State of California
State Water Resources Control Board
DIVISION OF WATER RIGHTS
P.O. Box 2000, Sacramento, CA 95812-2000
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PROTEST

Based on Environmental Considerations, Public Interest, Public Trust, and Other Issues

APPLICATION A025527 – SITES RESERVOIR

We, Eric Buescher of San Francisco Baykeeper, Gary Bobker of The Bay Institute, Ashley Overhouse of Defenders of Wildlife, and Scott Artis of Golden State Salmon Association have read carefully a copy of, or the notice relative to, Application A025527 of Sites Project Authority to appropriate: from the Sacramento River at Red Bluff Pumping Plant, at Hamilton City Pump Station, at Tehama-Colusa Canal, and at Glenn-Colusa Main Canal; from Funks Creek at the Golden Gate Dam; and from Stone Corral Creek at Sites Dam.

We protest the above application on Environmental Issues, including that the Application and Proposed Project will not best conserve the public interest, will have an adverse environmental impact and will adversely affect a public trust use of a navigable waterway. We also protest the above application on Other Issues because the Proposed Project is contrary to law.

The Statement of Facts in support of this Protest follows at pages 4 – 24, Exhibits A to F attached hereto, and the cited materials herein.

The Conditions under which this Protest may be disregarded or dismissed follow at pages 22 – 24.

A true and correct copy of this Protest has been served upon the Applicant by mail and electronic mail at the following address:

Sites Project Authority
Alicia Forsythe
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[signatures on following page]

Respectfully submitted on the 31st day of August 2023, by:

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<u>STATEMENT OF FACTS</u>

San Francisco Baykeeper, The Bay Institute, Defenders of Wildlife, and Golden State Salmon Association hereby protest the Water Rights Application, No. A025527 ("Application") submitted by the Sites Project Authority ("Applicant") for the proposed Sites Reservoir (the "Proposed Project").

I. <u>INTRODUCTION</u>

The best available scientific evidence, data, and information demonstrates that granting the Application would cause unreasonable impacts on fish and wildlife, would be contrary to law, and is not in the public interest. The science regarding protection of fish and wildlife beneficial uses and public trust resources should guide this decision, and the Application should be rejected. If the Application is approved, in whole or in part, Applicant's water rights should be conditioned as described in Section IV, *infra*.

The San Francisco Bay-Delta ecosystem is in crisis—the result in large part of drastic reductions and alterations of river and estuary inflows. The State Water Resources Control Board ("Board") has repeatedly found that existing water quality objectives and other regulatory requirements are inadequate to protect the public trust, preserve fish and wildlife beneficial uses, and comply with the law. Indeed, the state's salmon fishery is completely shut down in 2023, due to low abundance of fall-run Chinook Salmon, eliminating thousands of jobs that depend on healthy salmon runs. Spring-run Chinook Salmon face a high risk of extinction in the next few years, with extremely low abundance and survival in recent years due to mismanagement of water resources during the extended drought. Delta Smelt, Longfin Smelt, and winter-run Chinook Salmon all face the prospect of extinction soon. White Sturgeon are imperiled because of inadequate river flows into and through the Delta that limit recruitment and migration success. And the impacts on human health and communities in Northern California, from the Delta to coastal communities, are just as severe.

The Board, state and federal agencies, and other scientists have repeatedly and definitively concluded that existing flows are not adequate and that increased flows and improved water quality are necessary to protect the Public Trust, designated beneficial uses, and to prevent extinction of native fish species. In the face of this reality, the Application is clear—Sites Reservoir would reduce instream flows and Delta outflows, further reducing the abundance and productivity of California's native fish and degrading water quality conditions.

The Board should reject the Application because it unreasonably harms native fish and wildlife species, including Chinook Salmon, and it will negatively affect commercial and recreational fisheries and other beneficial uses. This harms the environment and public trust resources.

In addition, the Board should reject the Application because the Proposed Project is contrary to law. Applicant and the Proposed Project fail to comply with the Endangered Species Act ("ESA"), California Environmental Quality Act ("CEQA"), the California Endangered Species Act ("CESA"), the requirements of Proposition 1 of 2014, and the Sacramento-San Joaquin Delta Reform Act of 2009 ("Delta Reform Act").

Finally, the Board should also reject the Application as contrary to the public interest. The Proposed Project will cause unreasonable impacts to fish and wildlife populations and water quality—all of which are already severely degraded—and those unreasonable impacts result because the Applicant and the Proposed Project's potential contractors have failed to adequately invest in local and regional water supply projects.

II. SCOPE OF THE PROCEEDING AND LEGAL STANDARDS

Consistent with its obligations under state law, the Board is required to consider the Proposed Project's full range of impacts to fish and wildlife and the public interest, not just the claimed benefits in the Application. The Board has "an independent obligation to consider the effect of the Proposed Project on public trust resources and to protect those resources where feasible," *In the Matter of Permit 10477*, 2015 WL 4517569, at *9, 22 (March 30, 2015), and must consider the public trust when conditioning or approving any diversion of water, *In the Matter of License 7979 (Application 20301) of Irv Leen*, SWRCB Feb. 3, 2013 (2013 WL 596457) (citations omitted); *see also* Water Rights Order 2009-0033.

The Proposed Project's impacts must comply with existing water quality objectives, but the Board's review of impacts cannot be limited to compliance with existing water quality objectives because, according to the Board and state and federal fish and wildlife agencies, the existing objectives in the Bay-Delta Water Quality Control Plan fail to protect public trust resources including fish and wildlife and beneficial uses. *See, e.g.,* SWRCB, Development of Flow Criteria for the Sacramento-San Joaquin Delta Ecosystem (August 3, 2010) at 2 ("[t]he best available science suggests that current flows are insufficient to protect public trust resources."); *id*. at 5 (acknowledging that "[r]ecent Delta flows are insufficient to support native Delta fishes for today's habitats"); SWRCB Resolution 2010-0039 ("In accordance with the Delta Reform Act, the State Water Board approves the report determining new flow criteria for the Delta ecosystem that are necessary to protect public trust resources."); SWRCB, Scientific Basis Report in Support of New and Modified Requirements for Inflows from the Sacramento River and its Tributaries and Eastside Tributaries to the Delta, Delta Outflows, Cold Water Habitat, and Interior Delta Flows ("2017 Final Scientific Basis Report") at pp. 1-3 to 1-5, 1-21 to 1-22, 3-1, 5-1 to 5-3, 5-5, 5-7 to 5-8, 5-15, 5-25, 5-32 to 5-34, 5-41 to 5-42, 5-47; *see also* SWRCB, July 2018 Framework for the Sacramento/Delta, Update to the Bay-Delta Plan.

Similarly, the Board must ensure more than mere compliance with the California Endangered Species Act to avoid unreasonable impacts on fish and wildlife. Instead, in evaluating reasonable protection of fish and wildlife, the Board must protect species, like fall-run Chinook Salmon, White Sturgeon, Starry Flounder, and others that are not currently listed under CESA, as well as ensuring stronger protections that meaningfully improve conditions for spring-run Chinook Salmon and other species that are CESA-listed. The Board must also find that granting the application will not conflict with or impair meeting the existing narrative objective for salmon protection (salmon doubling) in the Bay-Delta Water Quality Control Plan ("WQCP"), or the proposed "viability" objective being considered by the Board as part of its imminent update of the Sacramento River and Delta portions of the WQCP. Indeed, it is impossible for the Board to reasonably protect fish and wildlife beneficial uses if fish populations are not viable.

Finally, the Board must evaluate the availability of alternative water supplies including water recycling, water conservation and efficiency, and urban stormwater capture, in evaluating the reasonableness of protections for fish and wildlife and other beneficial uses. *See* Decision 1485 at pp. 16-19; Decision 1631 at pp. 165-168, 176-177; Water Rights Order 2009-0034EXEC; *see also* Water Code § 13241(f). And the Applicant must demonstrate compliance with Water Code section 85021 requiring agencies to reduce reliance on water supplies from the Bay-Delta and invest in regional self-sufficiency.

III. <u>FACTUAL AND LEGAL BASIS FOR DENYING THE APPLICATION</u>

A. <u>The Proposed Project Would Cause Environmental Harm, Unreasonable Impacts to Fish and Wildlife, and Damage Public Trust Resources</u>

The best available scientific data and information demonstrate that granting the Application will cause unreasonable impacts to fish and wildlife, including: continued declines and potential extinction of the San Francisco Estuary population of Longfin Smelt, winter-run Chinook Salmon, and other fish species listed as endangered or threatened under the ESA and CESA; reduced survival of commercially important fall-run Chinook Salmon; reduced recruitment in and increased peril to the estuary's White Sturgeon population (which currently supports a valuable recreational fishery), reduced productivity for Starry Flounder (which contribute to a valuable commercial fishery), and degraded water quality, estuarine habitat and fish migration for a broad range of native fish species in the Sacramento River and Bay-Delta. Damaging these public trust resources is an unreasonable environmental harm, and approval of the Proposed Project in light of these impacts is contrary to law. These impacts are discussed in detail in NGO comments on the Revised Draft Environmental Impact Report / Supplemental Draft Environmental Impact Statement ("RDEIR/SDEIS") for the Proposed Project,[1] as well as in comments and studies prepared by state and federal agencies, including the California Department of Fish and Wildlife ("CDFW"), the U.S. Environmental Protection Agency ("EPA"), and the Board.

i. Longfin Smelt

Granting the Petition is likely to reduce the abundance of Longfin Smelt, primarily because the project will significantly reduce winter and spring outflows below the already impaired status quo. *See* Exhibit A, NGO RDEIR/SDEIS Comments, at pp. 27-32. There is overwhelming scientific evidence that one of the primary drivers of the abundance of Longfin Smelt is the volume of Delta outflow in the winter and spring months. CDFW found that "the Proposed Project, as currently described, and the mitigation measures currently proposed in the RDEIR/SDEIS are not sufficient to reduce impacts to less than significant for salmonids, Delta Smelt, and Longfin smelt," warning that "further reduction in winter/spring outflow may exacerbate the current decline in longfin smelt population." *See* Comments by California Department of Fish and Wildlife on Sites Reservoir RDEIR/SDEIS, dated January 28, 2022, attached as Exhibit B, at Appendix A pp. 1, 23. The Board likewise concluded that the Proposed Project may not be sufficient to reduce operational impacts to Longfin Smelt, recommending evaluation of significantly higher bypass flow requirements, including Delta outflow requirements. *See* Comments by the Board on Sites Reservoir RDEIR/SDEIS, dated January 28, 2022, attached as Exhibit C, at p. 6; *see also id*. at p. 32 ("As described in comments on Chapters 2 and 5, reductions in flows and survival of juvenile fish with a demonstrated flow survival relationship are likely to be negatively impacted by Proposed Project operations that reduce baseline flows.").

The Board has repeatedly found that, based on the best available science, existing Delta outflows are inadequate to protect Longfin Smelt. *See* Exhibit C, Board Comments, at p. 15 ("A significant amount of scientific information indicates that existing river flows, Delta outflows, and interior Delta flows (baseline flows) are not sufficient for halting and reversing declines of

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[1] Comments by National Resources Defense Council, Defenders of Wildlife, Baykeeper, The Bay Institute, Golden State Salmon Association, Restore the Delta, Planning and Conservation League, Northern California Council of Fly Fishers International, California Sportfishing Protection Alliance, Friends of the River, Golden West Women Flyfishers, Pacific Coast Federation of Fishermen's Associations, Institute for Fisheries Research, Save California Salmon, and Sierra Club California, on the Sites Reservoir RDEIR/SDEIS, dated January 28, 2022, are attached as <u>Exhibit A.</u>

multiple fish populations in the Bay-Delta watershed."); *see also* 2017 Final Scientific Basis Report at pp. 3-53 through 3-60. The U.S. Fish and Wildlife Service ("USFWS") has likewise concluded that Longfin Smelt warrants listing as endangered under the federal ESA, that the reduction in winter-spring Delta outflow is the primary threat to the continued existence of the species, and that existing regulatory protections, including existing Delta outflow requirements of the WQCP and requirements under the CESA incidental take permit for the State Water Project, are inadequate to protect Longfin Smelt. *See* U.S. Fish and Wildlife Service, Endangered and Threatened Wildlife and Plants; Endangered Species Status for the San Francisco Bay-Delta Distinct Population Segment of the Longfin Smelt, 87 Fed. Reg. 60957, 60961-60964, 60968-60971 (Oct. 7, 2022). Thus, maintaining existing levels of winter and spring Delta outflows is likely to lead to continued declines in abundance of this species.

Despite this well-established science, initial modeling submitted by the Applicant to the Board demonstrates that operations of Sites Reservoir would significantly *reduce* Delta outflow from current conditions. Indeed, Applicant's modeling shows that the Proposed Project would, in some cases, more than entirely eliminate any (theoretically available) increases in winter-spring outflow under the proposed voluntary agreement.[2]

In addition to unreasonable effects from reduced Delta outflow, granting the Petition is likely to harm Longfin Smelt by increasing entrainment in the Delta. *See* Exhibit A, NGO RDEIR/SDEIS Comments, at pp. 27-29. And the RDEIR/SDEIS uses a flawed analysis of the environmental impacts to Longfin Smelt. *See id.,* at pp. 30-32; *see also* Exhibit B, CDFW Comments, at Appendix A p. 23.

Finally, the RDEIR/SDEIS erroneously assumes that tidal marsh habitat restoration would mitigate impacts to Longfin Smelt resulting from reduced Delta outflow under the Proposed Project. This assumption is not supported by the best available scientific information. *See* Exhibit A, NGO RDEIR/SDEIS Comments, at pp. 32-34; *see also* NGO Comments on Voluntary Agreement Scientific Basis Report for Phase 2, dated February 8, 2023, attached as Exhibit D, at pp. 4-6, 9-11.[3] CDFW concluded that the proposed habitat mitigation measure "does not account for impacts associated with reduced Delta outflow due to Proposed Project diversions." *See* Exhibit B, CDFW Comments, at Appendix A p. 24. Similarly, in its Species Status

[2] Purported flow increases under the voluntary agreement are themselves largely replacing flows that were protected under the 2008/2009 ESA biological opinions, but which were made available for diversion by the illegal 2019 biological opinion, which forms the baseline for the voluntary agreements.

[3] Comments submitted by National Resources Defense Council, San Francisco Baykeeper, The Bay Institute, California Sportfishing Protection Alliance, Defenders of Wildlife, and Golden State Salmon Association.

Assessment of Longfin Smelt in the San Francisco Estuary, the USFWS indicated that the potential for restoration of shallow water habitat to benefit the species was uncertain, stating:

> "The loss of tidal marsh habitats may have hampered species productivity, but to date, there are no indications that restoration has been sufficient to stem the decline. Therefore, we cannot conclude whether or not the species has lost resilience due to landscape changes that occurred in the 19th and 20th centuries. The quantitative contributions of restored estuarine marshes to larval growth and rearing remains <u>a potentially important science question</u> in support of longfin smelt conservation.

USFWS Species Status Assessment (2022) Chapter 3 at p. 56, emphasis added, attached as Exhibit E.

The impacts on Longfin Smelt are unreasonable, are not mitigated, and must be avoided and fully mitigated if the Proposed Project is to proceed. Further harm to endangered public trust resources is also unreasonable. The Application should be denied, or in the alternative conditioned as described below to avoid unreasonable harm to Longfin Smelt.

ii. Winter-run Chinook Salmon

Granting the Petition is likely to reduce the survival and abundance of winter-run Chinook Salmon, primarily because the proposed bypass flows are inadequate to protect the species. *See* Exhibit A at pp. 20-25.

The best available science demonstrates that the survival of juvenile winter-run Chinook Salmon migrating down the Sacramento River increases continuously as instream flow at Bend Bridge increases up to approximately 24,720 cubic feet per second (cfs) and beyond. Hassrick et al. 2022. And generally, more flow on the Sacramento River increases survival of migrating juvenile winter-run Chinook Salmon. *See* Henderson et al. 2018. Reducing Sacramento River flows via diversions to Sites Reservoir will reduce the survival of migrating juvenile winter-run Chinook Salmon juveniles. To avoid harm to this species, the Proposed Project proposes bypass flows of just 10,700 cfs at Wilkin's Slough. The evidence shows that the proposed bypass flow is inadequate to protect migrating winter-run Chinook Salmon. As a result, the Proposed Project's water diversions will significantly reduce the survival of juvenile winter-run Chinook Salmon migrating down the Sacramento River. This is unreasonable.

In addition to reducing survival in the Sacramento River, granting the petition will reduce survival of juvenile winter-run Chinook Salmon through the Delta. The best available science demonstrates that there is a strong flow-survival relationship in many reaches of the Delta, and that survival of juvenile salmon through the Delta "decreases sharply" whenever flows at Freeport are less than ~35,000 cfs. Perry et al. 2018 ("survival decreases sharply and routing into the interior Delta (where survival is low) increases sharply as Delta inflows decline below approximately 1,000 m^3s^{-1} [~35,000 cfs].”); *see also* Hance et al. 2021. However, the petition includes no proposed bypass flows for the Sacramento River at Freeport, and the requirement of just 10,700 cfs at Wilkin’s Slough will not guarantee sufficient flows at Freeport. The best available science indicates that proposed operations would reduce survival of winter-run salmon by reducing flows through the Delta. This is unreasonable.

Moreover, the RDEIR/SDEIS’ analysis of impacts to winter-run Chinook Salmon is flawed and fails to use the best available science, including the failure to use the best available science regarding the effects of flow on juvenile survival, the timing of migration, and temperature impacts on salmon eggs. *See* Exhibit A, NGO RDEIR/SDEIS Comments, at pp. 9, 20-25.

Relatedly, the initial analysis of potential impacts from the Proposed Project using National Marine Fisheries Service’s Winter-Run Life Cycle Model (“WRLCM”) fails to use the best available science in two distinct and important ways, and as a result the model underestimates the adverse effects of the Proposed Project on survival and abundance.

First, the WRLCM fails to accurately assess the impacts of Sacramento River flows on the survival of winter-run Chinook Salmon. The WRLCM fails to incorporate data on the effects of river flows on survival of juvenile winter-run Chinook Salmon published in Hassrick et al. 2022; instead, the WRLCM uses a relatively flat flow-survival curve that is inconsistent with the best available science and that significantly underestimates the effects of reduced flows on reducing juvenile outmigration survival. WRLCM Model Description, March 15, 2023, at p. 13.

Second, the WRLCM assumes that operation of the Proposed Project will generate improved winter-run egg survival in a handful of years, through temperature benefits below Shasta Dam that arise from exchanges with the Bureau of Reclamation, *see* WRLCM Report 2035, Sites Alt3A_Mod, Alt3B_Mod, and NAA DRAFT, Feb. 27, 2023, at pp. 4-6. However, those purported water temperature benefits of exchanges are speculative, and do not account for the increased carryover storage requirements at Shasta Dam likely to be required as part of the ongoing ESA consultation regarding Central Valley Project operations. Indeed, new temperature requirements at Shasta Dam will likely eliminate the purported temperature benefits touted by the Applicant.[4]

As a result, the WRLCM’s assumed water temperature benefits are overstated or illusory, and the impacts of water diversions on river flow rates are understated. Thus, the reality of these impacts will be worse than described by the modelling—impacts which are unreasonable.

[4] Modeled benefits that meet existing and/or planned regulatory requirements are not a “benefit” from the Proposed Project and cannot be relied upon to avoid unreasonable impacts. And modeled benefits that are not explicitly included as conditions in any approved water rights application are purely speculative and not reasonably certain to occur.

Finally, the best available science does not show that tidal marsh or other habitat restoration would mitigate and offset these impacts on winter-run Chinook Salmon. *See* Exhibit D, NGO Voluntary Agreement Scientific Basis Report Comments, at 1-4, 6, 7, 9-11. An ineffective mitigation plan that does not offset actual harms is unreasonable.

iii. Spring-run Chinook salmon

Granting the Petition is likely to reduce the survival and abundance of spring-run Chinook Salmon, primarily because the proposed bypass flows are inadequate to protect the species. *See* Exhibit A at pp. 23, 26. Spring-run Chinook Salmon currently face a high risk of extinction due to significant population declines and low abundance this year, warranting particular attention and strengthened protections for this imperiled species. *See* National Marine Fisheries Service Report, March 2022, at pp. 4-5; *see also* National Marine Fisheries Service Report, March 2023, at pp. 1-2.[5]

Reduced instream flow because of diversions to Sites Reservoir is likely to reduce the survival of juvenile spring-run Chinook Salmon migrating down the Sacramento River, because the proposed bypass flow criteria are inadequate. The analysis published in Michel et al. 2021 identifies a potential flow-survival threshold at 10,712 cfs, above which survival of sonic-tagged juvenile salmon was approximately 50.8 percent through the stretch of the Sacramento River those authors studied.[6] However, there are error bounds around this estimated flow-survival threshold, meaning the actual threshold may be 11,030 cfs or higher. Furthermore, there is substantial evidence that the relationship between flow and juvenile Chinook Salmon survival is continuous, with survival increasing as flow increases. For example, in 2contrast to the thresholds detected by Michel et al. 2021, numerous other studies have not found similar breakpoints, but instead have concluded that juvenile salmon survival increases as flows increase, even beyond 11,030 cfs. *See, e.g.*, Michel et al. 2015; Henderson et al. 2018; Michel 2019; Munsch et al. 2020; Notch et al. 2020; Hance et al. 2021; Hassrick et al. 2022. Moreover,

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[5] These reports are available at https://www.pcouncil.org/documents/2022/03/d-1-a-supplemental-nmfs-report-1.pdf/ (2022), and https://www.pcouncil.org/documents/2023/02/d-1-b-nmfs-report-1.pdf/ (2023).

