IGNACIA S. MORENO, Assistant Attorney General
United States Department of Justice
Environment & Natural Resources Division
SETH M. BARSKY, Chief
S. JAY GOVINDAN, Acting Assistant Chief
ROBERT P. WILLIAMS, Trial Attorney
ETHAN CARSON EDDY, Trial Attorney (Cal. Bar. No. 237214)
Wildlife and Marine Resources Section
Benjamin Franklin Station, P.O. Box 7369
Washington, D.C. 20044-7369
Telephone: (202) 305-0202 / Facsimile: (202) 305-0275

Attorneys for Federal Defendants

UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF CALIFORNIA
FRESNO DIVISION

THE DELTA SMELT CONSOLIDATED CASES	Case No.: 1:09-cv-00407-OWW-DLB **Declaration of Dr. Jennifer M. Norris In Support of Federal Defendants' Request for A Stay**

I, Dr. Jennifer M. Norris, declare as follows:

1. I am the Assistant Field Supervisor for Ecological Services in the U.S. Fish and Wildlife Service ("Service") Bay Delta Fish and Wildlife Office ("BDFWO"). I manage the planning and permits division, which is responsible for Endangered Species Act ("ESA") regulatory actions in the San Francisco Bay/Sacramento-San Joaquin Delta Estuary ("Bay-Delta") for the Delta smelt. My curriculum vitae is attached to this declaration (**Exhibit A**).

2. In my position as Assistant Field Supervisor for Ecological Services, I frequently review proposed federal agency actions for potential impacts to ESA-listed species and their designated critical habitat pursuant to Section 7(a)(2) of the ESA. My job responsibilities include supervising my office's preparation of biological opinions ("BiOp") pursuant to ESA Section 7(a)(2), which assesses the likelihood that a federal action will result in jeopardy to listed species or in destruction or adverse modification of a listed species' critical habitat. 50 C.F.R. § 402.14(g) (discussing the Service's responsibilities during formal consultation). Where appropriate, I supervise the preparation of reasonable and prudent alternatives ("RPA") to proposed actions that avoid jeopardy and adverse modification of designated critical habitat, and incidental take statements ("ITS") that, if followed, protect the action agency from liability under the ESA's Section 9 "take" prohibition. 16 U.S.C. § 1536(b)(4); 50 C.F.R. § 402.14(i); *see also* 16 U.S.C. § 1536(o)(2).

3. I am familiar with the Service's 2008 BiOp on the Long Term Operations of the Central Valley Project and State Water Project ("2008 BiOp"), and I have read the Court's December 14, 2010, Memorandum Decision Re Cross Motions for Summary Judgment (Document 757). I also have read the Court's August 31, 2011 Findings of Fact and conclusions of Law (Doc. 1013) with respect to Component 3 (Action 4) of the 2008 BiOp's RPA (hereafter, "Fall X2 Action"). I submit this supplemental declaration in support of Defendants' request for the stay of the ruling pending appeal.

4. It is important to emphasize that delta smelt are at great risk of extinction. As the record shows in this case, delta smelt are threatened primarily by the loss and degradation of habitat. Fall 2011 represents the first opportunity in the last decade to provide essential habitat

for the species during a critical life stage. We do not know when water conditions will be this favorable for the species again. Given the downward trajectory of the smelt population, the current water conditions might not occur again until the smelt population has passed the tipping point at which extinction cannot be prevented. For this reason, implementation of the Fall X2 Action may represent the last opportunity to prevent extinction of a species unique to California.

5. Implementing the Fall X2 Action this year is an essential means of avoiding jeopardy to the species and adverse modification of critical habitat. The RPA requires an average X2 position of no greater than 74km in September and October of wet years and is intended to provide the delta smelt with sufficient good quality habitat during the period in its life history that will maximize the likelihood of a successful spawn in the following spring. In 2011, because of the wet conditions, implementation of the 74 km X2 position will take advantage of an opportunity that has not been available since 1998 (the last time that the Low Salinity Zone ("LSZ") was centered as far downstream as 74km upstream of the Golden Gate Bridge) to boost the smelt population and begin a gradual reduction in the risk of extinction of the species. By maintaining X2 at 74km this Fall, delta smelt produced this past spring are much more likely to survive and reproduce next year, thereby adding to the population overall. Failure to provide this habitat during Fall 2011 will result in irreparable harm to the species by allowing the jeopardy of the last decade to continue.

