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BEFORE THE

CALIFORNIA STATE WATER RESOURCES CONTROL BOARD

HEARING IN THE MATTER OF CALIFORNIA DEPARTMENT OF WATER RESOURCES AND UNITED STATES BUREAU OF RECLAMATION REQUEST FOR A CHANGE IN POINT OF DIVERSION FOR CALIFORNIA WATER FIX	**TESTIMONY OF CHRISTOPHER EARLE**

I, Christopher Earle, do hereby declare:

I. INTRODUCTION

My name is Christopher Earle and I am employed as a Senior Technical Analyst with ICF. I received a Bachelor of Arts degree in Biology and Geology from the Whitman College, WA, in 1979; a Master of Science degree in Geosciences from the University of Arizona, AZ, in 1986; and a PhD in Forest Ecology, from the University of Washington, WA, in 1993. I have been employed with ICF since 1999. My experience with ICF includes work on planning projects within the Delta. I began work on the Bay Delta Conservation Plan (BDCP) in 2010, with my primary role being an ecologist responsible for coordinating much of the draft BDCP. With the transition from BDCP to California WaterFix (CWF), I coordinated preparation of the California Endangered Species Act (CESA) 2081(b) Incidental Take Permit (ITP) Application (Exhibit DWR-1036), prepared the proposed action description for the Endangered Species Act (ESA) Biological Assessment (July 2016) (BA)

(Exhibit SWRCB-104), and coordinated the terrestrial species analysis for the BA. I assisted in responses to comments for the 2013 BDCP Draft EIR/EIS (Exhibit SWRCB-4), BDCP/CWF 2015 Recirculated Draft EIR/Supplemental Draft EIS (RDEIR/SDEIS) (Exhibit SWRCB-3), and 2016 Final Environmental Impact Report/Environmental Impact Statement for BDCP/CWF (FEIR/S) (Exhibit SWRCB-102), including responding to comments, developing revisions to address comments, and ensuring consistency between EIR/EIS analyses, BA analyses, and 2081 Application analyses. As part of the BDCP/CWF work, I prepared materials for consideration by several peer-review panels. Attached as Exhibit DWR-1003 is a true and correct copy of my Statement of Qualifications.

In October 2015 DWR and Reclamation (jointly Petitioners) petitioned the State Water Board for the addition of three new points of diversion on Petitioners' water rights permits. In testimony submitted in Part 1 of this hearing, the project was described as Alternative 4A with initial operational criteria that would fall within a range of operations described as H3 to H4. These operational criteria were described in the RDEIR/SDEIS. (Exhibit SWRCB-3.) For purposes of Part 2 of the hearing, including this testimony, the CWF project is described by Alternative 4A under an operational scenario described as H3+ that is set forth in the FEIR/S and supplemental information adopted by DWR through the issuance of a Notice of Determination in July 2017 (2017 Certified FEIR). (Exhibits SWRCB-102, SWRCB-108, SWRCB-109, SWRCB-110, SWRCB-111, SWRCB 112.) **The adopted project is referred to as CWF H3+.** Additional information is also referenced in this testimony from documents released prior to July 2017, including the Alternative 4A described in the 2016 FEIR/S (Exhibit SWRCB-102), Biological Assessment (BA) (Exhibit SWRCB-104), and the Biological Opinions (BOs) (Exhibits SWRCB-105, SWRCB-106). Similarly, after July 2017 the California Department of Fish and Wildlife issued a 2081(b) Incidental Take Permit, which is referred to as the ITP. (Exhibit SWRCB-107.) The interrelationship and use of these terms is further described in the testimony of Ms. Buchholz, Exhibit DWR-1010.

II. OVERVIEW OF TESTIMONY

My testimony provides (1) a detailed discussion of the adaptive management program used for both aquatic and terrestrial species testimonies; and (2) evidence that CWF is reasonably protective of wildlife and plant species. My testimony relies on the information and analysis contained in the 2016 FEIR/S (Exhibit SWRCB-102), 2017 Certified FEIR, (Exhibits SWRCB-102, SWRCB-108, SWRCB-109, SWRCB-110, SWRCB-111, SWRCB 112), the BA (Exhibit SWRCB-104), the 2081(b) Application (Exhibit DWR-1036), the BO issued by the US Fish and Wildlife Service (Exhibit SWRCB-105), the ITP (Exhibit SWRCB-107), and BDCP Appendix 5.J, Attachment 5J.C, *Analysis of Potential Bird Collisions at Proposed BDCP Powerlines* (Exhibit SWRCB-5). The 2017 Certified FEIR, composed in part of the 2016 FEIR/S, examines impacts to numerous species that collectively comprise all wildlife potentially present in the project vicinity; those impacts are summarized in the impact determinations for biological resources of the 2016 FEIR/S Table ES-8. (Exhibit SWRCB-102, pp. ES-93 to ES-117.) None of the FEIR/S impacts to species are significant and unavoidable; all are less than significant, or less than significant with mitigation. The USFWS BO finds that the proposed action would not jeopardize the continued existence of any ESA-listed wildlife species. (Exhibit SWRCB-105, p. 2; pp. 453-457 giving detailed statements of effect.) The ITP finds that the project would fully mitigate any take of CESA-listed wildlife species. (Exhibit SWRCB-107, p. 233.) Thus, the Final EIR/S, BO, and ITP, respectively, demonstrate and conclude that impacts to wildlife (a) would be less than significant with mitigation, under CEQA; (b) would fully mitigate impacts to wildlife protected under CESA; and (c) would avoid or minimize and mitigate impacts to wildlife protected under ESA. These conclusions show that CWF is reasonably protective of wildlife and plant species as covered by the Mitigation Monitoring, and Reporting Program for the CWF (MMRP, July 2017) (Exhibit SWRCB-111), and terms and conditions of the ITP and BOs. Additionally, my testimony serves to illustrate these conclusions with regard to certain key issues associated with the environmental evaluations for CWF; these key issues include the effects of proposed transmission lines on birds and bats; the potential