[6] The paper documents similar survival rates at flows between 10,712 cfs and 22,872 cfs, and a decrement in survival at flows above 22,872 cfs. However, the authors acknowledged that the apparent decline in survival at flows greater than the upper flow threshold, which was based on limited observations at higher flows, may be erroneous, admitting, "The 22,872 cfs threshold may be an artifact of lower detection efficiencies associated with fish utilizing additional high flow migration routes with less receiver coverage." In other words, at flows higher than 22,872 cfs, Chinook Salmon may migrate through habitats where there is no detection of sonic tags, thus, the appearance that these fish died (reducing survival rates) during migration may be erroneous.

flow thresholds detected in sonic tag studies are not informative regarding flows necessary to protect migrating salmon fry, which are smaller than the fish used in the acoustic tag studies. *See* Exhibit A, NGO RDEIR/SDEIS Comments at pp. 22-24. Migratory behavior and response to increases in river flows differs across Chinook Salmon juvenile class sizes. The thresholds detected by Michel et al. 2021 apply only to the relatively large fish used in that study. By contrast, Munsch et al. 2020 found that density of wild-spawned Chinook Salmon fry found in Delta tidal marshes increased with increasing flow above ~53,000 cfs.

Given that Michel et al. 2021 concluded that the effect of flow on survival of the fish they studied was represented by thresholds, any flow below the true threshold would produce no survival benefit. Thus, to ensure that fish benefit from flow bypasses at the diversion for Sites Reservoir, the bypass flow criteria must include a safety factor that accounts for environmental variability and measurement error in the estimated threshold.

In addition to reducing survival in the Sacramento River, granting the petition is likely to reduce survival of juvenile spring-run Chinook Salmon through the Delta. The best available science demonstrates that there is a strong flow-survival relationship in many reaches of the Delta, and that survival of juvenile salmon through the Delta "decreases sharply" whenever flows at Freeport are less than ~35,000 cfs. Perry et al. 2018 ("survival decreases sharply and routing into the interior Delta (where survival is low) increases sharply as Delta inflows decline below approximately 1,000 m^3s^{-1}."); *see also* Hance et al. 2021. However, the petition includes no proposed bypass flows for the Sacramento River at Freeport. The best available science indicates that proposed operations would reduce survival of juvenile spring-run salmon through the Delta.

As with winter-run Chinook Salmon, there is no basis for concluding that the Proposed Project would result in significant improvements in water temperature or spawning conditions for spring-run Chinook Salmon.

Finally, the best available science does not show that tidal marsh or other habitat restoration would mitigate and offset these impacts on spring-run Chinook salmon. *See* Exhibit D. These impacts to spring-run Chinook Salmon are unreasonable.

iv. Fall-run Chinook Salmon

Granting the Petition is likely to reduce the survival and abundance of fall-run Chinook Salmon, primarily because the proposed bypass flows are inadequate to protect the species. Exhibit A at pp. 26-27. The closure of the salmon fishery in 2023, and potential closure in 2024, which is due to low abundance of fall-run Chinook Salmon, highlight the need to strengthen protections for fall-run Chinook Salmon in the freshwater environment, to protect the species and the thousands of jobs in the salmon fishery that depend on healthy salmon runs.

Reduced instream flow because of diversions by Sites Reservoir are likely to reduce the survival of juvenile fall-run Chinook Salmon migrating down the Sacramento River and through the Delta, because the proposed bypass flow criteria are inadequate. *See* § III.A.iii, *supra* (necessary bypass flows and impacts to spring-run Chinook Salmon).

As with winter-run Chinook Salmon and spring-run Chinook Salmon, there is no basis for concluding that the Proposed Project would result in significant improvements in water temperature or spawning conditions for fall-run Chinook Salmon.

Finally, the best available science does not show that tidal marsh or other habitat restoration would mitigate and offset these impacts on fall-run Chinook salmon. *See* Exhibit D, NGO Voluntary Agreement Scientific Basis Report Comments at pp. 1-4, 6-7, 9-11. Ineffective mitigation in the face of understated and actual harm is unreasonable, especially given the perilous status of the species and the closure of the fishing season due to poor production of juveniles stemming from inadequate existing protections in the Sacramento River and Delta.

v. Delta Smelt

Granting the Petition is likely to reduce the survival and abundance of Delta Smelt. *See* Exhibit A, NGO RDEIR/SDEIS Comments, at pp. 34-36. This is unreasonable. In particular, the RDEIR/SDEIS completely ignores the effects of reduced spring Delta outflow on the abundance of Delta Smelt, despite scientific research demonstrating that reduced Delta outflow in the spring reduces the recruitment and subsequent abundance of Delta Smelt. *See id.,* pp. 34-35; *see also* Smith et al. 2021; Polansky et al. 2021; Final 2017 Scientific Basis Report at pp. 3-73 to 3-74; IEP MAST 2015. In addition, the project would likely reduce the survival and abundance of Delta Smelt by reducing turbidity in the Delta, as the RDEIR/SDEIS demonstrates the project would reduce sediment loading to the Delta. *See* Exhibit A, NGO RDEIR/SDEIS Comments, at pp. 34-35.

Finally, there is no scientific evidence that tidal marsh or other habitat restoration can fully mitigate these adverse impacts. *See* Exhibit D, NGO Voluntary Agreement Scientific Basis Report Comments, at pp. 6-7, 9-11. These Proposed Project's impacts due to reduced flows on a nearly extinct endangered species are unreasonable and are likely to result in permanent harm.

vi. Green Sturgeon and White Sturgeon

Reduced Sacramento River flow in spring months caused by water diversions to Sites Reservoir will unreasonably harm Green Sturgeon and White Sturgeon. Green Sturgeon in San Francisco Bay's watershed are listed as threatened under the ESA ("southern DPS Green Sturgeon").

White Sturgeon are listed as of Special Management Concern by CDFW (CDFW 2015) and experienced a major mortality event in 2022 as a result of a harmful algal bloom (red tide) in San Francisco Bay caused by the algae *Heterosigma akashiwo*, *see* CDFW, May 16, 2023, available at https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=213229&inline, and additional mortality for the same reason in 2023. The best available science demonstrates that high river flows and Delta outflow in the spring months are necessary for the reproductive success and long-term abundance of White Sturgeon. *See, e.g.,* Israel 2009; CDFW 2015; Jackson 2016.[7] Indeed, CDFW's conceptual model for San Francisco Estuary White Sturgeon life history states:

> The dispersal of larval white sturgeon is dependent on high spring river flows, which optimally consists of multiple large flow pulses and a relationship between the mean monthly outflow from April–July and white sturgeon YOY has been developed (Kohlhorst et al. 1991). Reduced seasonal flows or flows mismatched ecologically with sensitive early life stages may reduce dispersal of these life stages when they are most vulnerable to native and nonnative predation. Flow reductions may serve to reduce or eliminate YOY survival even if spawning was successful.

Israel et al. 2009 at p. 17.

Analysis of young-of-year White Sturgeon catch data from the Interagency Ecological Program's (IEP) Bay Study between 1980-2022 reveals that recruitment of White Sturgeon juveniles does not occur when Sacramento River flows (as measured by the sum of the "SAC" and "YOLO" variables in DWR's DAYFLOW dataset) are less than ~55,000 cfs during April, May, and June[8] and that recruitment is strongly and positively correlated with flows greater than 55,000 cfs. When Sacramento River flows into the Delta exceed ~80,000 cfs, young-of-year White Sturgeon are almost always detected in subsequent sampling. The project would reduce flows below these levels, causing unreasonable impacts to these species, especially given their imperiled status under state and federal law.

vii. Starry Flounder

Reduced Sacramento River flow in spring months caused by water diversions to Sites Reservoir will unreasonably harm Starry Flounder and the commercial fishery to which this fish

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[7] The Water Board and other agencies assume that flows needed to support recruitment of Green Sturgeon are roughly the same as those needed to support recruitment of White Sturgeon. *See, e.g.*, 2017 Scientific Basis Report at 3-63 to 3-66. ("The assumption is that this species needs flows of a similar magnitude as white sturgeon (USFWS 1996)" at 3-63.).

[8] According to the Sites application, diversion of flows will end after June 15 of each year; thus, we do not present analysis of the relationship between July flows and White Sturgeon recruitment.

contributes. Starry Flounder is a native marine fish that spawns outside the Golden Gate bridge. Larval and juvenile Starry Flounder rear in San Francisco Bay. Rearing success (measured as age 1 fish detected in the IEP Bay Study otter trawl) is strongly and positively correlated with Delta outflow, *see, e.g.,* Jassby et al. 1995; Kimmerer 2002; Ralston 2005; SWRCB 2017) and abundance of Starry Flounder rearing in San Francisco Bay is correlated with subsequent catch in the ocean fishery. Reductions in Delta outflow resulting from diversion to Sites Reservoir will reduce productivity and abundance of Starry Flounder. Given the already reduced abundance of this species, further degradation of the conditions it needs for successful recruitment and rearing is unreasonable.

viii. Avian and Fully Protected Species

Granting the Petition will harm numerous threatened, endangered, and other special status bird species by the construction and operation of Sites Reservoir.[9] Avian species that will be impacted include, but are not limited to, Western Yellow-billed Cuckoo, Bald Eagle, Swainson's Hawk, Bank Swallow, Burrowing Owl, Golden Eagle, and White-tailed Kite, each of which exists in the project area and reaches of the Sacramento River and Delta. *See* RDEIR/SDEIS, Chapter 10.

According to the Applicant, the construction and ongoing operation of the project will facilitate direct take of Burrowing Owls, Golden Eagles, Bald Eagles, and White-tailed Kite through electrocution or collision with new transmission lines. *See*, e.g., RDEIR/SDEIS at pp. 10-87, 10-95 to 10-97. Take of avian species could also occur through use of rodenticides, disturbances of nesting sites, and other means, and the RDEIR/SDEIS does not make clear how or whether these impacts would be fully avoided.[10] *See,* e.g., Exhibit B, CDFW Comments, at Appendix A p. 14.

Finally, the construction and ongoing operation of the project will also result in loss of habitat for many species such as Swainson's Hawk and Bank Swallow, due to inundation and changes in current flow regime. *See* Exhibit B, CDFW Comments, at Appendix A p. 13.[11] More

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[9] The full extent of significant impacts to avian and terrestrial species are unknown because project proponents did not use specific bird surveys, an accurate species distribution survey, and did not complete an aquatic delineation. The harms that are revealed by project proponents are likely an understatement of the real impacts. *See* Exhibit A, NGO RDEIR/SDEIS Comments at pp. 37-42; *see also* EPA Comments on RDEIR/SDEIS, January 28, 2002, attached as Exhibit F.

[10] Sites project will permanently impact 14,000 acres of suitable nesting habitat for the owl. Additionally, CDFW has noted that rodenticides used for pest control could negatively impact the Burrowing Owl, especially as the project lacks an Integrated Pest Management Plan.

[11] CDFW specifically states that, "Timing of flow releases can have both direct and indirect impacts to bank swallow populations. Direct impacts and potential take can occur if high flows

specifically, CDFW emphasizes that the changes in high flows during the late spring and summer will negatively impact nesting season for the threatened Bank Swallow. *See id.,* at Appendix A p.14. The loss of nesting habitat from changes to flow regime on the Sacramento River will be compounded by the loss of 15,664 acres of foraging habitat due to the Proposed Project. *See* RDEIR/SDEIS at p. 10-85.[12]

ix. Wetlands

According to the Applicant, Sites Reservoir would inundate and destroy terrestrial and aquatic habitat covering approximately 13,200 acres in Antelope Valley, devastating the habitat of numerous terrestrial and semi-terrestrial species.[13] RDEIR/SDEIS at ES-11. More specifically, "construction of the reservoir and appurtenant facilities under Alternatives 1 or 3 would result in permanent impacts to approximately 425 acres of wetlands and 234 acres of streams, with impacts under Alternative 2 slightly lower due to a smaller reservoir footprint." Exhibit F, EPA Comments, at p. 5; *see also* RDEIR/SDEIS at pp. 9-19, 9-29.

The EPA comments also emphasize that these impacts require analyses and findings, such as the determination of a least environmentally damaging practicable alternative, that cannot currently be supported without additional site-specific information which is not provided in the RDEIR/SDEIS, and that information was not provided in the Sites application. *See* Exhibit F, EPA Comments at p.5. To show the variability in the specific number, in contrast, the Board estimated different acreage amounts in their RDEIR/SDEIS comments, "Alternatives 1-3 are described as potentially eliminating more than 375 acres of wetland resources and more than 200 miles of stream resources." Exhibit D, Board Comments, at p. 32.

Operation of the Proposed Project will also impact wetlands downstream of the project along the Sacramento River and in the Sutter and Yolo bypasses by reducing the area of

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during the late spring and summer nesting season cause inundation of burrows or loss of nests caused by localized bank sloughing. Indirect impacts could occur with changes in flow regimes as bank swallows need winter and early spring flows to allow refreshing of erosional banks. Therefore, a change from current operations of flows on the Sacramento River as a result of the Proposed Project could beneficially or adversely impact bank swallows depending on the timing, duration, and volume of flows. CDFW recommends the FEIR/FEIS include the consideration of bank swallow life cycle in any changes in flows as a result of the Proposed Project, especially during nesting season (April - August)." *See* CDFW Comments, Exhibit B, at Appendix A p. 14.

[12] *See* Table 10-2d Acreages of Permanent and Temporary Impacts on Modeled Special-Status Bird Habitats in the Study Area.

[13] This number is just an estimate and may be more because, as we stated in the RDEIR/SDEIS comments, the RDEIR/SDEIS fails to accurately describe the baseline condition of the project site and the presence of special status species, undermining the accuracy of the impact analyses.

inundation at both bypasses and in Sacramento side channel habitat. *See* Exhibit F, EPA Comments, at pp. 5-6; *see also* RDEIR/SDEIS Appendix 11M, Chapter 9. Less than 10 percent of California's native wetlands remain after they were drained and diked for agricultural uses. *See* "The Central Valley Historic Mapping Project" by California State University, Chico Department of Geography and Planning and Geographic Information Center, 2003.[14]. California's wetlands offer both and support millions of migrating birds each year, in addition to many other environmental and flood management benefits. *See* State of California Natural Resources Agency (2010) State of the State's Wetlands: 10 Years of challenges and Progress, Sacramento, CA.[15]

The Project construction's transmission lines will also specifically impact vernal pools, which are of critical importance to many species, including amphibians, for breeding habitat.[16] For electrical transmission lines, the RDEIR/SDEIS indicates that "[o]nly one of the two north-south transmission line alignments described in Chapter 2 would be constructed, and specific locations for the transmission line towers are currently unknown." RDEIR/SDEIS at 9-14. Transmission line can have serious impacts to birds and the towers can destroy vernal pool wetlands and other important landscape features.[17]

x. Terrestrial Species

There are 33 special-status wildlife species likely to occur in the study area for the project. *See* RDEIR/SDEIS at 10-16. These species will be harmed by loss in habitat and the Proposed Project's ongoing operations. For example, the threatened Giant Garter Snake will be negatively impacted from the Project's construction activities. Construction activities are planned during the Giant Garter Snake's active period of May 1 and October 1, jeopardizing

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[14] Available at https://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/docs/cmnt081712/sldmwa/csuchicodptofgeographyandplanningcentralvalley.pdf

[15] Available at https://resources.ca.gov/CNRALegacyFiles/docs/SOSW_report_with_cover_memo_10182010.pdf. California cannot afford to further reduce its wetland footprint.

[16] *See* EPA Fact Sheet https://www.epa.gov/sites/default/files/2021-01/documents/amphibian_reptile_conservation.pdf. The latest aquatic delineation of the region's wetlands has not been updated in over 20 years. California Department of Water Resources. 2000. North of Delta Offstream Storage Investigation Progress Report, Appendix B: Wetland Delineation and Field Studies Report. Draft. Prepared for Integrated Storage Investigations, CALFED Bay-Delta Program. April 2000.

[17] Environmental Protection Agency, Environmental Impacts of Electricity Delivery, "When power lines and their access roads are placed in undeveloped areas, they can disturb forests, wetlands, and other natural areas." Available: https://www.epa.gov/energy/electricity-delivery-and-its-environmental-impacts#impacts; last updated October 24, 2022.

breeding and existing populations that are present in the project area. *See* RDEIR/SDEIS at 10-80; *see also* USFWS Final Recovery Plan for the Giant Garter Snake, 2017 at I-3. Project operations will also decrease important riparian habitat along the Sacramento River for the threatened Western Yellow-billed Cuckoo. The diversions of the Proposed Project will compound the negative impacts from existing dams and diversions, such as reduction of mean annual peak discharge flow, sediment starvation and reduced bank erosion rates and deposition. *See* CALFED 2000b; Greco 2014; Michalková et al. 2010; Buer et al. 1989; *see also* Biological Opinion for the Reinitiation of Consultation on the Coordinated Operations of the Central Valley Project and State Water Project, USFWS 2019, pp. 363-392.

In addition to the habitat lost to inundation, the construction of roads and new water transfer infrastructure will also sever ecosystems and inhibit species movement and proliferation. *See* RDEIR/SDEIS at pp. 10-137, 10-139; *see also* CDFW Comments, Exhibit B, at Appendix A p. 26. CDFW has identified much of the project area as having high connectivity value and high biodiversity ranking, with some areas marked as "irreplaceable and essential corridors" and "conservation planning linkages" in their Areas of Conservation Emphasis program. *See* CDFW, "Areas of Conservation Emphasis" Mapping Tool, available at https://wildlife.ca.gov/Data/Analysis/ACE. Connectivity between high quality habitat areas in heterogeneous landscapes is important to allow for range shifts and species migrations as the climate changes. *See* Cushman et al., 2013; Heller & Zavaleta, 2009; Krosby et al., 2018.

xi. Additional Fish, Wildlife, and Human Health Impacts via Effects on Water Quality

The proposed diversions to, and water releases from, Sites Reservoir would significantly degrade water quality downstream of the diversion and release locations causing negative impacts to fish and wildlife beneficial uses and potentially harming public health. Granting the application is likely to contribute to increased frequency of harmful algal blooms in the Bay-Delta as a result of reductions in turbidity and flow into the Delta, and via the direct discharge of *Microcystis spp*., other harmful algae, and/or warm water from the reservoir to the Sacramento River.

Harmful algal blooms of numerous algal and cyanobacteria species, including those in the genus *Microcystis,* currently occur in the Delta. *See* Kudela et al. 2023. These blooms can be lethal to fish, zooplankton on which fish feed, and small mammals, and can cause severe human health impacts. Toxins emitted by these blooms can be transported in water beyond the area of the bloom itself and toxins can also be aerosolized, creating potential health impacts to terrestrial and avian species. *See* Plaas and Paerl 2021. Blooms form in water with adequate nutrients (particularly nitrogen and phosphorous compounds) that is warm, relatively clear (low turbidity), and slow moving (high residence time). Diversions of water from the Sacramento River into Sites Reservoir will reduce flow volume, velocity, and sediment loads in the river and parts of the Delta, making them more suitable for blooms or harmful algae. Indeed, evidence indicates that flow volume is a major factor controlling bloom frequency and magnitude in the Delta. *See* Lehman et al. 2008; Lehman et al. 2020; Berg and Sutula 2015. In addition, because water released from Sites Reservoir is likely to be warmer than receiving waters in the Sacramento River, the likelihood of harmful algae blooms forming in the Sacramento River or its distributaries in the Delta will also increase. Finally, it is likely that harmful algae will bloom in Sites Reservoir itself. In that case, releases from the reservoir may deliver algal cells to the Sacramento River, promoting formation of a harmful bloom. *See* Exhibit F, EPA Comments, at Detailed Comments p. 6 ("EPA concurs . . . that construction and operation of Sites Reservoir is likely to create conditions conducive to the formation of HABs"). Harmful algal blooms pose risks to fish, wildlife, and public health, and increasing their likelihood, magnitude, or scope is unreasonable.