6. In my previous declaration, I provided a basic summary of the rationale for the Fall X2 Action and the specific locations for X2 and explained why the Fall X2 Action is a necessary element of the 2008 BiOp's RPA to an action that would otherwise result in jeopardy to delta smelt and adverse modification of the delta smelt's designated critical habitat. *See* Doc. 941. In this supplemental declaration, I reiterate the precarious status of the delta smelt and explain why the Court's ruling imposing Fall X2 at 79km instead of 74 km as required by the 2008 BiOp substantially alters the RPA and will increase the risk of extinction for delta smelt, preclude its recovery and cause irreparable harm to the species.

I. Delta Smelt Are Trending toward Extinction.

7. The risk that the delta smelt will become extinct is very real. Starting in the early 2000s, the delta smelt population has trended downward and has remained at record low levels for the last seven years, as indicated by the annual Fall midwater trawl index. Decl. of Dr. Jennifer Norris In Supp. of Fed. Def. Opp. to Pls. Mot for Int. Injunctive Relief, Exhibit C ((Feb 11, 2011) Doc. No. 794-1; Decl. Of Fred Feyrer In Supp.of Defs. Opp to Pls.Mot. For Inj. (Jul. 1, 2011) Doc No. 944. . This downward trend indicates the risk of extinction for delta smelt has increased substantially since it was listed in 1993. Decl. of Dr. Jennifer Norris In Supp. of Fed. Def. Opp. to Pls. Mot for Int. Injunctive Relief, Exhibit D (Feb 11, 2011) Doc No. 794-1; Decl. Of Fred Feyrer In Supp.of Defs. Opp to Pls.Mot. For Inj. (Jul. 1, 2011) Doc No. 944.

8. Due to the precipitous decline in the delta smelt's status, the Service has taken actions that reflect the precarious nature of the species' condition. First, in April 2010, the Service found that reclassifying delta smelt from a threatened to an endangered species was warranted. 75 Fed. Reg. 17667, April 7, 2010. Although such a reclassification does not offer a greater level of protection for smelt, in finding that an endangered classification is warranted the Service recognized the declining status. For instance, the Service cited a 2005 population viability analysis that calculated a 50 percent likelihood that the species could reach effective extinction (8,000 individuals) within 20 years. Bennett, W. A. 2005. Critical assessment of the delta smelt population in the San Francisco Estuary, California. San Francisco Estuary and Watershed Science 3(2):1-71.pp. 53-54. More recent genetic studies indicate that the delta smelt is losing genetic diversity and with it, viability, as it declines. Fisch. K.M. 2011. Conservation genetics of the endangered delta smelt (Hypomesustranspacificus) in the San Francisco Estuary. PhD Dissertation. University of California, Davis.

9. Second, in 2007, the Service committed resources to creating a genetic refugial population of delta smelt that would, through strict broodstock management, ensure the genetic diversity present in the wild population in 2007 would be maintained in the event of further population declines. The Service began refugial programs at the Fish Conservation and Culture Lab in Byron, California and Livingston Stone National Fish Hatchery. These refugial

populations are safeguards against extinction in the wild and would provide a source of genetically diverse fish should supplementation of wild populations or reintroduction become necessary recovery actions. In December 2009, six Federal agencies emphasized the importance of the refugial population in the December 2009 Interim Federal Action Plan for the California Bay-Delta: 2011 and Beyond ("Action Plan"). The Action Plan acknowledges that the refugial population program is in its earliest stages and that current facilities are not capable of addressing all the research needs or producing the numbers of fish necessary for supplementation or reintroduction. Refugial population operations represent substantial investment of resources. Of the 1380 listed plant and animal species, the Service reserves such action for species at imminent risk of extinction. For example, here in the Pacific Southwest Region, such measures have been undertaken for condors and riparian brush rabbits when numbers in the wild fell to a handful of individuals. As demonstrated by the information and actions cited above, the Service has a high level of concern for the continued existence of delta smelt, and has taken actions to prepare for possible extinction in the wild.