effects of CWF on wildlife at the Stone Lakes National Wildlife Refuge; the effects of CWF on the greater sandhill crane and its habitat; and potential effects of some increased risk of exposure to selenium. My main opinions are as follows:

- Adaptive management and monitoring program is likely to have beneficial outcomes for fish and wildlife species in the Delta;
- CWF measures will reasonably protect birds and bats from collisions with power lines, relative to current conditions;
- CWF mitigation and long-term habitat improvements will reasonably protect wildlife resources from construction at Stone Lakes National Wildlife Refuge;
- CWF restoration of greater sandhill crane habitat and protective measures during project construction will reasonably protect sandhill cranes in the Delta;
- CWF minimization and mitigation measures will reasonably protect bats in the Delta; and
- CWF will reasonably protect wildlife from possible increase in exposure to selenium.

III. DISCUSSION OF TESTIMONY

A. ADAPTIVE MANAGEMENT AND MONITORING PROGRAM IS LIKELY TO HAVE BENEFICIAL OUTCOMES FOR FISH AND WILDLIFE SPECIES IN THE DELTA

Implementation of the adaptive management and monitoring program is expected to have beneficial outcomes for fish and wildlife species in the Delta. The Delta Reform Act of 2009 identifies adaptive management as the desired approach to reduce ecological uncertainty associated with management of the Sacramento-San Joaquin Delta system, and for purposes of implementing CWF, an adaptive management program has been adopted as a preferred management strategy by the principal agencies with jurisdiction over threatened and endangered species in the Delta. (Exhibit SWRCB-104, Attached Adaptive Management Program, p. 3; Exhibit SWRCB-105, pp. 13, 125; Exhibit SWRCB-106, pp. 10, 20, 826; Exhibit SWRCB-107, Att. 5.)

The CWF implementation of adaptive management is detailed in the *Adaptive*

Management Program for the California Water Fix and Current Biological Opinions on the Coordinated Operations of the Central Valley and State Water Projects (AMP), which is attached to the BA (Exhibit SWRCB-104, Attachment), the 2081 Application (Exhibit DWR-1036, Appendix 6.A) and the ITP (Exhibit SWRCB-107, Attachment 5), and for which implementation is a requirement in the BOs (Exhibit SWRCB-105, pp. 13, 125; Exhibit SWRCB-106, pp. 10, 20, 826) and the ITP (Exhibit SWRCB-107, p. 7). The AMP is the primary basis for my testimony about adaptive management and monitoring.

1. Description of Adaptive Management

Adaptive management is a science-based, flexible approach to resource management decision-making. (Exhibit SWRCB-107, Att. 5, p. 5.) When correctly designed and executed, adaptive management programs provide the ability to make and implement decisions while simultaneously conducting research to reduce the ecological uncertainty of a decision's outcome. These characteristics facilitate a management regime that is transparent, collaborative, and responsive to changes in scientific understanding. (Exhibit SWRCB-107, Att. 5, p. 3.)

The Delta Reform Act of 2009 identified adaptive management as the desired approach to reduce the ecological uncertainty associated with the management of the Sacramento-San Joaquin Delta system. (Exhibit SWRCB-107, Att. 5, p. 3.) The Federal and State water operations agencies [Bureau of Reclamation and Department of Water Resources] and the State and Federal fisheries agencies [US Fish and Wildlife Service, National Marine Fisheries Service and the California Department of Fish and Wildlife] (collectively "Five Agencies") agree that adaptive management is the approach best suited to improve the management of the Delta and its resources. (Exhibit SWRCB-107, Att. 5, p.3.)

Together, the Five Agencies commit to ongoing adaptive management under the current Biological Opinions of the combined operations of the Central Valley Project and State Water Project, as well as the effects of future operations under CWF. (Exhibit SWRCB-107, Att. 5, p.3.) That commitment is articulated in the *Adaptive Management*

Program for the California Water Fix and Current Biological Opinions on the Coordinated Operations of the Central Valley and State Water Projects (the AMP). (Exhibit SWRCB-107, Att. 5, p. 3). As described in the AMP, the Five Agencies will use adaptive management to reduce uncertainty and improve the performance of water operations. (Exhibit SWRCB 107, Att. 5, p. 3.)

