacific Coast Groundfish FMP (PFMC 1998) has designated EFH for 83 species of groundfish, which
 43 taken together include all coastal waters, including to the upstream extent of saltwater intrusion in coastal
 44 rivers, along the Pacific coast. Starry flounder (*Platichthys stellatus*) is the most prevalent species managed
 45 under this FMP that is present within the described Action Area (see Section 2.3). Designated EFH for the
 46 Pacific groundfish FMP includes Suisun Bay, San Pablo Bay, and San Francisco Bay.

47 **8.3.2 Coastal Pelagic Species Fishery Management Plan**

48 Northern Anchovy (*Engraulis mordax*) is the only species managed under this FMP that may occur within the
 49 Action Area. Designated EFH for the Coastal Pelagic Species FMP includes Suisun Bay, San Pablo Bay, and
 50 San Francisco Bay.

51 **8.3.3 Pacific Salmon Fishery Management Plan**

52 The PFMC has identified and described EFH, Adverse Impacts, and Recommended Conservation Measures
 53 for salmon in Amendment 14 to the Pacific Coast Salmon FMP (PFMC 1999). Freshwater EFH for Pacific
 54 salmon in the California Central Valley includes waters currently or historically accessible to salmon within
 55 the Central Valley ecosystem as described in Myers *et al.* (1998), and includes the Sacramento River Basin
 56 hydrologic unit and the San Joaquin Delta (Delta) hydrologic unit (i.e., number 18040003). Sacramento River
 57 winter-run Chinook salmon (*Oncorhynchus tshawytscha*), Central Valley spring-run Chinook salmon
 58 (*O. tshawytscha*), and Central Valley fall-/late fall-run Chinook salmon (*O. tshawytscha*) are species managed
 59 under the Salmon Plan that occur in the proposed Action Area.

60 Factors limiting salmon populations in the Action Area include reduced instream flows due to water diversion
 61 and exports, loss of fish into unscreened diversions, predation by introduced species, and reduction in the
 62 quality and quantity of rearing habitat due to channelization, pollution, riprapping, etc. (Dettman *et al.* 1987;
 63 California Advisory Committee on Salmon and Steelhead Trout 1988, Kondolf *et al.* 1996a, 1996b). Factors
 64 affecting salmon populations in Suisun Bay include heavy industrialization within its watershed and discharge
 65 of wastewater effluents into the bay. Loss of vital wetland habitat along the fringes of the bay reduce rearing
 66 habitat and diminish the functional processes that wetlands provide for the bay ecosystem.

67 **8.4 LIFE HISTORY, DISTRIBUTION, AND HABITAT REQUIREMENTS**

68 **8.4.1 Starry Flounder**

69 The starry flounder is a flatfish found throughout the eastern Pacific Ocean, from the Santa Ynez River in
 70 California to the Bering and Chukchi Seas in Alaska, and eastwards to Bathurst inlet in Arctic Canada. Adults
 71 are found in marine waters to a depth of 375 meters. Spawning takes place during the fall and winter months
 72 in marine to polyhaline waters. The adults spawn in shallow coastal waters near river mouths and sloughs,
 73 and the juveniles are found almost exclusively in estuaries. The juveniles often migrate up freshwater rivers,
 74 but are estuarine dependent. Eggs are broadcast spawned and the buoyant eggs drift with wind and tidal
 75 currents. Juveniles gradually settle to the bottom after undergoing metamorphosis from a pelagic larva to a
 76 demersal juvenile by the end of April. Juveniles feed mainly on small crustaceans, barnacle larvae,
 77 cladocerans, clams, and dipteran larvae. Juveniles are extremely dependent on the condition of the estuary for

78 their health. Polluted estuaries and wetlands decrease the survival rate for juvenile starry flounder. Juvenile
79 starry flounder also have a tendency to accumulate many of the anthropogenic contaminants found in the
80 environment.

81 **8.4.2 Northern Anchovy**

82 Northern anchovy are pelagic schooling fish found in coastal waters of the eastern Pacific Ocean. A small,
83 short lived species, northern anchovy seldom live beyond four years. Spawning occurs during every month of
84 the year, peaking from January through April (Richardson 1981). Eggs are pelagic, found near the water
85 surface, and require two to four days to hatch, depending on water temperatures. Juveniles range in size from
86 25 mm to 140 mm in length and mature at two to three years of age. Northern anchovy feed diurnally,
87 selectively feeding on larger zooplankton, fish eggs, and fish larvae. One of the most abundant and productive
88 fishes in the San Francisco Bay area, northern anchovy occur throughout the San Francisco Bay-San Pablo
89 Bay-Suisun Bay complex. Although most common downstream of Carquinez Strait, separating San Pablo
90 Bay from Suisun Bay, they are often found in surveys of the lower brackish water portions of the Sacramento
91 and San Joaquin Rivers (PFMC 1998).

92 **8.4.3 Pacific Salmon**

93 General life history information for Central Valley Chinook salmon is summarized below. Information on
94 Sacramento River winter-run and Central Valley spring-run Chinook salmon life histories is summarized in
95 Section 3.1 of this BA. Further detailed information on Chinook salmon ESUs is available in the NMFS status
96 review of Chinook salmon from Washington, Idaho, Oregon, and California (Myers *et al.* 1998), and the
97 NMFS proposed rule for listing several Chinook salmon ESUs (63 Federal Rule 11482).

98 Adult Central Valley fall-run Chinook salmon enter the Sacramento and San Joaquin Rivers from July
99 through December and spawn from October through December. Adult Central Valley late fall-run Chinook
100 salmon enter the Sacramento and San Joaquin Rivers from October to April and spawn from January to April
101 (USFWS 1998). Chinook salmon spawning generally occurs in clean loose gravel in swift, relatively shallow
102 riffles or along the edges of fast runs (NMFS 1997).