II. Maintaining Fall X2 At 79 km Will Cause Irreparable Harm to the Delta Smelt

10. "X2" is the point in the Delta San Francisco Estuary where water salinity is calculated to average two parts per thousand (ppt); it's location is measured in the number of kilometers it is upstream from the Golden Gate Bridge. BiOp at 26, 149. X2's location is variable, and depends upon tides and river outflows into the Delta. BiOp at 372. X2 is used by scientists and managers to indicate the location of the low salinity zone (LSZ), which is the region in the estuary where freshwater from the delta and salt water from the ocean mix. However, X2 is not the same as the LSZ, which is defined as the area where salinities range between .5 to 6 ppt. See Findings of Fact and Conclusions of Law at 18 n.3. As stated above, X2 is the calculated location in the estuary where salinity is two ppt. Thus, X2 lies within, but is not synonymous with, the LSZ.

11. Scientists working in the Delta have long recognized the importance of the low salinity zone for delta smelt. See BiOp at 210-211; Decl. Of Fred Feyrer In Supp.of Defs.' Opp to Pls.' Mot. For Inj. (Jul. 1, 2011), Doc. No. 944. The delta smelt is undoubtedly the most

estuarine-dependent species that lives in the San Francisco Estuary. Moyle et al. 1993, Moyle 2002, Bennett 2005. The species completes its entire life cycle in the low salinity zone of the estuary except for spawning and juvenile rearing, which occurs seasonally just upstream in freshwater. Bennett 2005.

12. During fall months (September-December), X2 is indicative of the location and amount of suitable abiotic habitat for delta smelt. The location of "X2 clearly affects the spatial distribution of delta smelt habitat." Administrative Record ("AR") at 018285 (Feyrer 2008). That is, the amount of suitable abiotic habitat for delta smelt in the estuary declines as X2 moves upstream. See at BiOp 234 ("[P]ositioning X2 seaward during fall provides a larger habitat area."); see also AR at 010295 (mapping Delta, including pertinent fall X2 monitoring sites at 74km (Chipps Island) and 81km (Collinsville); BiOp at 374 (plotting 1967–2007 fall X2 location and corresponding amount of suitable habitat).

13. In particular, a fall X2 location at 74km means that the LSZ opens into Suisun Bay, leading to greater delta smelt abundance. See BiOp at 113, 115 (mapping); BiOp at 148 (stating spawning can occur in Suisun Bay and Marsh during wetter years); BiOp at 157 (stating increased autumn salinity in Suisun Bay has contributed to a long-term decline in habitat suitability); BiOp at 179 ("In general, delta smelt habitat quality and surface area are greater when X2 is located in Suisun Bay . . . ."); AR at 018652 (Jassby 1995)]("Delta smelt distribution is also determined by X2 , but population abundance depends in part on the presence of shallow habitat at a preferred salinity range. As a result, the highest abundance levels are attained at intermediate values of X2, i.e., when X2 is in Suisan Bay.").

14. Simply put, the habitat in Suisun Bay provided by X2 at 74 km is much more suitable for smelt than the modified river channel habitat that is provided by X2 at 79 km. Specifically, having habitat in Suisun Bay benefits smelt because it allows smelt to be exposed to shoal and shoal/channel boundary areas where turbidity is higher during the fall months. Higher turbidity is associated with better feeding success and reduced vulnerability to predation. Positioning Fall X2 at 79km would center the population near the confluence of the Sacramento and San Joaquin Rivers, where habitat is constricted and of substantially lower quality.

15. As U.S. Bureau of Reclamation ("Reclamation") fish biologist Mr. Federick Feyrer explains in his supplemental declaration, the Court misinterpreted his testimony to suggest that positioning X2 at 79 km or 80km instead of 74 km would provide sufficient habitat quality and quantity for delta smelt during the Fall. To the contrary, moving X2 from 74km to 79km reduces the amount of good-quality LSZ habitat for delta smelt by about one third during Fall months, which significantly reduces the effectiveness of the Fall X2 Action. In addition, by compressing the delta smelt into a smaller area the risk that a localized catastrophic event (e.g. oil or pesticide spill) will severely affect the population is increased. The dangers caused by these risks to the smelt population are magnified by the very precarious state of the population and the fact that there have been few signs in recent years that the species retains sufficient resilience to recover.