The AMP includes a framework for a structured decision-making process with an iterative process for reducing uncertainty, relying upon four phases: (1) Plan; (2) Assess; (3) Integrate; and (4) Adapt. (Exhibit SWRCB 107, Att. 5, pp. 3-22.) Work under the four Phases will be prescribed and recounted in an ongoing series of annual and multi-year *Operations Plans* and *Science Plans*. As described in the AMP the phases operate as follows:

- During *Phase 1: Plan*, initial operation and research priorities are set through an *Operations Plan* and a *Science Plan*. These plans will set water supply expectations, clarify operational needs, and address uncertainties.

- Through *Phase 2: Assess*, translate operational needs and uncertainties into research projects in a collaborative setting similar to the CSAMP process. The products developed during this phase will receive independent review led by the Delta Science Panel, and the outcomes of this research will provide the basis for future proposals for management adjustments developed during Phase 3.

- In *Phase 3: Integrate*, interagency and agency-stakeholder discussions, based on the results of Phase 2's scientific assessments, will inform development of management adjustment proposals and additional research alternatives through a structured decision-making process. This process will also lead to the development of additional adaptive management questions to continue to address operational needs, assess benefits and identify uncertainty.

- In *Phase 4: Adapt*, the Five Agencies decide whether to adopt or reject a

management adjustment proposal. Changes to the *Operations Plan* and *Science Plan* may require reinitiation of the ESA Section 7 consultation or amendment of the CESA Incidental Take Permit.

(Exhibit SWRCB-107, Att. 5, pp. 14-22.)

The four Phases describe the adaptive management process. This process receives information through the monitoring program (Exhibit SWRCB-107, Att. 5, p.17), which entails information collection through a variety of means:

- Continuation of existing monitoring required by the 2008/2009 biological opinions for CVP/SWP operations. (NMFS 2009 [Exhibit SWRCB-84], USFWS 2008 [Exhibit SWRCB-87].)

- Performance of construction and compliance monitoring required by the various permits and authorizations issued to the CWF and specified in its Mitigation Monitoring and Reporting Plan.

- Performance of specific pre-construction studies described in the Biological Opinions and Incidental Take Permit for the CWF. These studies are primarily focused on refining the design of the facilities so as to minimize impacts on special-status fish species, and on post-construction assessment of the effectiveness of the final design. They include work by specific Technical Teams focused on the North Delta Diversions, the Clifton Court Forebay modifications, and the Head of Old River Gate (HORG) facilities.

- Monitoring and studies related to operation of the proposed new facilities that must occur after operation of the new facilities has commenced (e.g., to support real-time operation of the HORG), including those necessary to monitor both species and habitat conditions that may be influenced by the new facilities (e.g., upstream temperatures, Delta rearing conditions, water quality, etc.).

- Monitoring and studies after operation of the new facilities has commenced,

related to evaluation of the effectiveness of proposed facilities, habitat restoration, and other mitigation measures.

- Performing studies identified through the adaptive management process described above.

(Exhibit SWRCB-104, Section 3.4.8, pp. 3-222 to 3-223.)

The AMP also identifies a number of other common elements of adaptive management plans, including the use of conceptual models to articulate key questions for resolution through monitoring or research, and the need to identify "triggers" or thresholds in project performance that mandate an adaptive management response. (Exhibit SWRCB-107 Att. 5, p. 16.) The AMP also designates a "Fish Facilities Technical Team" that is charged with conducting a number of monitoring and research studies that must be completed prior to final design of the fish screens, and that will inform that design. (Exhibit SWRCB-107, Att. 5, pp. 14, 51-52, 65.) Additional monitoring and research studies are identified to assess fish screen effectiveness. The adaptive management process will use the results of these studies to further modify fish screen design, if necessary. (Exhibit SWRCB-107, Att. 5, p. 14.)

2. Adaptive Management Provides Reasonable Protection

In my opinion, implementation of the adaptive management and monitoring program is likely to have beneficial outcomes for fish and wildlife species in the Delta. I base this opinion on the observations stated in Sections II.A.1 above, that the Delta Reform Act of 2009 identified adaptive management as the desired approach to reduce ecological uncertainty associated with management of the Sacramento-San Joaquin Delta system (Exhibit SWRCB-107, Att. 5, p. 3), and the AMP has been adopted as a preferred management strategy by multiple agencies with jurisdiction over threatened and endangered species in the Delta (i.e., NMFS, USFWS, and CDFW). (Exhibit SWRCB-107, Att. 5, pp. 3-13, 65-66.)

B. CWF MEASURES WILL REASONABLY PROTECT BIRDS AND BATS FROM COLLISIONS WITH POWER LINES, RELATIVE TO CURRENT CONDITIONS

Mitigation, avoidance, and minimization measures (AMMs) provided in the 2017 Certified FEIR for CWF H3+ will ensure no net increase in bird collisions with power lines, relative to current conditions. (Exhibit SWRCB-111, pp. 3-9 to 3-10.) The primary minimization measure, installing bird flight diverters[1] on power lines to further diminish collision risks, is a widely implemented strategy with high effectiveness at averting collisions. New lines will be fitted with diverters, and retrofits with diverters to existing lines will further increase the beneficial effects of the mitigation. In addition, AMMs will be implemented to minimize or avoid adverse effects from power lines to wildlife.