In addition, the U.S. Environmental Protection Agency has raised significant concerns regarding water quality impacts, including:

- Exceeding water quality objectives for aquatic life protection in Sites Reservoir for aluminum, copper, and iron, which also cause concerns regarding water quality impacts to the Sacramento River;
- Exceeding health objectives for methylmercury in fish caught in Sites Reservoir;
- Increased frequency and magnitude of harmful algal blooms, both in the reservoir and in the Bay-Delta.

See Exhibit F, EPA Comments, at p. 2, and at Detailed Comments at pp. 5-7.

Further, reduced turbidity in the Delta due to reduced sediment loading, *see supra re Delta Smelt,* would also cause secondary adverse impacts, including increased frequency and magnitude of harmful algal blooms (see above) and predation of and decreased cover for native fish species.

In addition, releases of warm water from Sites Reservoir are likely to cause temperature impacts in the Sacramento River, including direct and indirect impacts to migrating adult salmon.

Each of these impacts to water quality harm the environment, harm public trust resources, and risk harms to human health. All of this is unreasonable.

B. **<u>The Board Should Deny the Application as Proposed Because it is Contrary to Law</u>**

In addition to causing unreasonable impacts to fish and wildlife, the Board should deny the Application because it is contrary to law. The environmental analysis in the RDEIR/SDEIS fails to comply with CEQA, including because it fails to consider a reasonable range of alternatives and fails to accurately assess likely environmental impacts. *See generally,* Exhibit A.

The Proposed Project violates CESA and the ESA because it fails to fully mitigate impacts to species listed or identified as at risk under these statutes and because it would jeopardize the continued existence of Longfin Smelt, winter-run Chinook Salmon, Delta Smelt, spring-run Chinook Salmon, and Green Sturgeon.

The Proposed Project also violates the requirements of Proposition 1 of 2014 because it fails to result in a net ecosystem improvement to the Bay-Delta, does not provide the ecosystem and public benefits that were approved by the Water Commission in 2018,[18] and the public benefits are not reasonably certain to occur because the Proposed Project lacks contracts or other enforceable mechanisms to ensure that Level 4 refuge water supply is actually delivered to the wildlife refuges. *See* footnote 4, *supra*.

Finally, the Proposed Project violates section 85021 of the Delta Reform Act because it will not reduce reliance on the Delta.

Each of these separate violations of law is sufficient to deny the Application, and approving the Proposed Project would be contrary to state and federal law.

C. **<u>The Board Should Deny the Application as Proposed Because it is Not in the Public Interest</u>**

The Board should also deny the Application because it is not in the public interest. The project would cause unreasonable impacts to fish and wildlife and to water quality in the Sacramento River and Bay-Delta estuary, significant harm to the environment, damage public trust resources, and is unlawful.

In addition, the Board should find that the Proposed Project is not in the public interest because of the availability of millions of acre feet of sustainable water supplies from water recycling, urban stormwater capture, and improved agricultural and urban water use efficiency.

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[18] For instance, the information provided to the Commission demonstrates that the project would provide far less water for wildlife refuges (Level 4) than what was approved by the Commission in 2018. *See* https://cwc.ca.gov/-/media/CWC-Website/Files/Documents/2021/12_December/December2021_Item_10_SitesFeasibility_Final.pdf

See Pacific Institute / NRDC Report entitled *The Untapped Potential of California's Water Supply*, 2014; *see also* Pacific Institute Updated Report, 2022.[19] The availability of these cost-effective, drought resilient water supplies demonstrates that reduced diversions from the Bay-Delta, and increased protections for fish and wildlife, are feasible, reasonable, and in the public interest. Demanding that Applicant and the Proposed Project's contractors implement sustainable water supplies rather than syphon *more* water from the Sacramento River and Delta to be transported south would benefit the public, water quality, and fish and wildlife. The opposite—diverting, storing, and shipping more water out of the Delta's watershed—is not.

Similarly, the Delta Reform Act (Wat. Code, § 85000 et seq.) focuses on the critical value of the Delta as a natural resource to California and the nation and the importance of preserving the Delta's vital features. Wat. Code, § 85002. "The Delta is a distinct and valuable natural resource of vital and enduring interest to all the people and exists as a delicately balanced estuary and wetland ecosystem of hemispheric importance." Wat. Code § 85022. Further, the legislature stated that the protection of the Delta is of "paramount concern." *Id*. The Delta Reform Act states that "[t]he policy of the State of California is to reduce reliance on the Delta in meeting California's future water supply needs." Wat. Code, § 85021. Damaging the Delta by taking away the water that would otherwise support it is contrary to the public interest and unlawful.

Finally, dams and reservoirs have significant climate change impacts that are not addressed in the Proposed Project's water rights application. *See, e.g.*, RDEIR/SDEIS Chapter 21 (Greenhouse Gasses). Adding greenhouse gas emissions from both construction and operation of the Proposed Project is not in the public interest. The Applicant's contention that the Project will be "net-zero" is a speculative promise, which at minimum requires enforcement of the mitigation measures described in the RDEIR/SDEIS. The Application, if approved, must condition the water rights on full compliance with mitigation measures described in the CEQA process. Without such guaranteed full compliance, climate impacts are an admitted problem (increased greenhouse gas emissions) without an enforceable solution.[20] This is not in the public interest.

Ultimately, whether Sites Reservoir is in the public interest cannot be determined based on solely rosy predictions of the Applicant's speculation about water supply resilience. It must, instead, be based on the science, the actual impacts of the Project on the Sacramento River and the Delta, public trust resources, fish and wildlife, public health, and the communities of

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[19] These reports are available at https://www.nrdc.org/resources/untapped-potential-californias-water-supply and at https://pacinst.org/publication/california-urban-water-supply-potential-2022/ (2022).

[20] As above, modeled benefits (or planned mitigation measures) that are not explicitly included as conditions in any approved water rights application are not reasonably certain to occur.

Northern California that will be harmed by approval of the Application. *See* Sites Reservoir Authority, Status Briefing on Final EIR/EIS Part 3, May 19, 2023 (detailing "significant and unavoidable impacts to . . . surface water quality, vegetation and wetlands, wildlife" among others, and proposing adoption of Statement of Overriding Considerations under CEQA). Based on the best scientific data and information, the Proposed Project is not in the public interest and the Application should be denied.

IV. <u>CONDITIONS TO RESOLVE PROTEST</u>

The Proposed Project causes unreasonable impacts to fish and wildlife, is not in the public interest, damages public trust resources, and is otherwise in violation of the law. As a result, the Application should be denied in its entirety.

In the alternative, if the Board elects to grant the Application despite its illegality and unreasonable harms, it should condition the water rights approved for the Proposed Project as follows to mitigate the unreasonable harms described herein and ensure the Project does not degrade water quality.

A. <u>General Conditions</u>

1. A prohibition on diversion, summed across points of diversion, of volumes greater than or equal to 5% of Sacramento River flow on any day, as measured at the point of diversion where river flow is lowest.

2. A permit condition requiring that wherever existing quality of surface or ground waters are better than objectives established for those waters in a basin plan or water quality control plan, the existing quality be maintained and not be degraded or diminished due to operation of the Proposed Project. *See* State Water Board Resolution 68-16.

3. A prohibition on the release of water from Sites Reservoir to the Sacramento River that is warmer than the receiving water.

4. A prohibition on the diversion of water to Sites Reservoir at any time harmful algal blooms are documented in the Sacramento River or its distributaries in the Delta.

5. A prohibition on diversions from the Sacramento River to Sites Reservoir when any Temporary Urgency Change Order for Delta water quality is in effect.

6. A prohibition on delivery of water south of Delta from Sites Reservoir when any Temporary Urgency Change Order for Delta water quality is in effect.

7. A prohibition on the diversion of water into Sites Reservoir on any day that water is being released from Sites Reservoir for: (a) delivery south of Delta, or (b) to maintain environmental conditions in the Delta or San Francisco Bay.

8. Conditions in the Water Rights Permits requiring compliance with all provisions of the Bay-Delta Water Quality Control Plan and the Central Valley Basin Plan and that all operations of the Proposed Project shall, whenever possible, contribute to meeting all standards in both plans.

9. A prohibition on diversion or re-diversion of Trinity River water (water diverted by the Bureau of Reclamation from the Trinity River watershed into the Sacramento River watershed pursuant to its water rights) into the Sites Reservoir.

B. <u>Conditions specific to Upper Sacramento River bypass flows</u>

10. A prohibition on diversions of water into Sites Reservoir between October 1 and March 15 unless flows are greater than 24,720 cfs at all Sacramento River points of diversion.

11. A prohibition on diversion of water into Sites Reservoir from March 1 to June 30 unless flows greater than 11,030 cfs at all Sacramento River points of diversion.

C. <u>Conditions specific to Lower Sacramento River bypass flows</u>

12. A prohibition on diversions of water into Sites Reservoir between September 1 and June 30 unless flows at Freeport are greater than 35,000 cfs.

13. A prohibition on the diversion of water into Sites Reservoir between April 1 and June 30 when the 7-day average of Sacramento River discharge to the Delta ("SAC" in Dayflow) is between 55,000 cfs and 80,000 cfs.

D. <u>Conditions specific to Delta outflow</u>

14. A prohibition on the diversion of water from into Sites Reservoir between December 1 and June 30 unless Delta outflow is greater than 65 percent of unimpaired flow.

15. A prohibition on the diversion of water into Sites Reservoir between January 1 and March 31 and from June 1 to June 30 unless Delta outflow is greater than 42,800 cfs, and between April 1 and May 31 unless Delta Outflow is greater than 44,500 cfs.

16. In any water year concluding (in September) and following (in October) an "Above Normal" or "Wet" water year in the Sacramento Valley, a prohibition on the diversion of water from into Sites Reservoir between September 1 and October 31 unless Delta outflow is greater than 7,400 cfs.

E. <u>Conditions regarding releases of stored water to the Sacramento River</u>

17. A prohibition on releasing water from Sites Reservoir to the Sacramento River if cell counts of harmful algal bloom-forming organisms are higher in Sites Reservoir than they are at the point of release into the Sacramento River.

a. Project proponents will work with the Board and CDFW to develop a harmful algal bloom monitoring program in Sites Reservoir and in the Sacramento River to ensure compliance with this term;

b. All monitoring performed under this program shall be approved by the Board and CDFW;

c. Applicant and/or Contractors of Sites Reservoir, except the Bureau of Reclamation or DWR, will fund this program *in perpetuity* from onset of operations; and,

d. The monitoring program shall include at least 1 -year of pre-project baseline monitoring in the Sacramento River.

F. **<u>Specific Conditions to Protect Wetlands and Terrestrial Species</u>**

18. Project proponents must provide accurate species distribution, focused bird surveys, and aquatic wetland delineations, and work with the Board and CDFW staff to complete such essential work before construction begins.

19. Project proponents must develop detailed plans showing how all temporary and permanent impacts of the project on Golden Eagles, Giant Garter Snakes, vernal pools, and other species and habitats will be fully mitigated under the law, including appropriate assurances and performance standards before beginning operation of the Proposed Project.

V. **<u>CONCLUSION</u>**

For the foregoing reasons, as well as those provided during testimony and argument at the hearing on the Application, the Application should be denied. If the Application is not denied, the rights granted by the Board should be conditioned as described herein.

INDEX OF EXHIBITS

Exhibit A – NGO Comments on RDEIR/SDEIS, dated January 28, 2022.

Exhibit B –California Department of Fish and Wildlife Comments on RDEIR/SDEIS, dated January 28, 2022.

Exhibit C –State Water Resources Control Board Comments on RDEIR/SDEIS, dated January 28, 2022.

Exhibit D – NGO Comments on Voluntary Agreement Scientific Basis Report, for Phase 2, dated February 8, 2023.

Exhibit E – U.S. Fish and Wildlife Service, Species Status Assessment for the San Francisco Bay-Delta Distinct Population Segment of the Longfin Smelt, 2022, Chapter 3.

Exhibit F –Environmental Protection Agency Comments on RDEIR/SDEIS, dated January 28, 2022.

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EXHIBIT A

January 28, 2022

Sites Project Authority
P.O. Box 517
Maxwell, CA 95955

U.S. Bureau of Reclamation
2800 Cottage Way, W-2830
Sacramento, CA 95825

Sent via email to: EIR-EIS-Comments@SitesProject.org

RE: Comments on Sites Reservoir Revised Draft Environmental Impact Report/ Supplemental Draft Environmental Impact Statement (RDEIR/SDEIS)

Dear Sites Project Authority and Bureau of Reclamation:

On behalf of the Natural Resources Defense Council, Defenders of Wildlife, San Francisco Baykeeper, The Bay Institute, Planning and Conservation League, Restore the Delta, Northern California Council of Fly Fishers International, California Sportfishing Protection Alliance, Friends of the River, Golden West Women Flyfishers, Institute for Fisheries Resources, Pacific Coast Federation of Fishermen's Associations, Sierra Club California, Save California Salmon, and Golden State Salmon Association, we are writing to submit comments on the November 2021 Sites Reservoir Revised Draft Environmental Impact Report/Supplemental Draft Environmental Impact Statement ("RDEIR/SDEIS"). Unfortunately, our review of the RDEIR/SDEIS demonstrates that the document fails to comply with the requirements of the California Environmental Quality Act ("CEQA") and National Environmental Policy Act ("NEPA"). In particular, the RDEIR/SDEIS fails to consider a reasonable range of alternatives, fails to use a stable and accurate project description, uses an inaccurate environmental baseline, and fails to adequately account for and assess impacts of the project in light of climate change. Equally important, the RDEIR/SDEIS also fails to adequately analyze impacts to aquatic species like Chinook salmon, Delta Smelt, and Longfin Smelt, and to terrestrial wildlife including giant garter snake and migratory birds, fails to disclose significant environmental impacts of the project to these and other species, inappropriately defers the formulation of mitigation measures, and proposes inadequate mitigation measures. Despite the fact that state agencies and other commenters raised many of these issues in comments on the August 2017 Draft Environmental Impact Report/Environmental Impact Statement ("DEIR/DEIS"), the RDEIR/SDEIS fails to correct these errors. Because the RDEIR/SDEIS is riddled with significant errors, inadequacies, and omissions, the lead agencies must make substantial revisions to the document and recirculate the revised document for public review and comment.

I. <u>The RDEIR/SDEIS Fails to Consider a Reasonable Range of Alternatives</u>

CEQA and NEPA require that the RDEIR/SDEIS consider a reasonable range of alternatives. Cal. Pub. Res. Code §§ 21002, 21061, 21100; tit. 14, Cal. Code Regs. ("CEQA Guidelines") § 15126.6; 42 U.S.C. § 4332; 40 C.F.R. §§ 1502.1, 1502.14, 1508.25(b). However, the RDEIR/SDEIS fails to consider a reasonable range of alternatives because it only considers a single operational alternative, whereas other operational alternatives could reduce or avoid adverse environmental impacts. The failure to include any operational alternatives that could reduce or avoid adverse environmental impacts violates NEPA and CEQA. *See, e.g., Citizens of Goleta Valley v. Board of Supervisors*, 52 Cal.3d 553, 566 (1990) (EIR must consider a reasonable range of alternatives that offer substantial environmental benefits and may feasibly be accomplished); *Muckleshoot Indian Tribe v. U.S. Forest Serv*., 177 F.3d 800, 813 (9th Cir. 1999) (NEPA analysis failed to consider reasonable range of alternatives where it "considered only a no action alternative along with two virtually identical alternatives"); *Natural Res. Def. Council v. U.S. Forest Serv*., 421 F.3d 797, 813 (9th Cir. 2005).

State agencies and members of the public, including many signatories to this letter, have repeatedly emphasized the need to analyze more than one operational alternative, first in scoping comments prior to release of the DEIR/DEIS, and subsequently in comments that the DEIR/DEIS failed to consider a reasonable range of alternatives because it only included a single operational alternative. For instance, the California Department of Fish and Wildlife ("CDFW") previously wrote that,

> . . . the DEIR/DEIS does not include potentially feasible alternatives that would avoid or substantially lessen the Project's significant environmental impacts. CDFW continues to recommend that the DEIR/DEIS should include a more robust range of operational alternatives, as discussed in its comments to the NOP, provided on March 21, 2017. Of the five alternatives in the DEIR/DEIS, many of them are similar with respect to water operations (e.g. diversions, bypass criteria, deliveries are the same across alternatives.) CDFW recommends that alternatives

> should be split into two or more alternatives that encompass the entire range of possible water operations scenarios, including an alternative that minimizes operational impacts through more restrictive bypass flows and diversion criteria.

Letter from CDFW to the Sites Project Authority dated January 12, 2018 ("CDFW Comment Letter").

Despite the prior comments on the need to analyze multiple operational alternatives, the RDEIR/SDEIS analyzes only a single set of operational criteria that is common to all the alternatives. *See, e.g.*, RDEIR/SDEIS at ES-10, 2-6, 2-8, 2-28 to 2-33. Yet as discussed in more detail below, the proposed bypass flows and other operational criteria result in significant environmental impacts that are not disclosed in the RDEIR/SDEIS.

State agencies and public commentors previously highlighted the need to analyze more than one operational alternative because the DEIR/DEIS failed to disclose significant environmental impacts, which could be mitigated through alternative operational criteria such as increased bypass flows. *See, e.g.*, CDFW Comment Letter at 2 (noting that the DEIR/DEIS failed to adequately analyze and disclose environmental impacts and stating that "CDFW does not consider proposed bypass flows identified in the DEIR/DEIS to sufficiently minimize or offset these impacts."). The RDEIR/SDEIS now admits that the operational criteria that were included in the DEIR/DEIS, and that are modeled in the RDEIR/SDEIS, would result in significant environmental impacts requiring mitigation. *See* RDEIR/SDEIS at ES-26, 11-131. As discussed *infra*, even with the proposed mitigation measure (Wilkins Slough Flow Protection Criteria), all of the alternatives result in significant environmental impacts to several fish species. The RDEIR/SDEIS does not include the full range of bypass flows and other operational criteria proposed by CDFW or other commentators to mitigate these significant impacts as alternatives in the RDEIR/SDEIS.

Similarly, as discussed *infra*, the State Water Resources Control Board ("SWRCB") began the regulatory process to update the Bay-Delta Water Quality Control Plan in 2008, issued a Framework in 2018 for completing the update of the Water Quality Control Plan,[1] and has announced that it anticipates adopting new water quality standards for the Sacramento River and Delta as part of the updated Water Quality Control Plan in 2023.[2] The RDEIR/SDEIS fails to provide a reasoned explanation why it does not consider alternative operational criteria that

[1] *See* State Water Resources Control Board, July 2018 Framework for the Sacramento/Delta Update to the Bay-Delta Plan, available online at: https://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/docs/sed/sac_delta_framework_070618%20.pdf. This document is incorporated by reference.

[2] *See* State Water Resources Control Board, Upcoming Actions to Update and Implement the Bay-Delta Plan, December 8, 2021, available online at: https://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/docs/20211207-slides-for-12-08-bay-delta-plan-inform-item_accessible.pdf. This document is incorporated by reference.

would be consistent with the 2018 Framework for completing the update of the Bay-Delta Water Quality Control Plan, particularly since the final CEQA/NEPA document is intended to be used by the SWRCB in consideration of water rights permits.

The RDEIR/SDEIS violates CEQA and NEPA because it fails to consider more than one operational alternative that could reduce or avoid significant environmental impacts of the proposed project and alternatives.

II. The RDEIR/SDEIS Fails to Use an Accurate and Stable Project Description

(A) The RDEIR/SDEIS Fails to Use an Accurate and Stable Project Description Because the Project that the RDEIS/SDEIR Analyzes is Inconsistent with the Project Description

The RDEIR/SDEIS violates CEQA because the document fails to use an accurate and stable project description. In particular, the modeling of operations in the RDEIR/SDEIS, which is the basis for the analysis of potential environmental impacts throughout the document, does not include the proposed mitigation measure FISH-2 (Wilkins Slough Flow Protection Criteria). As a result, the quantitative analysis and modeling in the RDEIR/SDEIS does not analyze the project that is proposed in the RDEIR/SDEIS.

It is black letter law that "[a]n accurate, stable and finite project description is the sine qua non of an informative and legally sufficient EIR." *County of Inyo v. City of Los Angeles*, 71 Cal. App. 3d 185, 193 (1977). CEQA requires a clear explanation of the nature and scope of the proposed project, otherwise it “is fundamentally inadequate and misleading.” *See Communities for a Better Environment v. City of Richmond*, 184 Cal.App.4th 70, 84-85 (2010).