16. Recent scientific studies have "found a statistical association between Fall X2 and the production of young delta smelt during the following year." BiOp at 372. The district court discussed several of them in detail and with approval. See ESA Summ. J. Op. at 108–24. The 2005 Bennett study hypothesized that a shrinking volume of suitable habitat, combined with competition from other planktivorous species, was a primary factor contributing to the decreasing carrying capacity for delta smelt. AR at 017004 (Bennett 2005); see also AR at 017035, 017060 (Bennett 2005) (acknowledging that, although the precise statistical relationship between X2's location and delta smelt abundance was unknown, adult abundance was "always low" when X2 was upstream toward the convergence of the Sacramento and San Joaquin Rivers, and "elevated only in years when the [LSZ] is located in Suisun Bay"). Building on this research, the 2007 Feyrer et al. study "was designed to test the hypothesis that the combined effects of fall stock abundance and fall water quality affect recruit abundance the following summer." AR at 018270 (Feyrer 2007). Its regression modeling showed that water quality (especially in terms of salinity) was "an important predictor of [juvenile] delta smelt abundance" during the 1987–2004 period that followed introduction of the overbite clam (an invasive species that competes with delta smelt for plankton). AR at 018271 (Feyrer 2007); see also AR at 019949, 019946 (Nobriga 2008)(agreeing with the results of Feyrer et al. (2007) and using field data to generate "idealized salinity response curves" showing a relationship between salinity and

delta smelt distribution). AR at 019949 (Nobriga 2008); see AR 019946 (Nobriga 2008). The authors of the 2008 Feyrer et al. study expanded on their own earlier modeling and found that, "[d]uring Autumn . . . the amount of suitable abiotic habitat is positively associated with estuarine inflow [(indicated by X2's location)] and has a measurable effect on recruitment of juveniles the following summer." AR at 018279 (Feyrer 2008). They added: "Our results suggest that managing estuarine inflow via freshwater flow or X2 during autumn can have positive effects on delta smelt habitat and abundance." AR at 018292 (Feyrer 2008). The court accepted these studies as the best available science found that X2 was valid surrogate for delta smelt habitat. See ESA Summ. J. Op. at 115, 200.

17. It is my professional opinion that maintaining X2 at 79 kilometers (km) in Fall 2011 rather than 74 km as required by the Fall X2 Action would place the delta smelt at greater risk of extinction and therefore worsen the jeopardy condition of the species articulated in the BiOp. Below I expand on these opinions and explain how the 74 km location is scientifically supported and part of a comprehensive regulatory framework that is necessary to avoid jeopardy and adverse modification of critical habitat.

III. The Fall X2 Action Is a Necessary Element of the 2008 BiOp's Reasonable and Prudent Alternative.

18. Section 7 (a)(2) of the ESA requires Federal agencies to satisfy two separate standards. First, Federal agencies must ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of any listed species. Second, those agencies must ensure that such actions do not result in the destruction or adverse modification of designated critical habitat.

19. "Jeopardy" is a term of art that is applied through regulatory expertise and professional judgment. The regulations implementing Section 7 of the ESA define "jeopardize the continued existence of" as "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the production, numbers or distribution of that species." 50

C.F.R. § 402.02. Survival is further defined as the condition in which a species continues to exist into the future while retaining the potential for recovery. ESA Section 7 Consultation Handbook at xviii-xix (March 1998). "This condition is characterized by a species with a sufficiently large population, represented by all necessary age classes, genetic heterogeneity, and number of sexually mature individuals producing viable offspring, which exists in an environment providing all requirements for completion of the species' **entire** life cycle including reproduction, sustenance, and shelter" (emphasis added.) ESA Section 7 Consultation Handbook at xviii-xix (March 1998).

20. In the 2008 BiOp, the Service determined that the proposed operations described in Reclamation's Biological Assessment for the long term coordinated operations of the CVP and SWP are likely to jeopardize the continued existence of the delta smelt and result in the adverse modification of the delta smelt's designated critical habitat. BiOp at 276-79. The Service developed a Reasonable and Prudent Alternative (RPA) to avoid jeopardy and adverse modification of critical habitat.