Under the CWF, power lines will be needed to provide temporary power for construction of new tunnels and pumping facilities, and to provide permanent power to operate three new intakes on the Sacramento River between Clarksburg and Courtland. Most of the new power lines will be temporary, meaning they will be removed following completion of construction activities.

The project's potential power line effects on wildlife (birds) are analyzed in the BDCP Appendix 5.J, Attachment 5J.C, Analysis of Potential Bird Collisions at Proposed BDCP Powerlines, from which I summarize my testimony that follows. (Exhibit SWRCB-5, App 5.J, Att. 5J.C.) The cited BDCP analysis constituted the basis of the impact analysis presented in the FEIR/S (Exhibit SWRCB-102, pp. 12-3525 - 12-3704), the 2081 Application (Exhibit DWR-1036, p. 4-854), and the BA (Exhibit SWRCB-104, pp. 6.5-228, 6.5-312). The USFWS BO acknowledged the mitigation proposed in the BA, but provided no further analysis. (Exhibit SWRCB-87, pp. 84, 108.)

1. Risks and Adverse Effects from Power Lines

The two primary risks to birds from power lines are mortality from collision and electrocution. Electrocution occurs when a bird touches two conductors of different phases

[1] A bird flight diverter is typically a spiral-shaped piece of plastic that attaches to a ground wire and makes it more readily visible to birds.

or a conductor and a ground at the same time (Exhibit SWRCB-5, App 5.J, Att. 5J.C, pp. 1-27; discussing report by the Avian Power Line Interaction Committee 2006, p. 38). The majority of the proposed power lines would provide adequate clearance between conductors or between conductors and ground wires (i.e., 60 inches of horizontal separation and 40 inches of vertical separation) to avoid electrocution risk even for birds with large wingspans. In places where such clearances are not feasible, conductors or grounds would be protected by covers. These measures are sufficient to ensure a negligible risk of electrocution. (Exhibit SWRCB-5, App 5.J, Att. 5J.C, pp. 1-27; discussing report by the Avian Power Line Interaction Committee 2006, p. 60.)

Collision mortality is commonly associated with shield wires, which are grounded wires placed above electrified lines and are thinner and less visible; over 80% of collision fatalities at power lines occur through collision with the ground wire (Exhibit SWRCB-5, App 5.J, Att. 5J.C, pp. 2-29; discussing report by Hunting 2002, p. 11.) The risk for collisions with power lines is primarily limited to birds and though bats also fly they have not been identified as subject to appreciable risk from power line collision. (Exhibit DWR-1108, p. 33.)

The Analysis of Potential Bird Collisions at Proposed BDCP Powerlines (Exhibit SWRCB-5, App 5.J, Att. 5J.C) provides a qualitative discussion of the relative risk of power line collision for each evaluated bird species. It also provides a species-specific risk assessment for greater sandhill crane, as well as a collision risk map, mortality assessment for individuals and populations of cranes, and a mitigation strategy. The BDCP analysis, as extended in the Final EIR/S (Exhibit SWRCB-102, pp. 12-3525 – 12-3772) to cover a broader range of bird species, evaluated collision vulnerability for 31 species or species groups. The analysis found low collision vulnerability for 22 species or species groups, but found an appreciable collision risk for another 9 species or species groups. Of this latter group, subsequent analysis focused on a single species, the greater sandhill crane, because unlike the other 8 at-risk species it is a fully protected species, and also because of a biological factor that renders it more vulnerable to collision risk: it has relatively poor

maneuverability during flight, which limits its ability to avoid a collision, relative to many other birds. However, for all nine bird species or species groups at risk of power line collisions, the Final EIR/S provides measures to avoid and minimize those impacts. (Exhibit SWRCB-102, pp. 12-3525 – 12-3772.) In my opinion, the protective measures provided in the Final EIR/S and discussed below will result in no net increase in bird collisions with power lines, relative to current conditions.

2. CWF Measures Will Avoid, Minimize and Mitigate Power Line Effects

The principal protective measure addressing bird collisions with powerlines is AMM20 Greater Sandhill Crane. (Exhibit SWRCB-111, pp. 4-32 to 4-40.) The powerline provisions of AMM20 are also referenced by the FEIR/S in mitigation requirements for Swainson's hawk (Exhibit SWRCB-102, p. 12-3587) and tricolored blackbird (Exhibit SWRCB-102, p. 12-3595.) AMM20 requires design features for power line alignments, such as locating power lines on the same poles when it would minimize effects on sandhill cranes and avoiding impacts on sensitive habitats to the maximum extent feasible. In addition, AMM20 requires that the project meet the performance standard of "no take" of greater sandhill crane associated with the new facilities. The strategy to achieve this performance standard is required to be set forth in a plan, developed by a crane biologist and working in coordination with CDFW and USFWS, that uses one or a combination of the following measures (Exhibit SWRCB-111, pp. 4-32 to 4-33):

- Locating powerlines in low risk zones
- Remove, relocate or place underground existing lines
- Underground new lines in high-risk zones of the greater sandhill crane winter use area
- Use natural gas generators in lieu of transmission lines
- Install bird strike diverters on all new transmission lines, and also on existing lines in high-risk zones