In this case, the RDEIR/SDEIS includes inconsistent bypass flow criteria that limit diversions from the Sacramento River in the operational criteria common to all the alternatives. *Compare* RDEIR/SDEIS at 2-31 to 2-33 (identifying bypass flow criteria of 8,000 cfs at Wilkins Slough in April and May, and 5,000 cfs in other months) with *id*. at 11-131 (describing the proposed Wilkins Slough Fish Protection Criteria mitigation measure, which requires a 10,700 cfs bypass flow at Wilkins Slough during the months of March through May). Buried deep in the appendices, the RDEIR/SDEIS indicates that the proposed mitigation measure FISH-2 (Wilkins Slough Flow Protection Criteria) is not included in the modeling of the proposed project and alternatives. *See, e.g.*, RDEIR/SDEIS Appendices at 5A1-29, 5A2-28 to 5A2-33.

As a result, all of the modeling of proposed operations in the RDEIR/SDEIS common to all of the alternatives – including modeling and analysis of environmental impacts on surface water supplies, on fish and wildlife, and on water quality – does not actually model or analyze the effects of the proposed project or alternatives, and instead the analyses and modeling in the RDEIR/SDEIS are inconsistent with the actual proposed project (which includes this proposed mitigation measure). The document fails to analyze the likely environmental impacts of the proposed project and alternatives because, in light of the document's failure to articulate a stable project description, it fails to analyze the proposed project at all.

The inconsistent descriptions of the proposed project are grossly misleading to the public and decisionmakers in violation of CEQA. *See, e.g.*, *San Joaquin Raptor Rescue Center v. County of Merced*, 149 Cal.App.4th 645, 655-56 (2007) (holding that the project description was inconsistent as to whether the project would increase mining production and violated CEQA, in part based on statements in public hearings on the CEQA document that demonstrated such inconsistencies); *Communities for a Better Environment*, 184 Cal.App.4th at 83-84 (holding project description violated CEQA because of inconsistent statements regarding the objectives of the project).

The RDEIR/SDEIS uses different modeling assumptions for project operations and alternatives in other chapters, which also do not reflect the proposed project or alternatives. For instance, in the analysis of the effects of diversions on salmon survival in the Sacramento River (Appendix 11P), the RDEIR/SDEIS states that it uses different modeling assumptions that are not reflected in the proposed project, including a requirement that Delta outflow is greater than 44,500 cfs in the months of April to May and that there are 7 days of surplus conditions in the Delta in order for the project to divert water. RDEIR/SDEIS at 11P-2 to 11P-3. These operational criteria are not currently part of the proposed project, *see id*. at 2-31, nor are they part of the CalSim modeling used in body of the RDEIR/SDEIS, *see id*. at 5A2-23. As a result, the modeling in Appendix 11P and the analysis of the effects of reduced flows on salmon survival in the Sacramento River fails to analyze the proposed project and alternatives.

In addition, the RDEIR/SDEIS assumes that there will be water exchanges with Shasta and Oroville reservoirs in certain years, which affects operations of those reservoirs and temperature-dependent mortality of salmon. RDEIR/SDEIS at ES-12, 2-35 to 2-37, 5A-2-30 to 5A-2-33.[3] However, there are no proposed agreements for such exchanges between the CVP or SWP and Sites, and this element of the project is speculative. *See id*. at ES-10 ("exchanges of water *may* occur with the CVP and SWP") (emphasis added); *id.* at 2-35 (acknowledging that the Sites Reservoir Authority is in discussions with the U.S. Bureau of Reclamation ("Reclamation") and the California Department of Water Resources ("DWR") regarding potential exchanges). Equally important, the RDEIR/SDEIS does not analyze the potential adverse effects that would result from such exchanges, including potential changes in river flows, redd dewatering, or reductions in juvenile salmon survival, and completely ignores the effects of exchanges with Folsom Reservoir. *See* RDEIR/SDEIS at 5-27; *id*. at 11-103 (admitting that the RDEIR/SDEIS needs to "better reflect the exchanges in the model," that these exchanges are difficult to model,

[3] Because these exchanges would be intended to "assist the CVP and SWP in meeting their regulatory obligations," RDEIR/SDEIS at 2-35, these exchanges do not provide public benefits that justify public taxpayer expenditures for this project. These exchanges are effectively water supply benefits to the contractors of the CVP and SWP who are obligated to pay for meeting regulatory requirements of the CVP and SWP.

and that the RDEIR/SDEIS underestimates the extent of potential exchanges that could occur under the proposed project).[4]

Because the RDEIR/SDEIS fails to provide an accurate and stable project description, the document fails to model and analyze the environmental impacts of the proposed project and alternatives, in violation of CEQA and NEPA.

(B) <u>The RDEIR/SDEIS Fails to Use an Accurate and Stable Project Description Because the Overall Project Design is Not Final and Major Project Components Have Not Been Designed at All</u>

The RDEIR/SDEIS also fails to provide an accurate and stable project description because the overall project design is not yet final and major project components that will have significant environmental impacts have not been designed at all. The RDEIR/SDEIS states that, "[a]s with any large infrastructure project, the Project must and will continue toward final design. Project components will be refined as the Project moves toward final design and as parcels become accessible to survey." RDEIR/SDEIS at 3-7; *see also id.* at 9-20 (explaining that estimates of acreage of impacts to plant habitats and wetlands is based on "preliminary engineering design"). While the RDEIR/SDEIS acknowledges that the overall project design is not yet final, it does not clearly describe what project components could change and how. It is impossible for the public to understand the environmental impacts of the project and to meaningfully comment when it is not yet clear what the project is.

In addition to vague statements about the lack of finality of the project's design, the RDEIR/SDEIS highlights particular project components that have not been designed at all. For example, it appears that the locations for major sections of the project's 46 miles of new paved and unpaved roads have not yet been determined. *See, e.g.*, RDEIR/SDEIS at 9-15 ("The exact locations of the realigned Huffmaster Road, new Comm Road South, and new South Road are not yet finalized."); 9-44 ("exact locations of construction-related activities are not known for the new roads"). As the RDEIR/SDEIS acknowledges, these roadways could cause significant impacts to waterways, wetlands, and wildlife:

> New roadways would create physical barriers or impediments for some wildlife, including amphibians and reptiles, which may have a difficult time crossing the roadways. There are numerous waterways and wetlands in the study area, and new or larger roadways could disrupt existing connections between aquatic and upland habitats, and result in increased habitat fragmentation, which could affect

[4] The RDEIR/SDEIS also admits that Sites Reservoir cannot release water to GCID and other participants located between the Hamilton City Pump Station and Knights Landing, and that deliveries of water to those participants would be made by GCID and Reclamation. RDEIR/SDEIS at 2-34. The RDEIR/SDEIS does not appear to analyze the effects of additional Shasta Dam releases by Reclamation to fulfill such exchanges, which could be particularly impactful to the environment in drier years.

> seasonal movements of amphibians and reptiles. Roadways may deter some larger animals from moving through those areas, even if they are able to physically cross the roadways. In addition, some of the roadways may be fenced, which would create a greater impediment to large animals attempting to cross the road. New roadways would also increase the potential for wildlife to be struck by vehicles of workers traveling to operations facilities or visitors traveling to recreation areas, and the presence of fences could trap animals in the roadway and make them more prone to being struck by vehicles.

RDEIR/SDEIS at 10-139. Yet there is no meaningful discussion of the impacts of specific roads to specific resources and no exploration of alternative routes that could minimize impacts because specific road locations have not been proposed.

The RDEIR/SDEIS suggests that the lack of information about roadway locations is not a problem because the lead agencies have estimated the maximum extent of impacts by assuming that resources within the broader "road alignment corridor" will be impacted and because "roads . . . will be designed, to the extent practicable, to avoid direct and indirect impacts . . . ." RDEIR/SDEIS at 9-45 to 9-46. This approach undermines core purposes of CEQA and NEPA. First, it fails to provide the public with an accurate assessment of the project's impacts, and instead provides only an unrealistic overestimate of impacts that is not reflective of the actual project. Second, it deprives the public of an opportunity to comment on alternative alignments or approaches that could reduce the roadways' environmental impacts, deferring the process of selecting roadway locations to an unspecified future date when there will be no opportunity for public input and review pursuant to the procedures set forth in NEPA and CEQA.

Basic details about other key project components that could significantly impact the environment are also unknown. Large recreation areas are not yet designed, depriving the public of an opportunity to understand a realistic picture of their impacts and comment on alternative designs that could reduce those impacts. RDEIR/SDEIS at 9-24 ("The permanent footprint of these recreation areas is currently at a conceptual design stage, and the actual location of facilities is not yet known."). For electrical transmission lines, the RDEIR/SDEIS indicates that "[o]nly one of the two north-south transmission line alignments described in Chapter 2 would be constructed, and specific locations for the transmission line towers are currently unknown." RDEIR/SDEIS at 9-14. Transmission line can have serious impacts to birds and the towers can destroy vernal pool wetlands and other important landscape features. Yet the RDEIR/SDEIS does not provide the public with an opportunity to understand the project's impacts or suggest alternatives because it lacks basic information like the locations of transmission line towers. Similarly, the RDEIR/SDEIS discusses the need for upgrades to the GCID canal but indicates that the details will be worked out in the future. RDEIR/SDEIS at 2-9 ("The GCID system may require several upgrades to support the operation of Sites Reservoir. The specific details of these upgrades would be confirmed during future hydraulic modeling and assessment of system conditions."). There are likely threatened giant garter snakes in the GCID system, and the location, timing, and method of construction matters greatly for avoiding and minimizing impacts to this sensitive species. Once again, the RDEIR/SDEIS fails to provide the public with a meaningful opportunity to understand those impacts and suggest alternative approaches because the document omits the most basic planning details.

The RDEIR/SDEIS makes clear that the project's design is not yet complete, and that major, impactful decisions related to roads, recreation areas, transmission lines, canal modifications, and other project components will occur in the future. Shielding these decisions from public review deprives the public of a meaningful opportunity to understand the project's impacts and comment in violation of CEQA and NEPA. Accordingly, a revised draft EIS/EIR must once again be recirculated for public comment when project design is complete.

III. **The RDEIR/SDEIS Fails to Accurately Analyze the Environmental Impacts of the Project in Light of the Effects of Climate Change that have Already Occurred and the Effects of Climate Change Over the Life of the Project**

CEQA and NEPA require that the analysis of potential environmental impacts address the full duration of the project, not just the environmental impacts at the very beginning of the project. The CEQA Guidelines explicitly require the consideration of "both the short-term and long-term effects." 14 Cal. Code Regs. § 15126.2(a). In *Neighbors for Smart Rail*, the California Supreme Court reiterated that an EIR must evaluate both the near-term and long-term environmental impacts of a proposed project. 57 Cal. 4th at 455. The RDEIR/SDEIS violates CEQA and NEPA because it fails to accurately assess the environmental impacts of the proposed project in the short term in light of the already observed effects of climate change, and because it wholly fails to consider the environmental impacts in the long term in light of the increasing effects of climate change.

First, the RDEIR/SDEIS fails to accurately assess the short-term effects of the project because the analysis of environmental impacts uses observed hydrology from 1922 to 2003 without considering the effects of climate change. *See, e.g.*, RDEIR/SDEIS at 3-5, 5A1-2. However, that historic hydrologic data do not account for the effects of climate change that have significantly altered hydrology from the historic baseline as observed over the past several decades. Inexplicably, the RDEIR/SDEIS fails to use hydrologic modeling data that have already been developed by DWR and Reclamation for CalSim II (and for CalSim III) which incorporate the near-term effects of climate change on hydrology and water temperatures.[5] As a result, the analysis of environmental impacts in the RDEIR/SDEIS uses outdated information that significantly underestimates the environmental impacts of the proposed project in combination with the effects of climate change.

For example, because the Sites Reservoir RDEIR/SDEIS excludes the observed effects of climate change in recent years, the environmental analysis estimates that temperature-dependent

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[5] This modeling data is used in the Climate Change appendix, but it is not used in the body of the RDEIR/SDEIS, making the analysis of environmental impacts in the RDEIR/SDEIS plainly inaccurate.

mortality of winter-run Chinook salmon in the Sacramento River under the No Action Alternative is 24.4 percent in critically dry years. RDEIR/SDEIS at 11O-6. In contrast, the Trump Administration's final 2020 EIR on the long-term operations of the Central Valley Project and State Water Project concludes that temperature-dependent mortality of winter-run Chinook salmon in the Sacramento River under the biological opinions (the No Action Alternative in the Sites Reservoir RDEIR/SDEIS) is 61 percent.[6]

Similarly, Chapter 28 of the RDEIR/SDEIS shows that the effects of climate change with the proposed project and alternatives would cause greater reductions in Sacramento River flow at Wilkins Slough in critically dry years than when climate change is excluded. RDEIR/SDEIS at 28-16 (reductions in December flow at Wilkins Slough from the alternatives increase from 5-6 percent without climate change to 6-7 percent with climate change). And when the effects of climate change are included, the proposed project and alternatives result in much larger reductions in December Delta outflow. *See id*. at 28-24 to 28-25 (reductions in December Delta outflow in critically dry years are 4-5 percent excluding climate change and 7-8 percent when climate change is considered). Yet the impacts of the proposed project's reduction in flow on fish and other resources in the lower river and the Bay-Delta, in light of the effects of climate change, are not analyzed—the cursory discussion about aquatic biological resources in section 28.5.5 focuses on benefits in spawning areas from "temperature exchanges" (which are entirely speculative and solely a mitigation measure); describes a benefit to fish from increased Delta outflow in October (while ignoring flow reductions in other months); and suggests that reduced groundwater pumping due to the additional surface storage would benefit fish by protecting riparian trees (without acknowledging that the project changes the hydrograph in ways that may harm native riparian trees). None of these supposed benefits are adequately documented, analyzed, or likely to materialize and no mitigations are offered for the likely negative effects (e.g., of reduced flows and harm to native riparian trees) that the RDEIR/SDEIS glosses over. *See id*. at 28-31.

The exclusion of the effects of climate change from the RDEIR/SDEIS also results in inaccurate modeling of the temperature of water released from the proposed project, given the current effects of climate change, as well as the effects anticipated in the coming decades. *See id*. at 28-4 (estimating that air temperatures in California could increase by 5.8°F by 2050 and up to 8.8°F by 2100, and that air temperatures in the Sacramento Valley in the months of July through September are likely to increase by 2.7°F to 10.8°F, as a result of climate change); *id*. at 28-27 (admitting that climate change is likely to increase occurrence of harmful algal blooms in the proposed reservoir).

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[6] *See* Final EIS, Appendix F, Attachment 3-8, Table 1-1, available online at: https://www.usbr.gov/mp/nepa/includes/documentShow.php?Doc_ID=41744. As the table notes, "[a]ll scenarios are simulated at ELT (Early Long-Term) Q5 with 2025 climate change and 15 cm sea level rise." *Id*. This document is incorporated by reference.

Second, the RDEIR/SDEIS entirely fails to evaluate the long-term environmental impacts of the proposed project because it only analyzes environmental impacts based on anticipated conditions in the year 2020, 2021 or 2030, depending upon which part of the document is reviewed. *Compare* RDEIR/SDEIS at ES-7 (describing conditions in 2030) and *id*. at 3-5 ("Operations is assumed to begin in 2030 and would continue for the life of the Project.") *with id*. at 5A-2-2 ("Planning Horizon" defined as the year 2021) *with id*. at 3-2 ("the existing conditions baseline under CEQA has been updated to capture conditions through 2020."). Despite the clear mandate of CEQA to evaluate long-term impacts of the project, the RDEIR/SDEIS does not do so.

Excluding the effects of climate change in assessing environmental impacts[7] is particularly egregious and unlawful because: (1) analysis of the impacts of climate change was required in the quantification of public benefits of water storage projects under Proposition 1, as well as to comply with Executive Order B-30-15 (2015) and Assembly Bill 1482 (2015), which require state agencies to account for climate change in project planning and investment decisions; and (2) the longer-term effects of climate change are likely to have more severe impacts in terms of hydrological modification and increased air and water temperatures. Moreover, the RDEIR/SDEIS erroneously describes the 1922-2003 CalSim modeling as "current climate conditions," *see* RDEIR/SDEIS at 5A-2, but state and federal agencies have repeatedly concluded that the 1922-2003 historical hydrologic information does not adequately represent current climate conditions given the change in the climate that has been observed in recent decades.

Because the RDEIR/SDEIS fails to consider the effects of climate change in the near term in determining the potential environmental impacts of the proposed project and alternatives, and because the RDEIR/SDEIS wholly fails to consider the long-term environmental impacts in a future with climate change, the document violates NEPA and CEQA.

IV. <u>The RDEIR/SDEIS Fails to Use an Accurate Environmental Baseline and Fails to Accurately Describe the Environmental Setting</u>

(A) <u>The RDEIR/SDEIS Fails to Use an Accurate Environmental Baseline</u>

The RDEIR/SDEIS also violates CEQA and NEPA because it fails to use an accurate environmental baseline. The environmental baseline is typically the conditions that exist when the Notice of Preparation is issued. Cal. Code Regs., tit. 14, § 15125(a). Here, however, the RDEIR/SDEIS improperly uses the following baseline that differ from conditions that existed when the Notice of Preparation was issued, including: (1) it uses the Trump Administration's

[7] While the RDEIR/SDEIS includes a separate chapter that includes some modeling of the proposed project and alternatives with climate change, the document excludes the effects of climate change in determining what constitutes an environmental impact under NEPA and CEQA, and thus fails to consider the near-term and long-term effects of the project under a lawful baseline.

2019 Biological Opinions for operations of the Central Valley Project and State Water Project as part of the baseline; (2) it omits the SWRCB's 2018 Update of the Bay-Delta Water Quality Control Plan; and (3) it ignores the pending revision of water quality standards for the Sacramento River and flows into, through and from the Delta to San Francisco Bay as the final part of the SWRCB's forthcoming update of the Bay-Delta Water Quality Control Plan. Instead the RDEIR/SDEIS assumes that other regulatory requirements would be identical in the future even as species spiral towards extinction because of unsustainable water diversions.

First, the RDEIR/SDEIS proposes to use the 2019 biological opinions for operations of the CVP and SWP as part of the environmental baseline, claiming that because these biological opinions were issued after the Notice of Preparation, they are anticipated to be implemented "into the future," and thus "an updated baseline is necessary to provide the most accurate picture of the Project's impacts." RDEIR/SDEIS at 3-2 to 3-3. However, even before the RDEIR/SDEIS was released to the public on November 12, 2021, the federal government formally reinitiated consultation on the long-term operations of the CVP and SWP on October 1, 2021, beginning the process to develop new biological opinions. In addition, the Biden Administration has agreed to not defend these biological opinions in court, and the state and federal administrations have proposed interim operations that would modify and not fully implement the biological opinions in 2022. As a result, at the time the RDEIR/SDEIS was released to the public, the federal government had agreed that the 2019 Biological Opinions were "not an accurate picture" of how the CVP and SWP would be operated in the near term, let alone "into the future," and it is arbitrary and capricious to conclude otherwise. Including these blatantly unlawful biological opinions in the environmental baseline of the RDEIR/SDEIS violates CEQA and NEPA because this environmental baseline is not an accurate reflection of environmental conditions that would be affected by the proposed project and alternatives, and the document must be revised to analyze operations with a lawful environmental baseline that accurately reflects how the CVP and SWP could lawfully be operated.

Second, the environmental baseline used in the RDEIR/SDEIS violates CEQA and NEPA because it does not include existing water quality standards adopted by the SWRCB in 2018. While the RDEIR/SDEIS's environmental baseline selectively updated some regulatory requirements to include the 2019 biological opinions, the document excludes the regulatory requirements adopted by the SWRCB in 2018 regarding water quality standards for Delta salinity and freshwater inflow from the Stanislaus, Tuolumne, Merced, and lower San Joaquin Rivers. *See* RDEIR/SDEIS at 5A2-20 to 5A2-22. The RDEIR/SDEIS fails to provide any reasoned explanation for excluding these regulatory requirements from the environmental baseline.

Finally, the environmental baseline is also unlawful because it assumes that regulatory obligations that affect diversions from the Bay-Delta will not change in the future, even as fish species continue to spiral towards extinction and regulatory processes to update standards are underway. The RDEIR/SDEIS asserts that "[t]he reasonably foreseeable future conditions under the No Project Alternative would not be materially different from the conditions under the

CEQA existing conditions baseline" because existing regulatory requirements, including the 2019 Biological Opinions, "would reasonably be anticipated to continue to be implemented into the future." RDEIR/SDEIS at 3-2 to 3-3. The SWRCB began its process of updating the Bay-Delta Water Quality Control Plan in 2008, adopted new regulatory requirements for Phase 1 of the updated Water Quality Control Plan in 2018, issued a framework in 2018 for completing the update of the Water Quality Control Plan,[8] and has announced that it anticipates adopting new water quality standards for the Sacramento River and the Bay-Delta estuary as part of the updated Water Quality Control Plan in 2023.[9] There is no justification for entirely excluding consideration of the forthcoming updates to the Bay-Delta Water Quality Control Plan in the RDEIR/SDEIS, particularly since the document will purportedly be used by the SWRCB.