21. The RPA in the 2008 BiOp includes a number of different components that, working together, are designed to protect delta smelt from jeopardy and protect its critical habitat from adverse modification throughout the entire year. The first three Components of the RPA target specific life stages of the delta smelt and, in sum, encompass the species' full life cycle.

22. The Fall X2 Action is essential because it is the only RPA component that focuses on the pre-migration portion of the species' life cycle, and it is the only component that expressly protects the delta smelt's designated critical habitat. While actions to minimize entrainment (Component 1 and 2) are necessary to protect the delta smelt when it is at risk of direct mortality due to project pumping, those actions alone are insufficient to provide for the conservation of the species. As the BiOp discusses in great detail, a substantial body of peer-reviewed scientific literature demonstrates that the adverse effects of the operations of the CVP and SWP go well beyond direct mortality caused by entrainment. Therefore, enjoining the Fall X2 Action would leave a gap in protection from the adverse effects of CVP and SWP operations for an entire aspect of the delta smelt's life cycle and would remove the only RPA component aimed at

avoiding adverse modification of the delta smelt's critical habitat. In this year, implementing X2 at 79km would adversely modify critical habitat in a manner that precludes recovery of the species. Precluding recovery of the species is likely to be irreversible.

23. Expanding the distribution of the delta smelt (from a narrowly restricted, poor habitat quality area to a larger, higher habitat quality area) is essential to its survival and ultimately to its recovery. By repeatedly restricting the delta smelt to limited, poor quality habitat (upstream of the confluence of the Sacramento and San Joaquin Rivers) in Fall, and the delta smelt has been restricted to this location every year since 1999, the species is at a greater risk of stochastic, localized, catastrophic events that might affect a large portion of the population. Indeed, the lowest recorded abundances of delta smelt have all corresponded to periods when habitat for delta smelt was most restricted (< 6,000 ha). As the National Academy of Sciences pointed out, "this could mean that reduced habitat area is a necessary condition for the worst population collapses." National Research Council, *A Scientific Assessment of Alternatives for Reducing Water Management Effects on Threatened and Endangered Fishes in California's Bay Delta* (2010) at 40. Small populations are more vulnerable to extinction due to a variety of factors including their vulnerability to demographic stochasticity (random events that affect survival and reproduction, such as a skewed sex ratio), genetic stochasticity (random genetic events such as inbreeding or genetic drift) or to environmental uncertainty such as changes in weather, food supply and the populations of competitors, predators and disease. Minimizing the frequency that the population of delta smelt experiences population collapse is fundamentally critical to its survival and for alleviating jeopardy to the species. A failure to provide relief from this condition will irreparably harm the species and preclude recovery.

IV. Rationale for Specific Action 4 Outflow Requirements In Wet Years.

24. The Service clearly determined that an average X2 position of 74km for the months of September and October is critical following wet years. As Feyrer et al's (2011) results demonstrate, positioning X2 at 74km or less increases the expected abiotic habitat index above

values experienced during the years of the pelagic organism decline (POD) (Figure 4) and more closely approximates pre-POD Fall X2 conditions (Figure 7). In fact, the shift to a more persistent upstream positioning of the Fall LSZ in all water year types and the resulting reduction in delta smelt fall habitat is one of the most striking changes in the system during the POD years. The following discussion describes the biogeographic rationale for these specific compliance points articulated in the BiOp, with a focus on the wet year location.

25. One of the rationales for setting a required Fall X2 location as an RPA component is that studies have "found a statistical association between Fall X2 and the production of young delta smelt during the following year." BiOp 372; *see also id.* at 234 (discussing potential mechanisms); AR 018284-85 ("Although previous analyses have not shown simple relationships between X2 and delta smelt abundance, recent studies have identified links between estuarine salinity and recruitment of juveniles. Moreover, X2 clearly affects the spatial distribution of delta smelt . . . ."). The RPA addresses only wet and above-normal years "because these are the years in which project operations have most significantly adversely affected fall [X2] and therefore, actions in these years are more likely to benefit delta smelt." AR 006615, 006732; *see also* AR 006984 (displaying historic differences between fall X2 and spring X2 by year type).