- Manage habitat to shift crane roost sites away from risk zones created by new transmission lines

Of these measures, the most measurable benefit is expected to derive from installing bird strike diverters on power lines to further diminish collision risks. Based on the bird strike analysis (Exhibit SWRCB-5 Att. 5J.C, p.18), placement of bird strike diverters is expected to reduce mortality by approximately 60%. Additional bird strike diverters will be placed on existing lines in high collision risk areas, such as where roosts are located near powerlines, to further reduce risk of bird strikes, thereby avoiding any increase in collisions relative to existing conditions. (Exhibit SWRCB-111, p. 4-33.) This mitigation will avoid take of fully protected bird species, including the greater sandhill crane, through power line collisions.

C. CWF MITIGATION AND LONG-TERM HABITAT IMPROVEMENTS WILL REASONABLY PROTECT WILDLIFE RESOURCES FROM CONSTRUCTION AT STONE LAKES NATIONAL WILDLIFE REFUGE

In my opinion, CWF mitigation measures and resulting long-term improvements in habitat availability and quality will reasonably protect wildlife resources from construction effects at and in the vicinity of Stone Lakes NWR. As detailed in Chapter 12 of the 2016 FEIR/S (Exhibit SWRCB-102, p. 12-3505 – 12-3779), these effects are associated with noise, light, activity, and potential road-related mortality associated with project construction activity, as well as loss of habitat.

Potentially affected wildlife include giant garter snake, western pond turtle, California horned lark, Cooper's hawk, cormorants, egrets, grasshopper sparrow, greater sandhill crane, herons, least bittern, lesser sandhill crane, loggerhead shrike, Modesto song sparrow, northern harrier, osprey, shorebirds, short-eared owl, Swainson's hawk, tricolored blackbird, western burrowing owl, white-faced ibis, white-tailed kite, yellow-breasted chat, yellow-headed blackbird, waterfowl, special-status bats, and other common wildlife and plants. (Exhibit SWRCB-102, Chapter 12.)

Avoidance and minimization measures are presented in the FEIR/S Appendix 3B (Exhibit SWRCB-102, pp. 3B-82 to 3B-176) and included as part of the Mitigation

Monitoring and Reporting Program (MMRP) for the CWF (Exhibit SWRCB-111, pp. 4-1 to 4-55.) As described in Chapter 3 of the FEIR/S (Exhibit SWRCB-102, p. 3-60), the Environmental Commitments would be guided by specific Resource Restoration and Protection Principles (RRPP) to protect, enhance, and restore habitat for sensitive fish, wildlife, and plants, many of which occur in and around Stone Lakes NWR. (Exhibit SWRCB-102, Chapter 3, p. 3-60.) The RRPPs highlight and identify specific actions that would be used in selecting lands for protection and restoration, in implementing natural community restoration, and provide management guidance for use of these lands to maximize the benefit to common and rare plants and animals. CWF would avoid most potential impacts by performing surveys and avoiding occupied habitat for most sensitive wildlife species. Impacts that cannot be avoided, such as potential road-related mortality, would be minimized, e.g. by requiring and posting reduced speed limits on the roads adjacent to Stone Lakes NWR during construction. (Exhibit SWRCB-111, p. 2-89.)

Impacts associated with noise and light would be minimized in many different ways, depending upon the affected species. For greater sandhill crane, provisions of AMM20 provide for habitat enhancement as compensation for the effects of increased noise, by relocating roost sites away from construction noise, and by implementing a variety of BMPs that reduce the species' exposure to sound and light. BMPs are the primary means of minimizing noise and light effects on all other species, and include measures such as directing construction lighting downward, not illuminating areas outside of the work site, limiting the number and brightness of lights (consistent with worker safety and regulatory requirements), and for some activities such as geotechnical exploration, observing timing restrictions that limit animals' exposure to lighting. (Exhibit SWRCB-102, Chapter 12; Exhibit SWRCB-104 Section 3.4 and Appendix 3.F; Exhibit DWR-1036, Chapter 5 and Appendix 3.F.)

Habitat loss due to construction would be mitigated by creation of habitat as described in the Environmental Commitments in the MMRP (Exhibit SWRCB-111, pp. 5-1 to 5-18) and in the BA (Exhibit SWRCB-104, Section 3.4) and 2081 Application (Exhibit

DWR-1036, Section 5.4). All restored areas will be secured in fee-title or through conservation easements. The habitat mitigation would provide replacement habitat equaling or exceeding the impacted acreage. This habitat would be monitored and maintained to ensure its continued compliance with performance metrics for the created habitat. (Exhibit SWRCB-111, p. 5-6.)

CWF provisions require that adverse impacts to wildlife at Stone Lakes NWR would be avoided or minimized during project construction, and that any habitat loss would be mitigated to attain habitat quality equivalent or superior to current conditions. These provisions are reasonably protective of the wildlife resources at Stone Lakes NWR.