(B) The RDEIR/SDEIS Fails to Accurately Describe the Environmental Setting

In addition to the above-described inaccuracies in the environmental baseline, the RDEIR/SDEIS fails to provide basic information regarding the environmental setting, which makes it impossible for the public to understand and meaningfully comment on the project's impacts. This is particularly true for the RDEIR/SDEIS's discussion of vegetation, wetland, and wildlife resources. For these resources, the RDEIR/SDEIS relied on outdated, unreliable, and inaccurate habitat and species distribution information even though it was feasible to provide more accurate information, in violation of CEQA. *See Save Agoura Cornell Knoll v. City of Agoura Hills*, 46 Cal.App.5th 665, 692-94 (2020).

No new on-the-ground surveys regarding vegetation, wetland, or wildlife resources were conducted for preparation of the RDEIR/SDEIS. Rather, the RDEIR/SDEIS relies primarily on desktop modeling of land-cover types based on areal imagery to describe the location of plant communities and wetlands. RDEIR/SDEIS at 9-8. For wildlife resources,

> [a]vailable literature was reviewed to identify known habitat associations and habitat requirements for each species. Habitat requirements were then compared with the existing land cover types mapped in the study area, and a series of assumptions were made regarding which land cover types could provide potentially suitable habitat for each species based on its habitat requirements.

RDEIR/SDEIS at 10-8. The RDEIR/SDEIS emphasizes multiple times that "[a]ll land cover type acreages are preliminary and subject to revision based on pedestrian surveys once access has been granted to the study area." RDEIR/SDEIS at 10-8; *see also* DEIS.DEIR at 9-8 (same), 9-9 ("The acreages of wetlands and non-wetland waters presented are preliminary, as the aquatic resources delineation has not been completed with onsite surveys or jurisdictional review by the

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[8] *See supra* note 1.
[9] *See* State Water Resources Control Board, Upcoming Actions to Update and Implement the Bay-Delta Plan, December 8, 2021, available online at: https://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/docs/20211207-slides-for-12-08-bay-delta-plan-inform-item_accessible.pdf. This document is incorporated by reference.

USACE and State Water Board."); 9-18 ("All land cover type acreages are preliminary and subject to revision based on pedestrian surveys once access has been granted to the study area, particularly for the wetland and non-wetland water types, which are subject to change pending field review and verification by the USACE and State Water Board.").

Not only are the land cover type estimates that form the basis for the RDEIR/SDEIS's analysis of impacts to vegetation, wetlands, and wildlife "preliminary" and seemingly subject to radical revisions based on future field survey, the RDEIR/SDEIS admits they are unreliable. Appendix 10-B provides information about the models and methods used for defining wildlife habitats in the project area. It describes "habitat model limitations" for each species or species group analyzed and explains that "[t]he model is limited primarily by the accuracy of aerial imagery interpretation and the inability to ground truth the land cover mapping." RDEIR/SDEIS at 10B-3. For each species group, it then provides further details about the model's limitations. For example, for vernal pool branchiopods, it explains:

> Vernal pool habitat must be inundated sufficiently by rainfall at the appropriate time of year to allow vernal pool branchiopods to reach maturity and reproduce; if the availability of aerial imagery is limited or the resolution is poor, it may not be possible to accurately determine the sufficiency of ponding. Additionally, very small seasonal wetlands that could provide suitable habitat may not be visible on aerial imagery. Other parameters that affect the habitat suitability for vernal pool branchiopods that are not measurable using aerial imagery review include water quality, ponding depth, and water temperature (U.S. Fish and Wildlife Service 2005:xiii, xiv).

RDEIR/SDEIS at 10B-3. In combination, the descriptions of the modeling limitations make clear that the RDEIR/SDEIS's modeling of vegetation, wetlands, and wildlife is extremely coarse, inaccurate, unreliable, and not verified with any on-the-ground survey information. Yet this modeling is the basis for the RDEIR/SDEIS's description of the environmental setting and the basis for its analysis of impacts for these resource areas.

The coarse nature of the models used in the RDEIR/SDEIS obscures the existence, extent, and location of particularly sensitive habitats, denying the public the opportunity to understand and comment on the project's true impacts. For example, the RDEIR/SDEIS groups vernal pools and alkali wetlands along with several other wetland types under a category called "seasonal wetlands" in the description of the environmental setting and associated maps. Vernal pools and alkali wetlands are special types of seasonal wetlands that are a high priority for conservation because so few remain. But the RDEIR/SDEIS only provides location information for the broader category of "seasonal wetlands" and does not show the specific locations of vernal pools or alkali wetlands. Instead, it notes that "[a]dditional refinement of the mapping, including the resource boundaries and types (e.g., seasonal wetlands that are vernal pools or alkali wetlands) will be developed in coordination with agencies and with onsite surveys during the permitting process." RDEIR/SDEIS at 9B-10. Deferring mapping of habitat types that are of critical conservation concern until after the NEPA and CEQA process makes it impossible for the public to understand and meaningfully comment on the project's impacts.

The RDEIR/SDEIS indicates that, in addition to the modeling based on areal imagery, information on the extent and location of vegetation, wetland, and wildlife resources is also based on surveys conducted in 1998 and 2003. *See, e.g.,* RDEIR/SDEIS at 9-3. However, we are unable to discern how the old survey data are integrated into the description of the environmental setting or the impacts analysis, and it is not clear that they are integrated at all. *See, e.g.,* RDEIR/SDEIS at 10-7 (suggesting that the previous surveys were too old and therefore not used). To the extent the old survey data were used, reliance on them is problematic for all of the reasons discussed in our comments on the 2017 DEIR/DEIS, including because climate change is altering temperature and hydrologic patterns in the Sacramento Valley in a manner that impacts wildlife habitat suitability. *See also* CDFW Comments on 2017 DEIR/DEIS at 19 ("Botanical surveys were conducted in 1998 and 1999 within the reservoir footprint, and in 2000 through 2003 for potential conveyance routes, recreation areas, and road relocations. These surveys are out of date. CDFW recommends resurveying all areas associated within the Project area that would be impacted.").

The RDEIR/SDEIS's reliance on coarse and inaccurate habitat modeling (and potentially also on old survey data) is particularly problematic because more accurate approaches were available. For example, the lead agencies could have conducted on-the-ground surveys. The RDEIR/SDEIS explains that the lead agencies had to rely on coarse modeling based on areal imagery because "[p]roperty access restrictions to most of the Project area precluded field investigations of vegetation and wetland resources in the study area." RDEIR/SDEIS at 9-8. However, project proponents were able to gain access to survey 75 percent of the study area between 1998 and 2003, and the RDEIR/SDEIS indicates that they did so by seeking court orders to access properties. RDEIR/SDEIS at 9-8, 3-4. The lead agencies also "pursued targeted access in recent years to support environmental clearance for geotechnical investigations." RDEIR/SDEIS at 3-4 to 3-5. It seems that the lead agencies could have found a way to access the project area to conduct meaningful surveys for vegetation, wetlands, and wildlife—as they have in the past and did recently for geotechnical investigations—but chose not to prioritize access to the project area for these surveys. *See City of Agoura Hills*, 46 Cal.App.5th at 692-93 (use of outdated plant surveys violated CEQA, where document discussed future surveys but there was no showing that it was infeasible to perform these surveys prior to project approval so that the document could provide an accurate assessment of impacts).

The proponents also failed to consider other approaches that could have yielded more accurate information about the environmental setting, in order to accurately assess the environmental impacts of the proposed project and alternatives. For example, the RDEIR/SDEIS discusses conducting helicopter surveys to assess nest occupancy for golden eagles in the future. RDEIR/SDEIS at 10-97 to 10-98. The lead agencies could have, but did not, conduct helicopter surveys to inform the analysis in the RDEIR/SDEIS for golden eagles and perhaps other species as well. There are also detailed habitat suitability maps for some species that overlap with the project area and that do not appear to have been considered in the RDEIR/SDEIS. For example, Attachment A to the *2015 Programmatic Formal Consultation for Bureau of Reclamation's Proposed Central Valley Project Long Term Water Transfers (2015-2024) with Potential Effects on the Giant Garter Snake within Sacramento Valley, California* includes a habitat suitability map and maps of priority habitat areas for giant garter snakes. Inclusion of relevant information from these maps—and similar information for other species—in the description of the environmental setting would have helped to provide a more meaningful understanding of the project's likely impacts to giant garter snakes and other sensitive wildlife.

The coarse and inaccurate discussion of the presence and location of vegetation, wetlands, and wildlife in the project area render the discussion of the project's environmental setting unreliable. As discussed further below, this undermines the analysis of impacts for these resource areas in a manner that makes it impossible for the public to understand the nature and extent of the project's impacts and deprives the public of an opportunity to meaningfully comment on alternatives. For these reasons, the RDEIR/SDEIS violates CEQA and NEPA, and the lead agencies must recirculate a revised draft EIS/EIR for public comment after conducting accurate surveys of vegetation, wetlands, and wildlife in the project area.

V. The CALSIM Modeling Used in the RDEIR/SDEIS to Analyze Potential Environmental Impacts Appears to be Significantly Flawed, Making all of the Analyses Questionable

It appears that the CALSIM modeling that is used in the RDEIR/SDEIS is significantly corrupted and flawed, raising serious questions about the accuracy of the analyses in the RDEIR/SDEIS. For instance, the modeling shows that, as compared to the No Action Alternative, Alternative 1A results in diversions of Sacramento River flows greater than 1,000 cfs on average in January (in Wet and Above Normal water years), February (in Wet, Above Normal, and Below Normal water years), and March (in Wet, Above Normal, Below Normal, and Dry water years). RDEIR/SDEIS at Table 5B1-3-1c. Similarly, the modeling shows that these diversions for Sites Reservoir under Alternative 1A would reduce flows in the Sacramento River at Hamilton City by more than 1,000 cfs in January (in Wet and Above Normal water years), February (in Wet, Above Normal, and Below Normal water years) and March (in Wet, Above Normal, Below Normal, and Dry water years). RDEIR/SDEIS at Table 5B2-13-1c. Yet inexplicably, the modeling in the RDEIR/SDEIS shows that diversions to Sites under Alternative 1A would cause substantially less reduction in flows in the Sacramento River at Wilkins Slough, with reductions in flow greater than 1,000 cfs only in March (Above Normal and Below Normal water years). *Id*. at Table 5B2-14-1c. Similarly, there is much less of a reduction in flow in the Sacramento River at Freeport under Alternative 1A. *Id*. at Table 5B3-1-1c (showing flow reduction is greater than 1,000 cfs only in March (in Above Normal, Below Normal, and Dry water years). But Alternative 1A results in reductions in Delta outflow that are greater than 1,000 cfs in January (in Wet and Above Normal water years), February (in Wet, Above Normal, and Below Normal water years), and March (in Wet, Above Normal, Below Normal, and Dry water years). *Id*. at Table 5B3-5-1c.

	January (Wet year)	February (Wet year)	March (Wet year)
Total Sites Diversions	1,287	1,426	1,114

Hamilton City	-1,264	-1,418	-1,128
Wilkins Slough	-310	-254	-483
Freeport	-492	-454	-582
Delta outflow	-1,298	-1,332	-1,131

Sources: Table 5B1-3-1c (Total Sites Diversions), Table 5B2-13-1c (Hamilton City), Table 5B2-14-1c (Wilkins Slough), Table 5B3-1-1c (Freeport), and Table 5B3-5-1c (Delta outflow)

The modeling indicates that Alternative 1 reduces flows in the Sacramento River at Hamilton City and Delta outflow by similar amounts, but causes far lesser reductions in flow between these points. The modeling also shows that flows through the Yolo Bypass are reduced as a result of the proposed project and do not account for the change in flow between Freeport and Delta outflow. RDEIR/SDEIS at Table 5B3-3-1c. These results do not appear to be credible, and the RDEIR/SDEIS does not provide any explanation why the reduction in flow upstream caused by diversions under the proposed project and alternatives would not result in similar reductions in flow at other locations downstream.[10]

In addition, the RDEIR/SDEIS provides entirely inconsistent results of the effects of diversions to Sites under Alternative 1A on flows in the Sacramento River at Wilkins Slough. *Compare RDEIR/SDEIS at Table 5B2-14-1c with id*. at Table 5C-9-1c. These two tables should show identical results because they are comparing the same alternatives, but they do not.

Table 5C-9-1c. Sacramento River Flow at Wilkins Slough, Alternative 1A 011221 minus No Action Alternative 011221, Monthly Flow (cfs)

Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance												
10%	0	-50	-273	-299	-236	-379	-1,461	-113	-252	79	98	-112
20%	-12	-350	-268	-1,180	-355	-290	-1,032	-36	116	359	39	84
30%	81	42	-393	-1,087	-1,256	-1,020	-46	-41	-231	349	161	79
40%	132	-80	-563	-571	-815	-2,128	-87	-190	-239	267	91	37
50%	223	-109	-279	-454	-593	-1,520	-65	-58	-51	213	311	422
60%	351	-299	-390	-456	-517	-1,325	-29	-107	-10	511	132	371
70%	245	-200	-91	-35	6	-980	-119	-79	-62	53	114	182
80%	332	-31	-167	-99	-306	-826	-100	-74	16	164	80	224
90%	139	-65	-118	-254	-175	70	9	-158	-90	269	127	196
Long Term												
Full Simulation Period[a]	121	-106	-234	-403	-469	-774	-236	-201	-139	249	138	129
Water Year Types[b,c]												
Wet (32%)	-165	-200	-176	-437	-391	-541	-490	-253	-201	-29	-119	-41
Above Normal (15%)	56	-162	-267	-726	-771	-1,286	-216	-98	-176	51	-33	24
Below Normal (17%)	155	-8	-112	-460	-710	-1,119	-175	-26	-163	133	60	117
Dry (22%)	220	-25	-219	-258	-407	-835	-69	-148	-71	689	634	370
Critical (15%)	617	-83	-494	-157	-148	-274	-24	-475	-38	524	217	251

[10] The RDEIR/SDEIS shows that this is not the result of releases from Sites, as there is on average only 1 cfs of releases from Sites in January, 0 cfs in February, and 2 cfs in March. *See* RDEIR/SDEIS at Table 5B1-6-1c.

Table 5B2-14-1c. Sacramento River at Wilkins Slough Flow, Alternative 1A 011221 minus No Action Alternative 011221, Monthly Flow (cfs)

Statistic	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Probability of Exceedance												
10%	-62	39	-137	-432	-121	-1	-614	-564	-626	10	84	-15
20%	14	-638	6	-326	-482	-489	-185	123	-264	413	62	104
30%	54	-298	7	-1,282	-622	-892	1	32	0	326	201	87
40%	372	-144	141	-497	-815	-1,271	-48	-186	-2	256	168	-5
50%	300	21	-554	-503	-502	-1,812	122	-171	81	274	416	435
60%	221	-46	-4	-434	-551	-1,537	-27	-190	-277	578	190	376
70%	171	-187	-330	-198	-161	-631	143	-304	-207	37	90	180
80%	184	196	-37	-103	-243	-491	-187	-299	162	286	-11	349
90%	193	184	141	2	-75	-542	-59	-381	-217	326	28	125
Long Term												
Full Simulation Period[a]	108	-72	-124	-318	-351	-757	-193	-216	-121	278	142	146
Water Year Types[b,c]												
Wet (32%)	-164	-334	-56	-310	-254	-483	-511	-200	-231	-11	-88	-30
Above Normal (15%)	69	-18	-134	-515	-367	-1,108	-90	-160	-213	57	-34	32
Below Normal (17%)	149	142	-86	-398	-618	-1,212	-105	-171	-173	163	52	129
Dry (22%)	193	53	7	-239	-387	-885	-5	-141	10	753	623	376
Critical (15%)	558	3	-505	-163	-182	-279	10	-472	75	545	201	315

Finally, the Daily Divertible and Storable Flow Tool fails to include any Above Normal years, which results in a failure to adequately analyze potential impacts to salmon. RDEIR/SDEIS Attachment 11P-1 (describing Daily Divertible Flow Tool). This tool uses 2009-2018 hydrology, a period which contains no Above Normal years. There are only two Wet years during this period, and the tool identified significant impacts to salmon in both of these years. RDEIR/SDEIS at 11P-4. While the RDEIR/SDEIS suggests that mitigation Measure FISH-2.1 could reduce impacts to salmon from the project diversions, it shows that the project's impacts are not fully mitigated in one of those two years (2011) and would still result in reduced salmon survival through the Delta. *Id*. at 11P-8. In addition, because hydrologic conditions in 2011 are similar to that of Above Normal years, it indicates that unmitigated impacts are likely to occur in Above Normal years and other years similar to 2011. The decision to exclude Above Normal years from the analysis means that possible significant impacts in Above Normal years are unknown, and the RDEIR/SDEIS fails to analyze the effectiveness of Project Mitigation Measure FISH-2.1 in Above Normal years. Therefore, the RDEIR/SDEIS must be revised to include analysis of Above Normal years, such as 2000, 2003, and 2005.

The CALSIM modeling in the RDEIR/SDEIS is internally inconsistent and limited, and appears to be flawed and corrupted. All analyses in the RDEIR/SDEIS that use CALSIM to assess the effects of the project are unreliable.

VI. The RDEIR/SDEIS Fails to Accurately Analyze Environmental Impacts and Fails to Disclose Significant Adverse Environmental Impacts of the Proposed Project and Alternatives

(A) *The RDEIR/SDEIS Fails to Accurately Assess Environmental Impacts Because it Ignores Changes in Flow or Storage Less Than 5 or 10 Percent*

The RDEIR/SDEIS' analysis of significant environmental impacts violates NEPA and CEQA because it assumes that changes in flow or storage less than 5 percent and/or 10 percent are insignificant. However, changes in flow and/or storage less than 5 percent or 10 percent frequently results in these levels dropping below key thresholds relating to the survival of native fish species, including species listed under the California Endangered Species Act ("CESA") and the federal Endangered Species Act ("ESA"). As a result, even changes in flow or storage levels that are a less than 5 percent change from the baseline clearly can and do cause significant adverse impacts to native fish species. Moreover, for salmon and other species, reductions in flow less than 5 percent have synergistic impacts that can be devastating for these species, as reduced flows reduce survival in multiple reaches of the Sacramento River and through the Delta, resulting in cumulatively significant reductions in survival. As a result, the RDEIR/SDEIS fails to disclose significant impacts of the proposed project and alternatives to species listed under CESA and the ESA, for which mandatory findings of significance are warranted. The RDEIR/SDEIS must be revised to eliminate the assumption that changes in flow or storage less than 5 percent and less than 10 percent are insignificant.

The RDEIR/SDEIS claims that the CALSIM model is not accurate enough to assess changes in flow or storage less than 5 percent, stating that,

> Incremental flow and storage changes of 5% or less in modeled results are generally considered within the standard range of uncertainty associated with model processing. Therefore, for the purposes of the impact analysis, flow changes of 5% or less were considered to be similar to the NAA for comparative purposes. Changes in flow exceeding 10% were considered to represent a potentially meaningful difference.

RDEIR/SDEIS at 11-57. These 5 percent and 10 percent thresholds of significance are arbitrary, inconsistent with other NEPA/CEQA documents prepared by Reclamation, and not supported by substantial evidence. Moreover, to the extent that CALSIM 2 fails to accurately assess impacts, the RDEIR/SDEIS fails to explain why it does not use the CALSIM 3 model, which has been publicly released by DWR and incorporates more recent hydrological data.

First, the RDEIR/SDEIS provides no justification for why changes in flow less than the 10 percent threshold would not be considered a potentially meaningful difference. The lack of any explanation for this assumption regarding the 10 percent threshold makes it plainly arbitrary and capricious.

Second, the justification for the 5 percent threshold is also irrational and not supported by substantial evidence. Because CALSIM modeling is used in a comparative manner (meaning that it is used to model conditions under both the environmental baseline and action alternatives), there is no need for the 5 percent or 10 percent thresholds. Importantly, there is no basis to conclude that Sacramento River flow reductions due to diversions to storage under the proposed project are an illusory modeling artifact; instead, reduced flow in the Sacramento River is an inevitable and necessary consequence of diverting water from the Sacramento River to fill Sites Reservoir. While the CALSIM model does have significant flaws, failing to disclose changes in flow that are 5 percent (or 10 percent) or less as a significant impact misleads the public and decisionmakers. In fact, other CEQA/NEPA documents that use CALSIM modeling do not use a 5 percent or 10 percent thresholds for determining whether changes in flow or storage constitute a significant impact. For instance, the final CEQA/NEPA documents for the California WaterFix project did not use these thresholds, and the RDEIR/SDEIS provides no reasoned explanation why these assumptions are necessary since they have been omitted from other CEQA/NEPA analyses where CALSIM is used.