26. The agencies' findings as to the historic location of Fall X2 were based on actual DAYFLOW data from 1967 through 2007. *See* AR 008779 ("All Delta outflow and X2 data were retrieved from DAYFLOW"); *see also*, *e.g.*, BiOp at 265, 267, 271, 273, 374 (presenting historical data in graphs and tables that display forty-one data points, corresponding to 1967–2007 DAYLOW data). The agencies found that using CALSIM II modeling to determine the historic location of X2 produced results divergent from actual historic data, and so they used only DAYFLOW data in determining the historic location of X2. *See*, *e.g.*, BiOp at 235 ("The median location of X2 across the CALSIM II-modeled scenarios was 10–15 percent further upstream than actual historic X2 locations."); AR 009599 ("Given that X2 is considered an important overall metric of Delta ecosystem health, it is recommended that recent studies comparing the X2 location as determined by actual field measurements . . . be presented in the modeling appendix."). Importantly, in plotting the curve along which the 74km and 81km

locations for Action 4 were chosen, however, the Service relied only on actual data from DAYFLOW, not on any comparison between CALSIM II and DAYFLOW data. BiOp at 374 (displaying curve); *see also* BiOp at 266 (providing regression equation for curve, with additional data).

27. As a first step in determining the specific distance-based outflow requirements for Action 4, and based on actual historical DAYFLOW data, the Service determined that the median 1967–2007 Fall X2 location was 79km upstream of the Golden Gate Bridge. BiOp at 235. The further upstream Fall X2 is located, the less suitable habitat is available to delta smelt. *Id.* at 178. The average Fall X2 location has exhibited a long-term increasing (*i.e.*, moving upstream) trend. *Id.* In particular, the average Fall X2 location during the years following the Delta's pelagic organism decline ("POD") (2000–2005) was several kilometers upstream when compared to the pre-POD years (1995–1999). *Id.* at 179. "In general, delta smelt habitat quality and surface area are greater when X2 is located in Suisun Bay. Both habitat quality and quantity diminish the more frequently and further the low-salinity zone ("LSZ") moves upstream, toward the confluence [of the Sacramento and San Joaquin Rivers]." *Id.* at 191.

28. The second step of the Service's evaluation of historical Fall X2 data was to estimate the total surface area of suitable habitat corresponding to a given year's Fall X2 location. *See id.* at 235 (describing methodology); *see also id.* at 374 (plotting 1967–2007 Fall X2 location and corresponding amount of suitable habitat); *cf.* AR 018199 (showing Delta's surface area in particular areas). The Service's Delta Smelt Action Evaluation Team first considered setting the required fall X2 locations at 74km and 81km in August 2008. See AR 011450.

29. The Service initially proposed tying the required Fall X2 location to the location of the previous spring X2, with the fall X2 location's being allowed to be no more than 15km upstream of the previous spring X2 location. *See*, *e.g.*, AR at 006514 (peer review); *see also* AR at 009455–57 (notes from initial meeting at which 10km-difference standard was proposed). An independent peer review criticized this approach as "not well supported by the analyses presented." AR at 006526. It was also criticized by Plaintiff California Department of Water

Resources ("DWR"), which argued that the scientific paper cited by the Service did not support the approach of using the spring X2 location plus 15km to set the fall X2 location, but instead "suggest[ed] that keeping fall X2 downstream of about 80 km may increase the area of 'habitat.'" AR at 006994. DWR also argued that monitoring compliance with a variable required fall X2 position would be impractical, especially when compared with using existing monitoring locations. *See* AR at 007003 ("[I]t it would be difficult to measure an X2 at 85 km, whereas it would be much easier to measure at Collinsville (81 km) . . . .").

30. In response to these comments, the Service revised the proposed fall X2 location, setting it at fixed points of 75km (in wet years) and 80km (in above-normal years). AR 006399 (December 4, 2008 draft RPA); *see also* AR 013820 (stating 75km location was "based on regression relationship"); AR Bates 014227 (explaining regressive analysis). These locations were later slightly refined to 74km and 81km, which match the existing Chipps Island and Collinsville monitoring sites. *See* BiOp at 282; AR at 018789.