D. CWF RESTORATION OF GREATER SANDHILL CRANE HABITAT AND PROTECTIVE MEASURES DURING PROJECT CONSTRUCTION WILL REASONABLY PROTECT SANDHILL CRANES IN THE DELTA

Protective measures implemented during project construction would require that project effects on cranes in the Delta are avoided or minimized. Protection and restoration of greater sandhill crane habitat would improve the overall condition of greater sandhill crane habitat in the Delta, relative to current conditions. These measures together will reasonably protect the greater sandhill crane from effects of CWF.

The project's effects on greater sandhill crane are discussed in Chapter 12 of the FEIR/S, from which I summarize in the testimony that follows. These effects include the loss and conversion of habitat (Exhibit SWRCB-102, Impact BIO-69, p. 12-3544), the effects of power lines (Exhibit SWRCB-102, Impact BIO-70, p. 12-3549), and the indirect effects from project construction (Exhibit SWRCB-102, Impact BIO-71, p. 12-3551), which includes noise and visual disturbance and exposure to methylmercury and selenium. Power lines affect other birds besides the greater sandhill crane, so such effects on greater sandhill crane are addressed above in section II.B where the analysis gives particular attention to this species. Selenium may also affect other species besides the greater sandhill crane, so such effects are addressed below in section II.F. The following testimony focuses on the project's other effects on greater sandhill cranes, including effects on the availability of habitat, and the effects of noise, activity and visual disturbance.

Greater sandhill cranes winter in the Delta but do not breed there, so their habitat needs focus on wintering habitat, which includes areas of both roosting and foraging habitat; to some extent, these areas overlap. The roosting habitat includes shallowly flooded open fields or wetlands, which provide the cranes protection from predators while on the roost, and also provide foraging opportunities. Their foraging habitat in the Delta consists largely of cultivated lands, mostly harvested corn fields, winter wheat, alfalfa, pasture, and fallow fields. Construction of water conveyance facilities and habitat restoration would result in the permanent and temporary loss of up to 92 acres of roosting-and-foraging habitat and up to another 4,848 acres of foraging habitat (2,017 acres of which would be from habitat restoration). (Exhibit SWRCB-102, Chapter 12.)

These habitat impacts would be offset and mitigated by restoration and protection of greater sandhill crane habitat as described in FEIR/S Chapter 12. (Exhibit SWRCB-102, pp. 12-3542 – 12-3548.) These actions include creating 595 acres of roosting habitat and mitigating the loss of foraging habitat at 1:1 by protecting high to very high value crane foraging habitat. These conservation actions would be guided by Resource Restoration and Performance Principles GSC1, GSC2, GSC3, and GSC4 (Exhibit SWRCB-102, Chapter 3, p. 3-62), which provide specific direction for the location, size, and type of habitats to be protected and restored. These actions would also be guided by Avoidance and Minimization Measure 20, *Greater Sandhill Crane* (AMM20) (Exhibit SWRCB-102, App. 3B, p. 3B-135), which informs the timing and location of replacement roosting habitat and the ultimate design of project facilities in relation to existing crane roosting habitat. These habitat mitigation actions are required to be performed prior to actions that result in impacts to existing habitat. (Exhibit SWRCB-102, App. 3B, pp. 3B-137 – 3B-141.) Because of the density of greater sandhill cranes wintering on Staten Island and the importance of Staten Island to the existing population of greater sandhill crane in the Delta, AMM20 also includes performance standards to ensure effects on Staten Island are avoided and minimized to the maximum extent practicable. (Exhibit SWRCB-111, p. 4-37.) These measures include design and construction measures and additional habitat enhancement to be performed on

the island.

Sandhill cranes are sensitive to disturbance, including noise, light, and human activity. Noise and visual disturbances from water conveyance facilities construction and habitat restoration could reduce greater sandhill crane use of habitat adjacent to work areas. Potential indirect effects associated with construction include noise, dust, and visual disturbance caused by grading, filling, contouring, and other ground-disturbing operations outside the project footprint but within 1,300 feet of the construction edge. Furthermore, maintenance of the above ground CWF facilities could result in ongoing but periodic post-construction noise and visual disturbances that could affect greater sandhill crane use of surrounding habitat. These effects could result from periodic vehicle use along the conveyance corridor, inspection and maintenance of above ground facilities, and similar activities. The FEIR/S included an analysis of the effects of noise and visual disturbance on greater sandhill crane. (Exhibit SWRCB-102, App. 11F, p. 11F-223.) The analysis addressed potential noise effects on cranes and concluded that as much as 20,243 acres of crane habitat could be temporarily affected by general construction noise (including pile driving) above baseline levels of 50 to 60 dBA. (Exhibit SWRCB-102 App. 11F, p. 11F-213.) The analysis was conducted based on the assumption that there would be a direct line-of-sight from sandhill crane habitat areas to the construction site, and, therefore, provides a worst-case assessment of effects, since in actuality some habitat areas are screened from the construction site by intervening levees or vegetation. (Exhibit SWRCB-102, App. 11F, p. 11F-214.)