Third, the RDEIR/SDEIS does not consistently employ these thresholds. If a 5 percent change is significant, then to avoid impacts the project could simply limit diversions to levels that produce a less than 5 percent change in flow, yet it fails to do this. In addition, changes in Delta outflow from the proposed project are generally less than 5 percent, *see* RDEIR/SDEIS at Table 5B3-5-1a, yet as the RDEIR/SDEIS admits, the reduction in abundance of Longfin Smelt that results from reduced Delta outflow would be a significant impact requiring mitigation, *see id*. at 11-271.

Fourth, using these 5 percent and 10 percent thresholds results in the RDEIR/SDEIS failing to disclose significant environmental impacts for which mitigation is required. For instance, the RDEIR/SDEIS claims that the project and alternatives would cause a significant impact to winter-run Chinook salmon if diversions by the proposed project or alternatives caused flows in the Sacramento River to drop below 10,700 cfs. RDEIR/SDEIS at 11-130 to 11-131. However, because the RDEIR/SDEIS assumes that a 5 percent reduction in flows in the Sacramento River is simply a modeling artifact and not a real change, the RDEIR/SDEIS would not identify operations that reduce flows by 4 percent, but drop below 10,700 cfs, as a significant effect. Similarly, although the IOS life cycle model used in the RDEIR/SDEIS finds that on average, winter-run Chinook salmon escapement is 3 percent lower under Alternative 1A and 4 percent lower under Alternative 1B, with greater reductions in escapement in wetter water year types, *see* RDEIR/SDEIS at 11-128, the RDEIR/SDEIS wrongly concludes this is a less than significant effect.[11]

Similarly, the use of arbitrary thresholds for identifying significant impacts is inconsistent with the CEQA guidelines, which require a mandatory finding of significance if a project would "cause a fish or wildlife population to drop below self-sustaining levels" or "substantially reduce the number or restrict the range of an endangered, rare or threatened species." Cal. Code Regs., tit. 14, § 15065(a)(1). Where, as here, populations of winter-run Chinook salmon, Longfin Smelt, Delta Smelt, and other species are below self-sustaining levels, any further impacts that causes those populations to further drop below self-sustaining levels is a per se significant impact

[11] As the RDEIR/SDEIS admits, the OBAN model does not account for the flow:survival relationship in the Sacramento River, RDEIR/SDEIS at 11-129 to 11-130, and therefore the OBAN model does not provide an accurate assessment of the effects of the proposed project and alternatives on salmon. Similarly, the SALMOD model does not accurately assess the effects of the proposed project and alternatives, including because it does not account for the flow:survival relationships in the Sacramento River and through the Delta; SALMOD is an outdated and discredited model should not be relied upon.

under CEQA requiring mitigation.[12] As one example, the RDEIR/SDEIS finds, using the IOS life cycle model, that Alternative 1A would reduce the long-term abundance of winter-run Chinook salmon by 3 percent on average, as a result of reducing survival through the Sacramento River by 1 percent and through the Delta by 1-2 percent. RDEIR/SDEIS at 11-128 to 11-129. The population of winter-run Chinook salmon is not self-sustaining under baseline conditions, and the impact of Alternative 1A is therefore per se a significant impact requiring mitigation. Cal. Code Regs., tit. 14, § 15065(a)(1).

The RDEIR/SDEIS fails to accurately analyze environmental effects and disclose significant environmental impacts because of the use of these arbitrary 5 percent and 10 percent thresholds. The RDEIR/SDEIS must be revised to exclude these improper assumptions regarding the effects of the proposed project and alternatives.

(B) The RDEIR/SDEIS Fails to Accurately Analyze Environmental Impacts to Winter-Run Chinook salmon and Fails to Disclose Significant Impacts of the Proposed Project

The RDEIR/SDEIS erroneously claims that the proposed project and alternatives will not cause significant environmental impacts to winter-run Chinook salmon; however, this conclusion is based on flawed and internally inconsistent analyses that fail to accurately assess the likely impacts of the proposed project and alternatives. The proposed mitigation measure FISH-2 fails to mitigate impacts to winter-run Chinook salmon, and the proposed project and alternatives will cause reduced survival and abundance of winter-run Chinook salmon, which is a significant impact in light of the fact that the species is declining and is not self-sustaining under baseline conditions. Cal. Code Regs., tit. 14, § 15065(a)(1). The RDEIR/SDEIS must be revised to accurately characterize impacts to winter-run Chinook salmon and to identify adequate mitigation measures that eliminate significant impacts to winter-run Chinook salmon.

(i) The RDEIR/SDEIS Fails to Disclose Significant Environmental Impacts to Winter-Run Chinook Salmon Caused by Reduced Flows in the Sacramento River Due to Incorrect Assumptions Regarding Migration Timing

Although the RDEIR/SDEIS acknowledges the scientific evidence demonstrating that reduced flows in the Sacramento River as a result of diversions to fill Sites Reservoir will reduce the survival of migrating juvenile salmon, the RDEIR/SDEIS concludes that mitigation measure FISH-2 will reduce these impacts to a less than significant level. *See* RDEIR/SDEIS at 11-130 to 11-131. This conclusion is arbitrary and capricious because mitigation measure FISH-2 applies only in the months of March to May, whereas winter-run Chinook salmon juveniles migrate past the diversion points for Sites Reservoir from October to May.

[12] In addition, we note that CESA requires that the impacts of the project on listed species be fully mitigated and not jeopardize the continued existence of the species, *see* Cal. Fish and Game Code § 2081, regardless of whether those impacts are designated as significant under CEQA.

The RDEIR/SDEIS admits that diversions to Sites Reservoir that reduce flows in the Sacramento River at Wilkins Slough below 10,700 cfs would reduce the survival of winter-run Chinook salmon and constitute a significant environmental impact. *Id*. at 11-130 to 11-131. Numerous peer reviewed scientific studies have demonstrated a strong flow:survival relationship for juvenile salmon migrating down the Sacramento River, such that reduced flows as a result of diversions by Sites Reservoir would reduce the survival of juvenile salmon. *See, e.g.*, Michel et al. 2015; Cordoleni et al. 2017; Notch 2017; Henderson et al. 2018; Michel 2018; Michel et al. 2021).

The RDEIR/SDEIS claims that mitigation measure FISH-2, which prohibits diversions for Sites Reservoir when Sacramento River flows are less than 10,700 cfs at Wilkins Slough between March to April, would reduce these impacts to a less than significant impact while salmon are rearing or migrating downstream toward the Delta. RDEIR/SDEIS at 11-130 to 11-131 ("Mitigation Measure FISH-2.1 will limit the potential for negative flow-survival effects to winter-run Chinook salmon during their dispersal to rearing habitat and/or migration downstream toward the Delta"). However, as the RDEIR/SDEIS admits, winter-run Chinook salmon migrate past the diversion points for Sites Reservoir (at the Red Bluff Diversion Dam and at Hamilton City) and past Wilkins Slough well before the month of March, which is when the protections provided by FISH-2 would begin, and they are generally migrating out of the Delta between December and May. *See* RDEIR/SDEIS at 11-79 to 11-80 (noting that half of the annual migration of juvenile winter-run Chinook salmon have passed the Red Bluff Diversion Dam before late October and 90 percent before January 1; noting that winter-run Chinook salmon are caught in Knights Landing rotary screw traps between mid-September to mid-March, with the bulk of the run (90 percent) generally passing between early October to mid-March; noting that winter-run Chinook salmon are generally caught in the Chipps Island trawls between December 1 and May); *see id*. at 11-124 ("the main period of juvenile winter-run Chinook salmon occurrence in the Delta (i.e., December–April")). Indeed, most migrating juvenile Chinook salmon, including nearly all juveniles of the winter-run and late-fall run, will not be protected by this bypass flow requirement as most of these fish have migrated downstream of Knights Landing before March. *See* Williams 2006; NMFS 2019 BiOp at 67-68, 83-84; Munsch et al. 2019 at Figure 3; RDEIR/SDEIS at 11-120.

In other words, mitigation measure FISH-2 will limit pumping that reduces flows in the Sacramento River below 10,700 cfs only ***after*** winter-run Chinook salmon have already migrated downstream to the Delta, and as a result this mitigation measure wholly fails to protect juvenile winter-run Chinook salmon from the harmful effects of the proposed project and alternatives as they migrate down the Sacramento River. The RDEIR/SDEIS' conclusion that the proposed project and alternatives will not cause significant environmental impacts to winter-run Chinook salmon is arbitrary and capricious, and the document must be revised to include adequate mitigation measures that apply when winter-run Chinook salmon are migrating down the Sacramento River.

(ii) The RDEIR/SDEIS Fails to Disclose Significant Environmental Impacts to Winter-Run Chinook Salmon Caused by Reduced Flows in the Sacramento River Because it Misapplies Recent Scientific Studies

Citing recent research demonstrating strong and positive flow-survival relationships for juvenile Chinook salmon, the RDEIR/SDEIS acknowledges that diversions to Sites Reservoir have the potential to reduce Sacramento River instream flows and survival of juvenile salmonids, including winter-run Chinook salmon (RDEIR/SDEIS at p. 11-119). The proposed project includes Mitigation Measure FISH-2.1 which would prevent project diversions from reducing Sacramento River flow below 10,712 cfs at Wilkins Slough during March, April, and May. Above this flow, survival of juvenile Chinook salmon studied by Michel et al. (2021) averaged just over 50 percent in a particular reach of the Sacramento River; below this threshold survival dropped dramatically to 18.9 percent in the same reach.

Michel et al. (2021) measured the effect of flow on survival for a subset of migrating Chinook salmon through a portion of their freshwater life cycle. They measured survival rates downstream of where egg-to-fry survival is measured and upstream of the lower Sacramento River and Delta, where additional mortality occurs; their study focused on juvenile Chinook salmon that are larger than 75mm long. To put their results in context, typical freshwater survival (from egg stage to the outmigrating smolt stage) for Chinook salmon across their range is approximately 10 percent (Quinn 2005; SEP 2019). In the Sacramento River, egg-to-fry survival between 2002 and 2018 averaged 24.4 percent for winter-run Chinook salmon and 13.7 percent for fall-run Chinook salmon (Voss and Poytress 2020). Thus, under current conditions, attaining species-typical survival rates for Chinook salmon is challenging in many years even if survival is 50 percent in the reach that contains Wilkins Slough. It is therefore essential to the viability of Sacramento River Chinook salmon runs that survival in this reach be maximized whenever possible.

However, the proposed flow threshold in this mitigation measure is inadequate to prevent significant impacts to Sacramento River Chinook salmon runs.

First, diversions that reduce Sacramento River flows to the proposed threshold may reduce survival of migrating juvenile Chinook salmon in the size class studied by Michel et al. (2021). Although this study found strong evidence of decreased survival at flows <10,712 cfs, very few observations were made for flows between 14,000 and 21,000 cfs (Figure 3); the effects of reducing flow on survival are less certain in this range and it is quite possible that survival benefits of flows above 10,712 cfs were not detected by Michel et al. (2021). The best available science (including Michel et al. 2015; Henderson et al. 2018; Michel 2019; Munsch et al. 2020; Notch et al. 2020) suggests that decreasing flows in this reach of the Sacramento River (by diverting water to Sites Reservoir) when flows are between 10,712 and approximately 20,000 cfs will reduce survival of Chinook salmon juveniles.

Second, the bypass flow requirement is based around the success of relatively large migrating juvenile Chinook salmon. Diverting flows above the proposed threshold may cause significant negative effects for the much larger portion of the juvenile Chinook salmon population that measures less than 75mm in fork length. Michel et al. (2021) used sonic tags to track survival and movements of the fish they studied; their flow results apply only to fish large enough to carry a sonic tag. Migration behavior and habitat use of juvenile salmon varies with size (Quinn 2005; Williams 2006), so it is highly likely that increasing flow rates benefit smaller fish in ways and at levels that differ from those detected among the large fish studied by Michel et al. (2021). In fact, several other recent studies have documented continuous increases in survival and abundance as Sacramento River flows increase (Michel 2019; Notch et al. 2020); similar continuous positive relationships have been found among Chinook salmon in the San Joaquin River and its tributaries (SEP 2019). Furthermore, Munsch et al. (2019) identified a Sacramento River flow threshold associated with high likelihood of detection of small juvenile Chinook salmon ("fry"; greater than 55mm) in the Delta; they also found that abundance of fry increased continuously with increasing flows. Therefore, it is likely that reducing Sacramento River flows in a range above ~10,712 cfs will reduce survival rates among a significant portion of migrating juvenile Chinook salmon.

Third, the proposed flow bypass mitigation allows no margin for error and is thus likely to result in frequent loss of real survival benefits ascribed to the greater than or equal to 10,712cfs flow threshold. The bypass requirement allows flows to be reduced to exactly the threshold identified by Michel et al. (2021), despite known levels of uncertainty around this parameter estimate. Whereas the benefit of flows above 10,712 cfs is believed to be all-or-nothing (i.e., it is a threshold), errors in estimating that threshold, measuring actual flows in the river, or changes in the threshold from year-to-year or among salmonid populations (e.g., spring-run v. fall-run) could lead to the elimination of all positive effects of this proposed mitigation. In fact, Michel et al. (2021) estimate uncertainty around their flow threshold (at p. 9, Figure 4), and, as with any ecological study, the results are drawn only from a limited number of real-world situations that may not fully characterize natural variability in the flow-survival relationship. As the RDEIR/SDEIS acknowledges (at 11-130): "There is some uncertainty in the modeled flow-survival effects and in the ability to limit potential effects with real-time operational adjustments." These uncertainties must be factored into bypass flow mitigation by raising the threshold by a safety factor that accounts for environmental variability and measurement error.

In addition, the RDEIR/SDEIS' analysis of riverine survival of salmon is flawed and fails to accurately assess environmental impacts because it does not model or analyze the effects of the proposed project and alternatives. First, the RDEIR/SDEIS' analysis of the effects of reduced flows on salmon survival only considers the effects of water diversions on salmon survival in the Sacramento River between January 1 to May 31. *See* RDEIR/SDEIS at 11P-3. However, the vast majority of winter-run Chinook salmon have migrated past Red Bluff Diversion Dam (the upstream diversion point for Sites Reservoir) before January 1 in many years. *See id*. at 11-79 to 11-80. Thus, the analysis in the RDEIR/SDEIS ignores the effects of reduced flows caused by diversions for the proposed project and alternatives that affects the vast majority of winter-run

Chinook salmon, even though the proposed project and alternatives can divert water during these months. Second, the RDEIR/SDEIS' analysis of the effects of reduced flows on salmon survival includes operational restrictions (such as a prohibition on diversions when Delta outflow is less than 44,500 cfs during the months of March to May) that are more protective than, and not included in, the proposed project and alternatives. *Compare* RDEIR/SDEIS at 11P-2 to 11P-3 *with id*. at 2-31, 5A1-29 to 5A1-30, 5A2-28 to 5A2-33. Third, the RDEIR/SDEIS' analysis in Appendix 11P assumes that the proportion of salmon migrating down the Sacramento River on a daily basis is the same proportion that passed the Red Bluff sampling station, but acoustic tag data shows a wide variation in the speed of juvenile salmon migration between Red Bluff and Knights Landing (Klimley et al. 2017); without this assumption, the analysis shows significantly greater reductions in survival of juvenile salmon. *See* RDEIR/SDEIS at 11P-5. As a result of these flawed assumptions, the RDEIR/SDEIS fails to accurately analyze the effects of the proposed project and alternatives.

(iii) The RDEIR/SDEIS Fails to Disclose Significant Environmental Impacts to Winter-Run Chinook Salmon Caused by Reduced Flows in the Lower Sacramento River and Delta

The RDEIR/SDEIS' analysis of the effects of the proposed project and alternatives on the survival of juvenile winter-run Chinook salmon through the lower Sacramento River and Delta also fails to accurately assess impacts and fails to disclose significant impacts from the proposed project and alternatives. As the RDEIR/SDEIS acknowledges, there is a strong flow:survival relationship in several reaches in the Delta, and reductions in instream flow results in reduced survival of juvenile salmon. Perry et al. 2018; *see* RDEIR/SDEIS at 11-123 to 11-124. The RDEIR/SDEIS claims that diversions to Sites Reservoir under the proposed project would result in small changes in survival of salmon migrating through the Delta. RDEIR/SDEIS at 11-124 to 11-125. However, this analysis is misleading to the public and decisionmakers, and it fails to disclose significant environmental impacts to winter-run Chinook salmon that would result.

First, because the RDEIR/SDEIS' modeled effects of the proposed project and alternatives on flows in the Sacramento River at Freeport is inaccurate (estimating smaller reductions in flow than would actually occur under the proposed project and alternatives), *see supra* Section V, the assessment of effects on survival of salmon through the Delta is likewise inaccurate, underestimating the adverse impacts to winter-run Chinook salmon that are likely to occur.

Second, the RDEIR/SDEIS analyzes the reductions in survival through the Delta using the Perry et al. 2018 model, averaged by month and water year type. RDEIR/SDEIS at 11-124. This analysis is misleading because it does not present the annual results – the effects of reduced survival over the course of the year for juvenile salmon that are migrating downstream. The RDEIR/SDEIS also shows that juvenile winter-run Chinook salmon survival through the Delta would be reduced by 1-2 percent under Alternative 1A, based on the IOS model. RDEIR/SDEIS at 11-129. In light of the status of the species, this constitutes a significant impact under CEQA that is not disclosed in the RDEIR/SDEIS.

Equally important, the effects of the proposed project in reducing survival of juvenile winter-run Chinook salmon migrating through the Delta can be far greater when Sites diverts more water from the Sacramento River than in an average water year, which is what is disclosed in Table 11-16. Unlike the analysis of riverine survival in the RDEIR/SDEIS, the analysis of through-Delta survival of salmon only evaluates effects using average water diversions from the Sacramento River by water year type. RDEIR/SDEIS at Table 11-16; id. at Table 11J-1. Annual water diversions by the proposed project and alternatives used in the RDEIR/SDEIS are approximately 344,000 acre feet in a Wet year and 354,000 acre feet in an Above Normal water year type. *See* RDEIR/SDEIS at Table 5B1-3-1c. Yet in wetter water years like 2017, Sites can divert more than 1 million acre feet of water under the proposed operating criteria. *See* Sites Reservoir Project, 2021 Water Estimate, May 28, 2021, at 8 (attached hereto as Exhibit 1). The RDEIR/SDEIS fails to analyze the effects of diversions greater than the average for that water year type, where the reductions in survival through the Delta are likely to be substantially higher as a result of greater reductions in flow at Freeport. *See* Perry et al. 2018; RDEIR/SDEIS at Fig. 11J-1. Reduced survival is the clear consequence of the flow: survival relationship and inadequate operational criteria that are proposed.

The RDEIR/SDEIS' analysis of the effects of the proposed project and alternatives on the survival of winter-run Chinook salmon through the Delta must be revised to incorporate accurate modeling of project operations and to disclose the higher reductions in survival that result in years with greater than average levels of water diversions.

(iv) The RDEIR/SDEIS Fails to Disclose Significant Environmental Impacts to Winter-Run Chinook Salmon

Taken together, the RDEIR/SDEIS shows that the proposed project and alternatives will reduce the abundance of winter-run Chinook salmon, which are listed as endangered under CESA, and will cause winter-run Chinook salmon to drop further below self-sustaining levels. This constitutes a significant impact under CEQA. Cal. Code Regs., tit. 14, § 15065(a)(1).

The RDEIR/SDEIS finds, using the IOS life cycle model, that Alternative 1A causes an average 3 percent reduction in adult abundance (escapement) of winter-run Chinook salmon, as a result of Alternative 1A reducing juvenile survival through the Delta by 1-2 percent and reducing juvenile survival through the Sacramento River by 0-1 percent. RDEIR/SDEIS at 11-128 to 11-129. As described above, these are likely substantial underestimates of the project's impacts; however, even assuming for the sake of argument that they are accurate, in light of the fact that winter-run Chinook salmon are listed as endangered and their population is below self-sustaining levels, these additional reductions in survival and abundance are per se significant impacts requiring mitigation. Cal. Code Regs., tit. 14, § 15065(a)(1). The RDEIR/SDEIS must be revised to disclose this significant impact and to identify adequate mitigation measures that eliminate significant impacts.

(C) The RDEIR/SDEIS Fails to Accurately Analyze Environmental Impacts to Spring-Run Chinook Salmon and Fails to Disclose Significant Impacts of the Proposed Project

As with winter-run Chinook salmon, the RDEIR/SDEIS fails to adequately analyze impacts of the proposed project and alternatives on spring-run Chinook salmon and fails to disclose significant impacts that are likely to occur under the proposed project and alternatives.