31. The specific location of X2 chosen in the RPA is based on three scientific reasons. First, data show that both locations are correlated with delta smelt population trends. For instance, Reclamation has observed that "delta smelt abundance is generally reduced when X2 is located upstream of Chipps Island [(74km)]," and that "when X2 is downstream of this point [abundance] increases in at least some of the years." AR at 018153. Data on the 81km location show an even greater change. *See* AR at 010041 (noting in August 2008 Biological Assessment that "the historical movement of fall X2 upstream from Suisun Bay is associated with declines in environmental quality for delta smelt during the same period. In particular, movement of the low salinity zone upstream of Collinsville (at River Kilometer Index 81) is associated with a sharp decrease in the quality of delta smelt habitat"); AR at 010052 ("Analyses of historical data indicate [ ] that habitat conditions are relatively poor and contribute to delta smelt producing fewer offspring in years when X2 is located above Collinsville during Autumn").

32. The reason for this correlation with population trends is ultimately geographic. AR 018273 (Feyrer *et al.* (2007) mapping long-term Delta Smelt habitat quality trends). Specifically, setting the fall X2 location at km 74 (Chipps Island) means that the LSZ opens into the broader,

more biologically productive Suisun Bay. *See* BiOp at 118 (map); *id.* at 148 (stating that spawning can occur in Suisun Bay and Marsh during wetter years); *id.* at 157 (stating increased autumn salinity in Suisun Bay has contributed to a long-term decline in habitat suitability); *id.* at 191 ("In general, delta smelt habitat quality and surface area are greater when X2 is located in Suisun Bay . . . ."). Delta smelt habitat is of lower quality and smaller area overall when X2 is positioned at 79km.

33. Second, the 74km and 81km locations corresponded with actual fall X2 locations in wet and above-normal years prior to the POD, which began in 2000. *See id.* at 369 ("This will help return ecological conditions of the estuary to that which occurred in the late 1990s when smelt populations were much larger."); *id.* at 179 ("X2 . . . during fall in the years following the POD (2000–2005) was several km upstream compared to that for the pre-pod years (1995–1999)"); *id.* at 180 (plotting 1995–1999 average X2 location).

34. Third, these locations restore inter-annual variability in fall outflow to historical conditions, which are necessary to maintain and recover the delta smelt population. Historically, there was natural variability in the location of fall X2 to match the type of water year experienced that year. *See* BiOp at 273 (plotting actual historical fall X2 location by year, color-coded by water year type). Put simply, a wet year would naturally result in fall X2 being located relatively further downstream than its location in a dry year. This variability allowed delta smelt to reach productive downstream areas in the fall during wet and above-normal years. However, increases in pumping have eliminated this natural variability, by removing freshwater from the system to an extent that causes the location of X2 to resemble that of a dry year in all water year types, including wet years. *See id.*

35. The BiOp concludes that "[t]he persistence of this significant hydrologic change to the estuary threatens the recovery and persistence of delta smelt." BiOp at 374. As shown by a graph in the BiOp, *id.* at 274, this divergence trend began to increase substantially beginning in 1994 due to significant changes in water operations, "such that post-1994 fall season hydrodynamics chronically mimicked drought conditions." AR at 09455. The combination of "wet springs and drought falls," means that "[t]here are two opposing selection forces in

operation," *i.e.*, delta smelt hardy enough to survive drought conditions must then also face wet spring conditions that are not optimal for them. *Id.*

36. Additionally, the "wet spring and drought fall" phenomenon favors "the eastern expansion of . . . invasive species and switches the ecological community to a green slimy benthic based system." *Id.* By setting the required fall X2 locations at 74km in wet years, the Service sought to reduce the intensity of this divergence and its consequent harms to both critical habitat and delta smelt persistence and recovery, by "restoring flow variability to the Delta environment so that smelt populations can recover through allowing these essential periods of population rebound." BiOp at 375.