Evening and night time construction would entail artificial lighting. Night time construction could also result in headlights shining into roost sites when construction vehicles are turning onto or off of construction access routes. Few data are available on the effects of artificial lighting on roosting birds. Direct light from automobile headlights has been observed to cause cranes to flush from their roost and it is thought that they may avoid roosting in areas subject to artificial lighting. Potential risks of lighting include a reduction in the cranes' quality of nocturnal rest, and effects on their sense of photo-period,

which might cause them to shift their physiology towards earlier migration and breeding. A change in photo-period could also cause cranes to fly out earlier from roost sites to forage and might increase their risk of power line collisions if they were to leave roosts before dawn. (Exhibit SWRCB-102, Chapter 12.)

Risks to sandhill cranes created by noise, light, and activity would be minimized through Avoidance and Minimization Measure 20, *Greater Sandhill Crane* (AMM20). (Exhibit SWRCB-102, App. 3B, p. 3B-140.) This measure contains many detailed provisions, the intent of which is to inform design of project facilities and conduct of construction activity so as to minimize potential impacts to crane roosting habitat or the cranes that may be using it. Besides protections related to power lines, previously described in Section II.B, AMM20 also requires that activities within 0.75 mile of crane roosting habitat reduce construction noise during night time hours, during periods when the roost sites are available. The area of crane foraging habitat that would be affected during the day by construction noise would also be minimized. Unavoidable noise related effects would be compensated for by the enhancement of 0.1 acre of foraging habitat for every acre indirectly affected by noise. With these measures in place, indirect effects of noise and visual disturbance from construction activities are not expected to reduce the greater sandhill crane population in the Delta. To reduce the effects from lighting and visual disturbance, AMM20 also requires that construction, operations and maintenance avoid and minimize the effects of lighting and visual disturbance by routing truck traffic to reduce headlight impacts on roosting habitat, installing light barriers at construction sites and along travel routes, and operating portable lights such that they are oriented down and toward construction areas only. (Exhibit SWRCB-111, p. 4-37.)

In summary, protection and restoration of greater sandhill crane habitat will improve the overall condition of greater sandhill crane habitat in the Delta, relative to current conditions. Protective measures implemented during project construction will ensure project effects on cranes in the Delta are avoided or minimized. These measures together will reasonably protect the greater sandhill crane from CWF.

E. CWF MINIMIZATION AND MITIGATION MEASURES WILL REASONABLY PROTECT BATS IN THE DELTA

Protective measures provided in the FEIR/S avoid and minimize effects on bats. Protection and restoration of habitat for bats would improve the overall condition of bat habitat in the Delta, relative to current conditions. These measures together ensure that the project will reasonably protect bats in the Delta.

Projects effects on special-status bats are discussed in FEIR/S Chapter 12 (Exhibit SWRCB-102, pp. 12-3724 to 12-3734), from which I summarize in the testimony that follows. There are two primary effects that include loss of habitat and direct mortality (Exhibit SWRCB-102, Impact BIO-166, p. 12-3726), and indirect effects of project construction (Exhibit SWRCB-102, Impact BIO-167, p. 12-3733).

At least thirteen different bat species are potentially present in the vicinity of the proposed project, but the impact analysis has focused on four species designated as "species of special concern" by CDFW. These special-status bat species use varied roost strategies, from solitary roosting in foliage of trees to colonial roosting in trees and artificial structures. Habitat types used for roosting by special-status bats include riparian natural community, developed lands (e.g., buildings, bridges), and landscape trees (including eucalyptus, palms and orchards). Potential foraging habitat includes all riparian habitat types, cultivated lands, developed lands, grasslands, and wetlands.

The potential for direct mortality of bats would be minimized by implementing Mitigation Measure BIO-166 (Exhibit SWRCB-102, pp. 12-3729 to 12-3733) which provides pre-construction surveys for bats as well as additional protective measures to ensure that effects on maternal roosts are avoided and that effects on other roosting bats are avoided and minimized to the maximum extent practicable. Loss of habitat could occur primarily by altering the availability of habitat for species that roost in trees. Habitat loss effects on bats include the permanent loss of approximately 64 acres of roosting habitat and 4,496 acres of foraging habitat, as well as the temporary loss of up to 200 acres of roosting habitat and up to 3,459 acres of foraging habitat. These losses would be mitigated by implementing Environmental Commitments 3, 4, 7, 9, and 10 (Exhibit SWRCB-111, pp, 5-1 to 5-14),

which provide for restoration and protection of cultivated lands, grasslands, riparian areas, vernal pools, alkali seasonal wetlands, nontidal marsh, and tidal wetlands. This habitat protection and creation would provide replacement habitat equaling or exceeding the impacted acreage, and would be provided in natural community types that provide optimal habitat for the affected species. Moreover, as described in the MMRP (Exhibit SWRCB-111, pp. 5-1 to 5-14), this habitat would be monitored and maintained to ensure its continued compliance with performance standards for the created habitat. Thus the replacement habitat would equal or exceed the value of existing habitat, most of which consists only of agricultural land and much of which is not currently managed to optimize wildlife habitat values.

Indirect effects on bats include effects such as light, vibration, and noise associated with construction and operations. These effects would be minimized by implementing the same BMPs described in Section II.C above. Although that testimony focuses on measures protecting Stone Lakes NWR, the same noise and light reduction BMPs would be implemented at all CWF construction sites adjoining wildlife habitat. The CEQA analysis found such effects would be less than significant, and did not call for mitigation.