First, proposed mitigation measure FISH-2 fails to adequately protect spring-run Chinook salmon from the significant impacts of diversions by Sites Reservoir because substantial numbers of spring-run Chinook salmon would have already migrated down the Sacramento River and into the Delta each year before this mitigation measure would be implemented, resulting in substantial reductions in survival of these migrating juvenile salmon. Significant proportions of spring-run Chinook salmon generally migrate downstream of Hamilton City as early as December, and spring-run Chinook salmon are frequently found in the Delta (in both surveys and salvage) by March. RDEIR/SDEIS at 11-132 to 11-134; *id*., Appendix 11A at 1-13 to 1-21; 2019 NMFS BiOp at 82-83. More than half (50 percent) of the spring-run Chinook salmon population in the Sacramento Basin migrated past the Knights Landing before March 1 in many years (including Brood Years 2015, 2014, 2012, 2010, 2007, 2005, and 2003). RDEIR/SDEIS, Appendix 11A at 1-15. None of the spring-run Chinook salmon that migrate to the Delta before March would be protected by mitigation measure FISH-2, meaning that in many years less than half of the population would be protected by the proposed mitigation measure. As a result, the proposed project and alternatives would cause significant impacts by reducing survival of these migrating salmon.

Second, the proposed flow threshold of 10,712 cfs used in Mitigation Measure FISH-2 is inadequate for the same reasons identified with respect to winter-run Chinook salmon. *See supra*. And as with winter-run Chinook salmon, the RDEIR/SDEIS fails to adequately analyze impacts to riverine or Delta survival because it uses flawed CALSIM modeling that underestimates the reduction in flows into the Delta and fails to analyze impacts to riverine survival before January 1, despite the fact that significant numbers of spring-run Chinook salmon migrate past Red Bluff and even Hamilton City before that date. *Id*. Finally, because spring-run Chinook salmon populations are listed under CESA and are not currently viable, even small reductions in survival caused by the proposed project and alternatives that cause this population to fall further below self-reproducing levels constitute a significant impact under CEQA. Cal. Code Regs., tit. 14, § 15065(a)(1).

(D) The RDEIR/SDEIS Fails to Accurately Analyze Environmental Impacts to Fall-Run Chinook Salmon and Fails to Disclose Significant Impacts of the Proposed Project

Like the flawed analysis of impacts to winter-run and spring-run Chinook salmon, the RDEIR/SDEIS fails to adequately analyze impacts of the proposed project and alternatives on fall-run Chinook salmon and fails to disclose significant impacts that would result.

First, a substantial proportion of the fall-run Chinook salmon population migrates down the Sacramento River by March 1, before mitigation measure FISH-2 limits diversions by the proposed project and alternatives. *See* RDEIR/SDEIS at 11-157 to 11-164, 11-189; *id*., Appendix 11A at 1-22 to 1-30. For instance, according to the RDEIR/SDEIS more than half of the fall-run Chinook salmon population that migrates past Red Bluff does so before March 1 in most years. *Id*., Appendix 11A at 1-22 (50 percent passage at Red Bluff Diversion Dam before March 1 for all Brood Years 2019, 2018, 2015, 2014, 2013, 2012, 2010-2004). Similarly, more than half of the run was estimated to have passed Knights Landing before March 1 in most years. *Id*., Appendix 11A at 1-24 (Brood Years 2019, 2018, 2016, 2015, 2014, 2012-2003). And the RDEIR/SDEIS asserts that the majority of fall-run Chinook salmon are already in the Delta between January and May. *Id*. at 11-189. As a result, a significant proportion of the fall-run Chinook salmon population has already migrated downstream and is not protected by mitigation measure FISH-2, and the proposed project and alternatives would cause significant environmental impacts by reducing the survival of these juvenile salmon down the Sacramento River and through the Delta.

Second, the proposed flow threshold of 10,712 cfs in Mitigation Measure FISH-2 is inadequate for the same reasons identified with respect to winter-run Chinook salmon. *See supra*. And as with winter-run Chinook salmon, the RDEIR/SDEIS fails to adequately analyze impacts to riverine or Delta survival because it uses flawed CALSIM modeling that underestimates the reduction in flows into the Delta and fails to analyze impacts to riverine survival before January 1, despite significant numbers of fall-run Chinook salmon migrating past Red Bluff Diversion Dam and even Hamilton City before that date. *Id*.

(E) The RDEIR/SDEIS Fails to Accurately Analyze Environmental Impacts to Longfin Smelt and Fails to Disclose Significant Impacts of the Proposed Project

The RDEIR/SDEIS ignores or underestimates potentially significant impacts to the San Francisco Estuary's Longfin Smelt population. Longfin Smelt are listed under CESA as a threatened species because they have experienced dramatic declines in abundance over several decades. Abundance of this population is strongly correlated with Delta outflow (Jassby et al. 1995; Kimmerer 2002; Rosenfield and Baxter 2007; Kimmerer et al. 2009; Thomson et al. 2010; Mac Nally et al. 2010) as is juvenile recruitment/productivity (Nobriga and Rosenfield 2016) and distribution (Dege and Brown 2004; CDFG 2009; Lewis et al. 2019b). Entrainment-related mortality is positively correlated with exports, and negatively correlated with Delta outflows and prior abundance indices (CDFG 2009; Grimaldo et al. 2009; Rosenfield 2010).

(i) The RDEIR/SDEIS Fails to Accurately Analyze Impacts from Entrainment

The RDEIR/SDEIS ignores the likely significant impact of additional Longfin Smelt entrainment arising from the proposed project. Given its precarious conservation status, any increase in entrainment-related mortality is likely to threaten the viability of Longfin Smelt in the San Francisco Estuary. This is particularly true given that entrainment of Longfin Smelt has historically been highest when population numbers are low and environmental conditions lead to low Longfin Smelt production (Rosenfield 2010). Despite these known patterns, the RDEIR/SDEIS inappropriately ignores increases in entrainment-related mortality that are likely to occur as a result of increased water exports and decreased Delta outflow. To the extent that Delta Smelt and Longfin Smelt are similar (both smelt have experienced significant declines, are pelagic swimmers, and spawn, at times, in the zone of influence of CVP and SWP export facilities), recent findings on the effects of entrainment-related mortality on Delta Smelt apply, in general, to Longfin Smelt. Smith et al. (2021) state:

> In a population in which recruitment success rates cannot sustain the population, no additional mortality is sustainable . . . No additional mortality can be sustained by the population, but that does not mean that entrainment mortality of 0 will result in its recovery

Smith et al. 2021 at p. 14.

The existing CDFW conceptual model for Longfin Smelt life history finds that combined CVP/SWP exports is a significant predictor of combined CVP/SWP salvage of adult Longfin Smelt (Rosenfield 2010). Also, Delta outflow in January-March is significantly and negatively correlated with total annual Longfin Smelt entrainment (Rosenfield 2010 at Figure 9); salvage consists mostly of juvenile Longfin Smelt and occurs mainly during April-June (Grimaldo et al. 2009). This led CDFW to suggest that Delta outflow in the winter affects the distribution of Longfin Smelt and the subsequent juvenile cohort (CDFG 2009; Rosenfield 2010). Entrainment of larval Longfin Smelt (which is not measured at CVP/SWP fish salvage facilities) is believed to be positively correlated with X2 and increasingly negative values of Old and Middle River (OMR) flow. The RDEIR/SDEIS fails to estimate changes in entrainment to larval Longfin Smelt or to connect such changes in mortality to overall Longfin Smelt population dynamics.

The RDEIR/SDEIS fails to describe any safe level of Longfin Smelt entrainment, much less acceptable increases in that entrainment caused by the project – it simply categorizes negative directional changes in conditions that promote entrainment as "small." Average X2 increases under all project alternatives – increasing the risk of entrainment for all life stages of Longfin Smelt (CDFG 2009; Rosenfield 2010) in every month from December-May of Critically Dry years when Longfin Smelt are at significant risk of entrainment mortality (Appendix 6B3: Tables 6b3-1-1c, 2c, 3c, and 4c). Because the X2 values reported are averages, it is extremely likely that some years will experience a greater shift of X2 towards the export pumps, resulting in greater entrainment risk to all Longfin Smelt life stages. The assertion that the modeled changes in X2 are "small" is arbitrary and capricious – relatively small changes in Delta outflow or X2 are all that is required to produce large changes in entrainment risk for Longfin Smelt (Rosenfield 2010).

Combined with increasing X2 (which places more Longfin Smelt at risk of entrainment), more negative OMR flows expected under the proposed project and alternatives increase the likelihood of Longfin Smelt entrainment at levels that would pose significant risk to the overall population.

Average OMR is projected to be more negative in December, March and April during Critically Dry years under all project alternatives (OMR is also more negative in January of Alternative 1A; Appendix 5B3, Tables 5B3-6-1c, 2c, 3c, and 4c) – more negative OMR is correlated to the logarithm of Longfin Smelt salvage meaning entrainment-related mortality increases very rapidly as OMR becomes more negative (Grimaldo et al. 2009). Dismissing persistent and directional negative effects on an imperiled species by asserting, without evidence, that they are "small" is arbitrary and capricious. For example, with respect to endangered salmonids, NMFS has repeatedly warned that "[s]mall reductions across multiple life stages can be sufficient to cause the extirpation of a population" and that a "1% to 2% mean reduction in survival is a notable reduction for an endangered species, especially if it occurs on a consistent (e.g., annual) basis" (NMFS 2017 at 736). Similarly, while commenting on Delta Smelt entrainment-related mortality, Kimmerer cautioned against dismissing small but persistent losses to fish productivity and stated that mortality related to export pumping ". . . can be simultaneously nearly undetectable in regression analysis, and devastating to the population. This also illustrates how inappropriate statistical significance is in deciding whether an effect is biologically relevant." (Kimmerer 2011 at p. 7). Thus, conditions under the proposed project that facilitate increased entrainment-related mortality (increasing flow towards the export facilities, increased X2) may have a significant negative effect on Longfin Smelt population viability and the likelihood that this species will recover in the wild.

Entrainment of larval Longfin Smelt has never been effectively monitored, but we know that larval Longfin Smelt (a) are more abundant and weaker swimmers than juvenile or adult Longfin Smelt, (b) associate with the low salinity zone (Dege and Brown 2004; CDFG 2009; Hobbs et al. 2010) and are thus located closer to export facilities in drier years than in years with high Delta outflow, and (c) remain abundant into the late spring and early-summer, at least (as evidence by continued recruitment to the Bay Study's nets well into the summer and fall; Rosenfield and Baxter 2007). Thus, it is likely that entrainment mortality of larval Longfin Smelt follows the same general pattern as entrainment of older life stages -- increasing with increasing X2 and export rates – and that larval entrainment-related mortality much larger than for juvenile and adults, in absolute and relative terms. Also, entrainment of Longfin Smelt larvae likely continues from January through spring and into early summer, as larval fish are abundant throughout this period. The RDEIR/SDEIS must be revised to analyze the effect of the proposed project on entrainment of larval Longfin Smelt and to link the effect of any changes in entrainment-related mortality to overall Longfin Smelt population dynamics.

(ii) The RDEIR/SDEIS Fails to Adequately Analyze Impacts on Longfin Smelt Abundance

The best available science indicates that reductions in Delta inflow and Delta outflow during the winter and spring months under the proposed project will result in decreased Longfin Smelt productivity and overall declines in abundance, which constitute a significant impact under CEQA. Longfin Smelt abundance indices are strongly correlated with Delta outflow (Jassby et al. 1995; Kimmerer 2002; Rosenfield and Baxter 2007; CDFG 2009; Kimmerer et al. 2009;

Thomson et al. 2010, MacNally et al. 2010; Nobriga and Rosenfield 2016). The RDEIR/SDEIS analysis of Aquatic Biological Resources states: "Winter-spring diversions for Alternatives 1, 2, and 3 would reduce Delta inflow and Delta outflow." RDEIR/SDEIS at 11-269. The best available science demonstrates that the proposed project and alternatives will have a negative effect on Longfin Smelt recruitment and overall abundance, constituting a significant impact under CEQA.

Longfin Smelt viability is already severely impaired by reduced abundance. Even maintenance of the population at current levels exposes the population to high risk; further persistent declines in abundance of this CESA-listed fish's population that are projected under the proposed project would contribute significantly to the risk of Longfin Smelt extirpation from the San Francisco Estuary. Furthermore, the status quo for Longfin Smelt represents continued decline towards extinction. Maintenance of Delta outflows at levels permitted under the state's CESA incidental take permit for operation of the State Water Project are expected to result in declines in abundance of the Longfin Smelt population (DWR 2020 Final EIR at p. 5-135, Tables 5.3-8 and 5.3-9) and even that level of decline assumes that Delta outflow will be augmented in April and May of certain years; however, April-May Delta outflow augmentation is not reasonably likely to occur and the biologically important outflow period is December to May (Nobriga and Rosenfield 2016), not March to May. For example, flows were not augmented in April 2021 as low Delta outflows violated D-1641 standards; the state also petitioned to waive Delta outflow requirements in February-April of 2022 despite acknowledging that reductions in Delta outflows below levels set in D-1641 will likely to harm the Longfin Smelt population (Reclamation and DWR 2021). Even prior to being weakened under the state CESA permit and waivers of Bay-Delta water quality control plan standards, status quo protections were demonstrably inadequate to protect Longfin Smelt; this is why the SWRCB (SWRCB 2010, 2017) previously concluded that Delta outflows need to increase in order to protect Longfin Smelt adequately. Thus, the proposed project anticipates degrading environmental conditions from a status quo that is already expected to cause Longfin Smelt population declines.

The RDEIR/SDEIS's characterization of the proposed project's effects on Longfin Smelt understate the true impact of reductions in Delta outflow on this population because it relies on erroneous interpretation and misrepresentation of different models of Longfin Smelt population biology. Furthermore, neither of the analyses of flow effects on Longfin Smelt abundance incorporates potential persistent increases in entrainment-related mortality of Longfin Smelt adults, larvae, or juveniles, described above. Rather, the RDEIR/SDEIS relies on historical relationships between flow and adult abundance, ignoring the likelihood that abundance for any given outflow may decline if entrainment mortality is higher than it has historically been.

Using a computer code that is intended to replicate a population model developed by Nobriga and Rosenfield (2016), the RDEIR/SDEIS concludes that there will be "small" negative effects on Longfin Smelt (RDEIR/SDEIS at 11-270) – these negative effects are visible in all year types (RDEIR/SDEIS Tables 11-69, 11-70; *see also* Table 11-70). However, the RDEIR/SDEIS's implementation of Nobriga and Rosenfield's (2016) population model and its interpretation of model results are unjustified and invalid (the RDEIR/SDEIS references DWR's 2020 implementation and interpretation of the same model, which were similarly flawed and invalid; *see* Appendix A: Critique of CDWR's modeling of Longfin Smelt abundance and productivity under different operational alternatives for the SWP March 12, 2020 (attached hereto as Exhibit 2). As a result, the RDEIR/SDEIS's assertion that the differences between project alternatives and no action alternatives are "uncertain" is without merit. Specifically, the RDEIR/SDEIS applies Nobriga and Rosenfield's (2016) model inappropriately – the original model was designed to evaluate different conceptual alternatives of Longfin Smelt population dynamics, not to predict or compare changes in population abundance under different water management regimes. Nobriga and Rosenfield (2016) found that Longfin Smelt juvenile recruitment was powerfully affected by changes in Delta outflow – and Delta outflow was the only abiotic variable that produced a significant effect. As a result, their model will show lower recruitment of Longfin Smelt for management alternatives that reduce Delta outflow – contrary to the RDEIR/SDEIS's implication, there is no uncertainty associated with this modeling result. The analysis in the body of the RDEIR/SDEIS obscures this certainty by inappropriately comparing all possible outcomes under different management alternatives rather than analyzing year-by-year pairwise differences between NAA and alternatives. In other words, the RDEIR/SDEIS confounds all the variability associated with the estuary's Longfin Smelt populations through time (including a 2-3 order of magnitude decline and that related to natural variation in Delta Outflow from year-to-year) with variation among operational alternatives that differ only in their annual winter-spring Delta outflow. For example, by categorizing years into year types (each of which includes great variation in Delta outflow, *see* Exhibit 2), the RDEIR/SDEIS mistakes natural variability that has nothing to do with project alternatives for "uncertainty" in the outcomes of these alternatives. As a result, RDEIR/SDEIS Figures 11-36 and 11-37 are not valid and are extremely misleading regarding the certainty of persistent negative effects on Longfin Smelt that should be expected from implementation of any of the project alternatives. By presenting the high variation in model estimates of Longfin Smelt abundance across years and across decades as if it represented uncertainty about outcomes under different alternatives, the RDEIR/SDEIS's presentation undermines the entire purpose of comparing alternatives, which is to contrast differences that arise from different water management operations rather than background variation that is not related to the alternatives. In a prior analysis of a version of the underlying code used in the RDEIR/SDEIS, we found that the Longfin Smelt population response to changing Delta outflow is disproportionately high; for example, a 5 percent reduction in Delta outflow produces a greater than 5 percent reduction in projected Longfin Smelt abundance (*see* Exhibit 2). Given that population size in one generation affects abundance in the next generation (Nobriga and Rosenfield 2016), these differences among alternatives would be expected to compound over time (until the system's carrying capacity is reached). To emphasize: Nobriga and Rosenfield (2016) demonstrated that Delta outflow was extremely well correlated, over 5 decades, with Longfin Smelt juvenile productivity – their model predicts that lower Delta Outflow as proposed under the proposed project and alternatives will result in lower Longfin Smelt productivity; the RDEIR/SDEIS's representation of that model and interpretation of its outputs are egregiously flawed and highly misleading.

The RDEIR/SDEIS also estimates changes in population abundance based on regressions between X2 and Longfin Smelt abundance. This estimate is very coarse and should be used to evaluate only the likely relative effects of project alternatives. This analysis reveals significant negative effects on Longfin Smelt abundance as a result of project alternatives in every year type; in fact, this analysis reveals that Longfin Smelt abundance under project alternative 1A will be lower relative to the NAA in over 70 percent of years analyzed in the RDEIR/SDEIS (Compare Appendix 11F Table 11F-7 to Table 11F-8). Here again, the RDEIR/SDEIS inappropriately treats mean abundance differences as though they are static, ignoring deviations from the reported mean difference in each year type (i.e., declines relative to the NAA will be greater in some years) which further increase the risk of irreparable harm to the population, and the compounding effect of abundance declines across multiple generations (Thomson et al. 2010; Nobriga and Rosenfield 2016). Furthermore, this regression approach assumes that Longfin Smelt abundance is a function of outflow alone – in this model, prior abundance plays no role in subsequent abundance. Thus, if this regression approach showed that the population was extirpated, it could magically resurrect the population in subsequent years with higher flows. This obviously underestimates and ignores the permanent harm that can arise from persistent degradation of environmental conditions on Longfin Smelt populations under the proposed project.

(iii) The RDEIR/SDEIS's Proposed Mitigation Measures Fail to Reduce Impacts to Longfin Smelt to a Less than Significant Level

The RDEIR/SDEIS claims to mitigate anticipated negative impacts to Longfin Smelt arising from reduced Delta outflow by requiring 11-13 acres of tidal habitat restoration (negative effects of increased entrainment on Longfin Smelt abundance are ignored). There is no credible evidence to support the RDEIR/SDEIS's claim that tidal habitat restoration (especially such a tiny acreage) will benefit this population or mitigate for the expected (and understated) negative effects of the proposed project. Because there is no known effect of tidal habitat restoration on Longfin Smelt abundance and even the presumed mechanisms are highly uncertain and poorly defined, there is no scientifically supported methodology for calculating the amount of such habitat required to mitigate for the proposed project's effects.

Despite significant tidal marsh habitat restoration in the Delta, the Napa estuary, and the South Bay, there is no evidence yet to demonstrate that these areas provide net benefits for the San Francisco Estuary's Longfin Smelt population (i.e., that they act as a "source" as opposed to a "sink"). Despite the restoration of several thousand acres of shallow tidal habitat that has occurred over the last several decades, Longfin Smelt abundance and productivity have not increased -- the flow-juvenile abundance relationship remains unchanged and survivorship from juveniles to adults has declined (Rosenfield and Baxter 2007; Nobriga and Rosenfield 2016). In fact, Longfin Smelt abundance has declined despite massive investment in shallow tidal habitat restoration.

Although recent research has documented Longfin Smelt occurrence in marshes outside of the Delta-Suisun Bay region (Lewis et al. 2019a), there is no direct evidence that Longfin Smelt detected in these areas contribute to the adult population. Results of a preliminary otolith chemistry "fingerprinting" study concluded, ". . . of the adult fish that were classified with moderate confidence (e.g., 75%), nearly all appeared to have reared in the northern [San Francisco Estuary] . . . " (Lewis et al. 2019b at p. 9 and Figures 17 and 18 at p. 75 of the PDF). Indeed, it is not clear that Longfin Smelt found in shallow tidal habitats downstream of Suisun Bay originated in those habitats or reproduce successfully as a result of those habitats. For example, although researchers have detected substantial numbers of Longfin Smelt west of Suisun Bay, this occurred primarily during the exceedingly wet years 2017 and 2019 (Lewis et al. 2019b) and even then it was not clear that the fish detected were produced in local marshes; Lewis et al. stated (2019b at p. 6) : ". . . it is valuable to consider whether, with high Delta outflows, it is feasible and probable that larval and juvenile Longfin Smelt found in high numbers in San Pablo Bay, and even Lower South San Francisco Bay, could have been transported from Delta and Suisun Bay spawning sites by currents, tides, and winds." Although these same researchers caught pre-reproductive adult and larval Longfin Smelt in shallow tidal habitats downstream of Suisun Bay and the Delta, they were circumspect regarding the importance of spawning and rearing in these habitats, stating that their value "remains unknown." (Lewis et al. 2019b at p. 2; see also at p. 6).