103 Egg incubation occurs from October through March (Reynolds *et al.* 1993). Shortly after emergence from
104 their gravel nests, most Chinook salmon fry disperse downstream towards the Delta and into the San
105 Francisco Bay and its estuarine waters (Kjelson *et al.* 1982). The remaining fry hide in the gravel or station in
106 calm, shallow waters with bank cover such as tree roots, logs, and submerged or overhead vegetation. These
107 juveniles feed and grow from January through mid-May, and emigrate to the Delta and estuary from mid-
108 March through mid-June (Lister and Genoe 1970). As they grow, the juveniles associate with coarser
109 substrates along the stream margin or farther from shore (Healey 1991). Along the emigration route,
110 submerged and overhead cover in the form of rocks, aquatic and riparian vegetation, logs, and undercut banks
111 provide habitat for food organisms, shade, and protect juveniles and smolts from predation. Chinook salmon
112 smolts generally spend a short time in the Delta and estuary before entry into the ocean. Whether entering the
113 Delta or estuary as fry or juveniles, Central Valley Chinook salmon depend on passage through the Delta for
114 access to the ocean.

115 **8.5 EFFECTS OF THE PROPOSED ACTION**

116 **8.5.1 Starry Flounder**

117 Starry flounder salvage does occur at the State and Federal export pumps on Old River south (upstream) of
118 the Project sites. Therefore, starry flounder may be adversely affected by the proposed Project. Most salvage

119 occurs in the months of May through July and is made up of young-of-the-year fish with the largest between
120 3 and 4 inches long (Lloyd Hess, pers. comm. as reported in Bureau of Reclamation 2008).

121 The general effects on the quality of EFH for starry flounder are expected to be similar to those described
122 previously for green sturgeon due to their benthic life history. Benthic dwelling fish will have direct contact
123 with sediment and may ingest contaminated sediment exposed during the construction phase of the proposed
124 Project along with benthic invertebrates during their foraging activities. It is anticipated that starry flounder
125 will spend more time as juveniles rearing in the Action Area than Chinook salmon smolts expected to pass
126 through the area. Therefore, this fish species will have a greater duration of potential exposure to
127 contaminants of concern during construction activities than juvenile Chinook salmon, leading to potentially
128 greater levels of adverse effects to the individual organisms.

129 Essential Fish Habitat designated in the Groundfish FPM ends at the eastern boundary of Suisun Bay, 30 river
130 miles (RM) downstream of the Project site. The proposed Project may adversely affect starry flounder habitat
131 in the Delta by changing flow and water quality within the Action Area; however, it is unlikely that the
132 Project will adversely affect designated EFH as far downstream as Suisun Bay.

133 Effects to starry flounder habitat are anticipated to be minor, as the majority of their habitat is some distance
134 downstream of the Project site, in Suisun Bay, San Pablo Bay, San Francisco Bay, and the marine
135 environment. In addition, no commercial fisheries for groundfish will be affected by localized effects of the
136 Project.

137 **8.5.2 Northern Anchovy**

138 Northern anchovy is primarily a marine and estuarine species and only occasionally occur within the Action
139 Area. There are no records of northern anchovy salvage at the State and Federal export pumps on Old River
140 south (downstream) of the Project sites. Therefore, no adverse effects to northern anchovy are expected within
141 the Project area.

142 EFH designated in the Coastal Pelagic FMP ends at the eastern boundary of Suisun Bay, 30RM downstream
143 of the Project site. Therefore, no adverse effects to Coastal Pelagic EFH are expected as a result of the
144 Project.

145 **8.5.3 Pacific Salmon**

146 The effects of the proposed action on Pacific salmon habitat are described at length in Section 5. Effects of
147 the Action, and generally are expected to apply to Pacific salmon EFH as well.

148 **8.6 CUMULATIVE EFFECTS**

149 Potential impacts of river modification due to the proposed 2-Gates Project include effects on flow, water
150 quality, fish migration pattern, spawning habitat and species diversity within the Action Area. These
151 interactions may have an influence on the abundance and distribution of prey or food items for benthic and
152 pelagic fish species as well as predators of these species within the Action Area. Changes in flow patterns and
153 water quality within the Action Area may affect habitat essential to benthic and pelagic fish species managed
154 under FMPs; however, effects to designated EFH as a whole is expected to be less than significant. This is
155 because either designated EFH does not occur within the Action Area of the Project (Ground Fish and Coastal
156 Pelagic) or the effects are localized, affecting a relative small portion of designated EFH (Pacific salmon).

157 **8.7 PROPOSED CONSERVATION MEASURES**

158 Proposed conservation measures include recommendations that: (1) all intake or other Project structures such
159 as the gates be designed to minimize entrainment or impingement of fish; (2) mitigation be provided for the
160 net loss of habitat from placement of the gate structures and associated components (i.e. sheet pile, rip-rap,
161 etc.); and, (3) the gates are to be operated in a way that allows migrating salmon to pass through the Project
162 sites in both upstream and downstream directions.

163 **8.8 CONCLUSION**

164 Based on the best available information as described in this section it is believed that the Project may
165 adversely affect designated EFH for Pacific salmon during initial construction and normal long-term
166 operations and annual construction activities. Although there may be effects to Starry Flounder within the
167 Action Area, this area is not designated EFH in the Groundfish FPM, therefore, no Groundfish EFH will be
168 adversely effected by the Project. In addition, while Northern Anchovy may occasionally occur within the
169 Action Area, this area is not designated EFH in the Coastal Pelagic FPM; therefore, no Coastal Pelagic EFH
170 will be adversely affected by the Project.