In summary, protective measures provided in the FEIR/S avoid and minimize both direct and indirect effects on bats. Habitat mitigation would convert a substantial acreage of agricultural land into habitat types that provide greater value for bats, relative to current conditions. These measures together ensure that the project will reasonably protect bats in the Delta.

F. CWF WILL REASONABLY PROTECT WILDLIFE FROM POSSIBLE INCREASE IN EXPOSURE TO SELENIUM

Hydrodynamic effects of CWF and mitigation in the form of tidal habitat restoration would increase the amount of bioavailable selenium in the Delta. This increase would be minimized through AMM27. (Exhibit SWRCB-111.) The FEIR/S determined for all wildlife species evaluated that selenium exposure effects would be less than significant because any minor adverse impacts will be negligible in comparison to the benefits that will follow

from the proposed restoration of tidal wetland habitats. Since these beneficial impacts outweigh potential minor adverse effects, CWF is reasonably protective of wildlife.

Selenium is a naturally occurring trace element that can be harmful to birds that ingest it with their prey. (Exhibit DWR-1109 [Ohlendorf and Heinz 2011].) Selenium in the Delta is contributed from San Joaquin River runoff, Yolo Bypass runoff, oil refinery discharges, and other, more minor sources. (Exhibit DWR-1055 [Presser and Luoma 2013].) Selenium can bioaccumulate in organisms that feed on the aquatic food chain, and is known to have harmful effects in many types of birds, including many of the bird families considered in the FEIR/S. (Exhibit DWR-1109 [Ohlendorf and Heinz 2011].) Selenium loads to the Delta are regulated under a TMDL. (Exhibit DWR-1110 [McCarthy and Grober 2001].)

Potentially affected species include giant garter snake, California black rail, California least tern, Cooper's hawk, cormorants, egrets, greater sandhill crane, herons, least Bell's vireo, least bittern, lesser sandhill crane, Modesto song sparrow, northern harrier, osprey, shorebirds, short-eared owl, tricolored blackbird, waterfowl, western yellow-billed cuckoo, white-faced ibis, white-tailed kite, yellow warbler, yellow-breasted chat, yellow-headed blackbird, and special-status bats.

In my opinion, selenium exposure due to CWF operations will have minor impacts on wildlife. I base this opinion upon the analysis presented in the FEIR/S Chapter 12 which addressed wildlife exposure to selenium in analysis of 17 different impacts[2] addressing bird species. These impacts were found to entail an appreciable risk of elevated species exposure to selenium, due to hydrodynamic effects of CWF operations, with the primary effect being increased San Joaquin River flow into the Delta; nonetheless, these impacts were found to be less than significant. (Exhibit SWRCB-102, Chapter 12.) For these species, FEIR/S Appendix 3B and the MMRP require AMM27 *Selenium Management*,

[2] Impacts BIO-59, BIO-67, BIO-71, BIO-74, BIO-78, BIO-89, BIO-98, BIO-102, BIO-107, BIO-111, BIO-119, BIO-123, BIO-136, BIO-144, BIO-150, and BIO-183, described in Exhibit SWRCB-111 Chapter 12, p. 12-3526 – 12-3776.

which specifies measures to minimize selenium exposure. (Exhibit SWRCB-102, App. 3B; Exhibit SWRCB-111.) AMM27 *Selenium Management* will be implemented to identify and evaluate potentially feasible actions to minimize bioaccumulation of selenium at habitat restoration sites. Foremost among the required actions is, at each restoration site, to develop a comprehensive Selenium Monitoring and Management Plan, and to implement appropriate plan provisions in restoration project design and management. DWR will implement this work pursuant to permits and regulation under the authority of the Regional Water Quality Control Board. Work under AMM27 includes identifying adaptive management strategies that can be implemented to monitor and minimize, as feasible, bioaccumulation of selenium in the aquatic food web. (Exhibit SWRCB-111.)

Mitigation, primarily in the form of tidal habitat restoration performed under CWF, would increase bird life exposure to selenium in the Delta. The increased exposure will be minimized through AMM27. Although adverse impacts are expected, they will be less than significant under CEQA, and will be minor in comparison to the benefits for wildlife that will follow from the proposed restoration of tidal wetland habitats. Since the beneficial impacts far outweigh the minor adverse effects, CWF is reasonably protective of wildlife.

IV. CONCLUSION

My main opinions are:

- The Adaptive management and monitoring program is likely to have beneficial outcomes for fish and wildlife species in the Delta;
- CWF measures will reasonably protect birds and bats from collisions with power lines, relative to current conditions;
- CWF mitigation and long-term habitat improvements will reasonably protect wildlife resources from construction at Stone Lakes National Wildlife Refuge;
- CWF restoration of greater sandhill crane habitat and protective measures during project construction will reasonably protect sandhill cranes in the Delta;
- CWF minimization and mitigation measures will reasonably protect bats in the Delta;

and

- CWF will reasonably protect wildlife from possible increase in exposure to selenium.

Executed on this 29th day of November, 2017 in Olympia, Washington.

(Christopher Earle)

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