37. The 74km and 81km fall X2 locations are also correlated to the outflow water quality objectives for fish and wildlife beneficial uses required by the State Water Resources Control Board's Water Right Decision 1641, Revised, ("D-1641"), which generally requires a minimum daily outflow of 7,100 cfs or that X2 should be located at or downstream of Collinsville (81km), or Chipps Island (74 km) under certain higher inflow conditions, from February into June. See *In re Implementation of Water Quality Objectives for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary*, No. 1641, at 184–86, 191 (Cal. State Water Res. Control Bd. Rev'd Mar. 15, 2000), *available at* http://www.waterrights.ca.gov/Decisions/D1641rev.pdf (articulating requirements in annotated tables); *see also id.* at 10 n.11 (stating 1995 Bay-Delta Water Quality Control Plan required these spring X2 locations, which it expressed in the electrical conductivity equivalent of 2.64 mmhos/cm, because "[t]he abundance of several estuarine species has been correlated with X2"). Project operations are required to comply with the D-1641's requirements. BiOp 21; *see also* AR at 010041, 010123 (August 2008 Biological Assessment). Accordingly, in proposing that required fall X2 locations be set during wet and above-normal years, the Service adopted the D-1641's definitions of such years. AR at 006613. The Service also analyzed the effects of setting fall X2 at roughly 74km and 81km in tandem with the required spring X2

locations. *See, e.g.*, AR at 013818, 013820 (stating that state and federal "fish agencies" wanted Reclamation and DWR to model effects of setting fall X2 at 75km and 81km, thereby "assuming [a] baseline" of the D-1641); *see also* AR at 011450 (stating that correlation of fall X2 locations with 74km and 81km spring X2 location requirements imposed by D-1641 could "[e]nsure that the position of [fall] X2 will provide equal or higher level or rearing-habitat quantity and quality than would be achieved with D-1641"). Therefore, by setting the required fall X2 locations at 74km and 81km, the Service not only continued to use the D-1641's required spring X2 locations (and existing compliance points) to protect the delta smelt, but also ensured that in a given year there would be a relationship between spring X2 and fall X2, thereby restoring inter-annual variability and addressing the issue of all fall X2 locations' reflecting drought conditions since 2000, regardless of whether the previous spring had been wetter.

38. In summary, the Fall X2 Action is designed to ensure that, at least in wet and above normal years, the delta smelt is provided adequate and ample suitable habitat prior to its spawning migration in the fall. While this habitat is likely important every year, for an annual species, at a minimum this habitat must be created with sufficient frequency to allow the population to rebound. Given the continuing severely diminished population and overall poor status of the species, *see* Decl. of Dr. Jennifer Norris In Supp. of Fed. Def. Opp. to Pls. Mot for Int. Injunctive Relief, Exhibit B, C (Feb 11, 2011) Doc No. 794-1(images charting severe decline in relative abundance of delta smelt), the Fall X2 Action described in the RPA has become increasingly critical. This spring the delta experienced high outflow and extended cool temperatures. These conditions allowed for an exceptionally protracted spawning window, which has been linked to an increase in the summer townet survey. By implementing the Fall X2 Action, by placing X2 at 74km this year, delta smelt produced this past spring are much more likely to survive and reproduce next year, thereby adding to the population overall. This improvement in the population status is essential to reverse the species downward decline toward

extinction. Without the Fall X2 Action, the ability of the RPA to avoid jeopardy will be eliminated and the harm to the species would be irreparable.

39. The delta smelt are at great risk of extinction. Delta smelt are threatened primarily by the loss and degradation of habitat. Fall 2011 represents the first opportunity in the last decade to provide essential fall and winter habitat for the species during a critical life stage. It is unknown when water conditions will be this favorable for the species again. In all likelihood, they might not occur again until the smelt population is past the tipping point where extinction cannot be prevented. Given the status of the species, and the uncertainty about whether or when another wet or above-normal year will occur, the Fall X2 Action as described in RPA should be implemented to provide the species the greatest opportunity to avoid extinction and promote recovery of the species. As discussed above, failure to implement the Fall X2 Action at 74 km in this year will result in irreparable harm to the delta smelt.

I declare under the penalty of perjury under the laws of the State of California and the United States, that the foregoing is true and correct to the best of my knowledge.

Dated this 7th day of September, 2011

Dr. Jennifer M. Norris
Assistant Field Supervisor
Bay-Delta Fish and Wildlife Office