The notion that shallow tidal habitat restoration can mitigate declines in Longfin Smelt caused by reduced outflow is entirely speculative. Among other things, this concept presumes that larval production is limited by spawning and incubation habitat area; juvenile and adult Longfin Smelt are generally not found in shallow habitats (Rosenfield and Baxter 2007; Rosenfield 2010). The underlying hypothesis that the Longfin Smelt population is limited by production of larvae requires that the RDEIR/SDEIS demonstrate that (a) measurable numbers of additional larvae and juveniles will be produced by the required acres of shallow tidal habitat mitigation, and (b) this number of larvae and juveniles exceeds the significant decreases in Longfin Smelt production that can be expected as a result of reductions in Delta outflow. The RDEIR/SDEIS fails to make that comparison, at least in part because the benefit to Longfin Smelt of restoring a certain acreage of shallow tidal habitat is unknown, highly uncertain, and not currently estimable. Additionally, the RDEIR/SDEIS problematically calculates the proposed acreage of mitigation based on differential entrainment of Longfin Smelt expected under the project alternatives versus under the NAA. This is inappropriate and arbitrary because (a) the RDEIR/SDEIS has concluded (without evidence) that entrainment of Longfin Smelt under the proposed project and alternatives "would be similar to the NAA" (at p. 11-268), (b) because the methods used to identify significant reductions in Longfin Smelt abundance under the project do not account for impacts arising from increased entrainment that are additional to the flow impact being mitigated, and (c) because the mitigation calculation assumes (without evidence) some equivalence between acreage of tidal marsh restoration and acreage in which Longfin Smelt are affected by entrainment. Thus, the proposed mitigation calculation is without scientific support and is not relevant to the significant negative effect (reduced Longfin Smelt productivity resulting from reduced Delta outflow) that it is supposed to mitigate.

Far from being a substitute for the well-described negative effects of reduced Delta outflow on Longfin Smelt abundance and productivity, the benefits of restoring putative Longfin Smelt spawning and rearing habitats in shallow tidal environments are highly uncertain, if they have any beneficial effect at all (Lewis et al. 2019b at pp. 44-45 of PDF). Clearly, more research is needed to demonstrate what, if any, value restored shallow tidal habitats have for the Longfin Smelt population in this estuary. Until such research is completed, it will not be possible to determine (a) that constructing these habitats actually benefits the Longfin Smelt population, and if it is beneficial, (b) how much of this habitat is necessary to mitigate impacts of the proposed project. Furthermore, there is no evidence that we know how to "restore" tidal habitats such that they benefit rather than harm Longfin Smelt. Although some shallow habitats where Longfin Smelt are now detected have been the subject of marsh restoration efforts (e.g., the South Bay Salt Ponds), historical records suggest that these fish occurred in these areas prior to restoration (Rosenfield 2010). There is no evidence to assess whether fish in these "restored" habitats do better or worse following habitat restoration. Certainly, there is no evidence to support the RDEIR/SDEIS's calculation of a precise acreage to mitigate for the persistent negative effects the proposed project is expected to have on Longfin Smelt abundance.

Finally, even if Longfin Smelt do reproduce and rear successfully in tidal habitats that have been restored, evidence suggests that any benefits will be limited to years when local stream flows and Delta outflows are high. Indeed, Lewis et al. (2019b at p. 6) write: (a) "It is unlikely that in dry, normal, or possibly even above normal years that such conditions would exists in each of these bay tributaries [west and south of the Carquinez Straights] sufficient enough to support substantial spawning and rearing. Thus in most years, the majority of suitable spawning and rearing habitats would likely occur in Suisun Bay/Marsh and the Delta," and (at p. 11) (b) ". . . given the prevalence of drought conditions and limited outflows from the Napa River and Coyote Creek watersheds due to upstream catchment and diversion, suitable conditions for spawning appear to only occur in years of anomalously high precipitation." This pattern suggests that even if it is effective, restoring shallow tidal habitats in these areas will only counter the proposed project's negative effects during wetter years, whereas declines in Longfin Smelt abundance (and increases in Longfin Smelt entrainment) are expected in drier year types, when the population is at greatest risk. Furthermore, regardless of any mitigation that might occur as a result of the proposed habitat restoration, the benefits of this activity cannot possibly occur until the habitat is actually constructed and functioning. Tidal habitat restoration generally takes many years or decades to complete; therefore, under the very best scenario, negative effects of the proposed project will not be mitigated for several Longfin Smelt generations.

(F) The RDEIR/SDEIS Fails to Accurately Analyze Environmental Impacts to Delta Smelt and Fails to Disclose Significant Impacts of the Proposed Project

The RDEIR/SDEIS incorrectly concludes that the proposed project and alternatives would not cause significant adverse impacts on Delta Smelt, because it fails to analyze important aspects of the problem and because it unlawfully assumes that changes less than 5 percent cannot constitute a significant impact.

First, the RDEIR/SDEIS ignores the effects of reductions in spring outflow on Delta Smelt recruitment. *See* Polansky et al. 2021; IEP MAST 2015. As Reclamation and DWR explained in the recent Temporary Urgency Change Petition submitted to the SWRCB,

> Subsequent analysis in a peer review journal using a nonlinear state space model by Polansky et al. (2021) found statistical support for both a negative effect of March through May X2 and Export:Inflow (E:I) ratio on recruitment of delta smelt. Thus the most recent analysis from Polansky et al. (2021) suggests the TUCP could result in negative effects to delta smelt, based on higher March through May X2 under the TUCP and TUCP with DCC options (~88.3 km) and TUCP with Collinsville X2 option (~82.3 km) relative to the base case (~81.1 km).

Reclamation and DWR 2021. While the RDEIR/SDEIS discusses potential impacts of reduced Delta outflow on zooplankton, *see* RDEIR/SDEIS at 11-260 to 11-262, the document completely ignores Polansky et al. 2021 and the adverse impacts from reduced outflow on the recruitment and subsequent abundance of Delta Smelt.

Second, while the RDEIR/SDEIS acknowledges that diversions by the proposed project and alternatives could reduce abundance of zooplankton prey for Delta Smelt in the low salinity zone, it improperly concludes this would not be a significant impact because the changes in abundance of *P. forbesi* would be less than 5 percent. RDEIR/SDEIS at 11-260 to 11-261, 11-266. However, given the dire status of Delta Smelt, even a very small reduction in prey abundance could constitute a significant impact. *See* Cal. Code Regs., tit. 14, § 15065(a)(1). Moreover, in years when Sites Reservoir would divert more water and cause greater reductions in Delta outflow, there is likely to be greater reductions in Delta Smelt prey abundance as a result of the proposed project and alternatives.

Similarly, the RDEIR/SDEIS finds that diversions by the proposed project and alternatives could reduce sediment loading to the Delta by up to 5 percent. RDEIR/SDEIS at 11-265. Reduced turbidity would significantly harm Delta Smelt, but the RDEIR/SDEIS finds that this impact is less than significant, based on the magnitude of the change and potential mitigation measures. *Id.*; *see id*. at 11-266. However, even a small reduction in sediment supply that reduces turbidity in the Delta may be a significant impact given that could further reduce Delta Smelt below self-sustaining levels, Cal. Code Regs., tit. 14, § 15064(a)(1). Moreover, other agencies have previously concluded that any reduction in sediment supply to the Delta and San Francisco Bay should be considered a significant impact. *See* Bay Conservation and Development Commission, comments on the Bay-Delta Conservation Plan, July 29, 2014 (attached hereto as Exhibit 3). In addition, the potential mitigation measure unlawfully defers mitigation, because it does not describe specific performance metrics that would be used. *See id*., Appendix 2D, at 2D-

46 (stating that performance criteria will be established in the future--analysis of sediment entrainment impacts is deferred until after "at least 5 years" of project operation, and implementation of sediment reintroduction is deferred another 5 years, for at least a decade of unmitigated operation). For comparison, Delta Smelt live only 1 year; so this mitigation will not be implemented for at least 10 generations of Delta Smelt. The failure to identify specific performance standards that the mitigation measure must achieve is unlawful. Cal. Code Regs., tit. 14, § 15126.4(a)(1)(B). In addition, the RDEIR/SDEIS fails to evaluate, let alone demonstrate, that such potential mitigation measures are feasible, particularly since prior analyses (by ICF for the California WaterFix project) found that the vast majority of entrained sediment could not be reused. The RDEIR/SDEIS must be revised and recirculated with: (1) an accurate analysis of impacts from sediment entrainment; (2) analysis of the feasibility of sediment mitigation measures; (3) specific mitigation measures and performance standards identified to ensure that impacts are reduced to a less than significant level; and (4) proposed monitoring to evaluate the implementation of mitigation measures and adaptively modify the measures as needed. Developing mitigation measures a decade after the impact is already occurring is unlawful and imposes unacceptable impacts on the multiple endangered species that depend on turbidity in the Estuary.

Finally, the RDEIR/SDEIS relies on an unlawful mitigation measure (FISH-8.1) to address potentially significant impacts to Delta Smelt from water released from Sites Reservoir, which does not describe specific performance criteria to avoid impacts but instead defers development of these performance criteria to a future process. RDEIR/SDEIS at 11-266 to 11-267 ("Dissolved oxygen and temperature criteria for determining effects will be developed in collaboration with the fishery agencies and will maintain existing DO and temperature levels suitable to delta smelt that will not exceed recognized critical physiological thresholds."). The failure to identify specific performance criteria makes this mitigation measure unlawful. Cal. Code Regs., tit. 14, § 15126.4(a)(1)(B).

(G) The RDEIR/SDEIS Fails to Accurately Analyze Environmental Impacts to Fish Below Golden Gate Dam and Sites Dam and Fails to Disclose Potentially Significant Impacts of the Proposed Project

Flows required for maintaining fish in good condition below Golden Gate Dam and Sites Dam have not yet been identified or incorporated into the project design or mitigation measures. The lack of information on Funks Creek and Stone Corral Creek flow needs (fish assemblage, geomorphic flows, etc.) makes it impossible to understand and comment on the proposed project's environmental impacts. Studies have yet to be conducted on basic hydrology and fish needs. RDEIR/SDEIS at 2-38. The RDEIR/SDEIS must be revised to include sufficient information so decision-makers can evaluate if stream ecosystem needs downstream of the reservoir can be met or will be degraded by the project design. Concerns that should be analyzed in a revised environmental document include:

- valve capacities of only 100 cfs (RDEIR/SDEIS at 2D-40), when Stone Corral Creek flows exceeding 500 cfs are common in wet years;
- effects of emergency releases of up to 2,500 cfs on Stone Corral Creek; and
- sediment and fish passage needs, which should be evaluated earlier than "prior to construction of dams" (hydrogeomorphic technical study described on RDEIR/SDEIS at 2D-42) so they can be incorporated into the project design.

We recommend using the tools and following the approach described in the California Environmental Flows Framework (CEFF; https://ceff.ucdavis.edu/) to conduct this analysis. Steps 1-10 of the Framework should inform the RDEIR/SDEIS, including "propose mitigation measures to offset impacts" as described in CEFF Step 10.

(H) The RDEIR/SDEIS Fails to Accurately Analyze Environmental Impacts to Wetlands and Terrestrial Wildlife and Fails to Disclose Significant Impacts of the Proposed Project

(i) The RDEIR/SDEIS Fails to Adequately Analyze Impacts to Wetlands and Terrestrial Wildlife Because the Analysis is Based on Inaccurate Species Distribution Information

The coarse and inaccurate description of the environmental setting with respect to vegetation, wetlands, and wildlife resources, discussed *supra*, undermines the RDEIR/SDEIS's analysis of the proposed project's impacts to these resources. Without an accurate understanding of where specific resources are located, which the RDEIR/SDEIS fails to provide, it is impossible to understand the nature and extent of the project's impacts. Yet those impacts are likely to be profound, among other reasons because 33 special-status wildlife species are likely to occur in the study area. *See* RDEIR/SDEIS at 10-16.

The RDEIR/SDEIS suggests that the inaccurate assessment of impacts is acceptable for two reasons, neither of which is legally valid. First, the RDEIR/SDEIS suggests that, because detailed on-the-ground surveys will occur in the future, the lack of detailed and accurate information in the RDEIR/SDEIS is acceptable:

> After land acquisition and prior to construction actions, the Authority would complete additional biological surveys to confirm mapped habitat types and the presence/absence of biological resources including, but not limited to, special-status species, state and federal waters, sensitive plant communities and other applicable resources identified as sensitive by state, and/or federal agencies and discussed in Chapter 9, Vegetation Resources; Chapter 10, Wildlife Resources; and Chapter 11, Aquatic Biological Resources, of this document. The Authority would use this information regarding occupied habitat to fulfill the permitting and consultation requirements of the federal and state resource agencies (USFWS, CDFW, U.S. Army Corps of Engineers, Central Valley Regional Water Quality Control Board, and State Water Board).

RDEIR/SDEIS at 2-48. However, deferring this important analysis until after the NEPA and CEQA process fails to comport with the foundational informational purposes of those laws and deprives the public of a meaningful opportunity to understand the project's impacts and provide input. *See City of Agoura Hills*, 46 Cal.App.5th at 692-94. For example, the public cannot understand how the project will impact vernal pools and the wildlife they support and cannot suggest alternatives to reduce any impacts because the RDEIR/SDEIS fails to provide accurate information about the location of vernal pools in the project area.

Second, the RDEIR/SDEIS suggests the lack of accurate and detailed information about impacts to vegetation, wetlands, and wildlife is not a problem because the RDEIR/SDEIS overestimates the project's impacts. For example, with respect to special status species, the RDEIR/SDEIS claims that,

> [i]n general, permanent and temporary impacts on potential habitat for special-status species are overestimated because surveys to assess habitat suitability of land cover types could not be conducted in the study area due to access limitations. Consequently, the entirety of the land cover is considered affected even when specific habitat requirements may be absent (e.g., elderberry shrubs, which are host plants for valley elderberry longhorn beetle, in riparian land cover types).

RDEIR/SDEIS at 10-29. Yet providing only an unrealistic overestimate of the project's impacts that is disconnected from reality fails to provide members of the public and decision makers with an accurate understanding of the project and leaves them unable to meaningfully assess alternatives that could reduce the project's impacts in violation of CEQA and NEPA.

(ii) The RDEIR/SDEIS Fails to Adequately Analyze Impacts to Wetlands and Terrestrial Wildlife Because Key Information and Analysis is Missing

The coarse and inaccurate description of the environmental setting and cursory impacts analysis makes it difficult to meaningfully comment on specific information gaps and flaws in the analysis. Nevertheless, it is clear that the impacts analysis suffers from several additional deficiencies.

First, the RDEIR/SDEIS fails to analyze impacts to wildlife that utilize Sacramento Valley wildlife refuges and private lands surrounding the refuges that are enrolled in U.S. Fish and Wildlife Service ("FWS") and Natural Resources Conservation Services ("NRCS") easement programs. The project area is in close proximity to units of the Sacramento National Wildlife Refuge Complex that are essential for migratory birds and other wildlife, including threatened and endangered species. Project construction and operation could impact wildlife that rely on the refuges, including impacts related to construction-related noise and traffic and addition of transmission lines that could impact migratory pathways. Yet the RDEIR/SDEIS does not appear to discuss how the project will impact wildlife that exist within and migrate to and from the refuges. Additionally, as we mentioned in our comments on the 2017 DEIR/DEIS for the project, there are USFWS and NRCS conservation easement lands in and surrounding the project area that are important for migratory birds and other wildlife. Yet the RDEIR/SDEIS fails to identify these easement lands and does not discuss how the wildlife that depend on these important habitats will be impacted by project construction and operation.

Second, the RDEIR/SDEIS's discussion of impacts to particular species is exceedingly cursory and lacking in detail. For example, giant garter snakes are listed under both CESA and the ESA, and they are known to occur in several parts of the project area. Yet for construction impacts from Alternatives 1 and 3, the RDEIR/SDEIS dedicates only one exceedingly brief paragraph to giant garter snake impacts. RDEIR/SDEIS at 10-79. The description is vague and fails to provide basic information about where, when, and how the impacts are expected to occur. Without this basic information, it is not possible to understand the nature and extent of the project's impact, or to suggest alternative approaches that could reduce those impacts. The RDEIR/SDEIS also fails to discuss giant garter snake impacts in the context of FWS's 2017 Recovery Plan for the Giant Garter Snake. Parts of the project area fall with the Colusa Basin Recovery Unit, and the recovery plan describes specific recovery criteria for that unit. *See* Final GGS Recovery Plan at II-15 to 16. Yet the RDEIR/SDEIS does not describe how the proposed project could impede recovery efforts and does not explain how mitigation for giant garter snake impacts will advance the goals that the final recovery plan establishes. Impacts to other wildlife species are discussed in a similarly cursory manner and are lacking details that are essential for understanding and commenting on the project's impacts.

(iii) The RDEIR/SDEIS Fails to Adequately Describe Measures to Completely Avoid Take of Fully Protected Species

The RDEIR/SDEIS discusses likely project impacts to several State fully-protected species, including golden eagles and bald eagles. In its comments on the 2017 DEIR/DEIS, CDFW explained that "[t]ake of fully protected species is unlawful and subject to enforcement under the Fish and Game Code. The only way for a project to obtain incidental take authorization for any fully protected species is through the development of a Natural Community Conservation Plan (NCCP) (Fish and G. Code, § 2800 et seq.)." Accordingly, CDFW "recommend[ed] the DEIR/DEIS include a discussion of potential for take of fully protected species, and identify measures to completely avoid take of these species."

However, for golden eagles and other fully-protected species, the RDEIR/SDEIS indicates that take may occur, and it fails to describe measures that will completely avoid take. For example, the RDEIR/SDEIS describes the potential for mortality of golden eagles, bald eagles, and white-tailed kite through electrocution or collision with new transmission lines but does not explain how the proposed mitigation measures would ensure complete avoidance of mortality or other forms of take. *See, e.g.,* RDEIR/SDEIS at 10-95 to 10-97. Take of fully protected species could also occur through use of rodenticides, disturbances of nesting sites, and other means, and the RDEIR/SDEIS does not make clear how these impacts would be fully avoided.

(iv) The RDEIR/SDEIS Fails to Propose Adequate Mitigation Measures for Significant Impacts to Wetlands and Terrestrial Wildlife

The RDEIR/SDEIS makes clear that proposed project is likely to have significant, negative impacts on a substantial number of wildlife species, including golden eagles, bald eagles, Western pond turtles, and giant garter snakes, among many others. Because the impacts to these species are potentially significant, the SDEIR/SDEIS must describe feasible mitigation measures that could minimize the significant adverse impacts. CEQA Guidelines § 15126.4(a)(1). Generally, the formulation of mitigation measures may not be deferred until a later time. *Id.* § 15126.4(a)(1)(B). If an agency chooses to defer formulation of specific measures in a CEQA document, it must "commit itself to specific performance criteria for evaluating the efficacy of the measures implemented." *POET, LLC v. California Air Res. Bd.*, 217 Cal. App. 4th 1214, 737-38 (2013). The mitigation measures described in the RDEIR/SDEIS fail to meet these standards and the document's claims that significant impacts will be mitigated to a less-than-significant level are unsubstantiated.

First, the RDEIR/SDEIS impermissibly defers formulation of mitigation measures. This problem is created, at least in part, by the document's failure to accurately describe the environmental setting and its relatedly inadequate analysis of impacts to vegetation, wetlands, and wildlife. In fact, for most wildlife species, the RDEIR/SDEIS includes analysis of the project's impacts as a mitigation measure. *See, e.g.*, Mitigation Measure WILD-1.1, RDEIR/SDEIS at 10-37 ("Once property access is granted and prior to the start of construction, the Authority will retain qualified biologists to assess habitat suitability and conduct surveys for vernal pool branchiopods in the Project area . . . ."). By impermissibly deferring the impacts analysis until the project's mitigation phase, the RDEIR/SDEIS fails to include information about the nature and extent of impacts to vegetation, wetlands, and wildlife, which makes it impossible to describe how impacts will be mitigated with any particularity.

Second, proposed mitigation ratios seem inadequate to reduce the project's impacts to a less-than-significant level. For example, the RDEIR/SDEIS appears to propose a 1:1 mitigation ratio for vernal pools. RDEIR/SDEIS at 9-47. For these rare and ecologically important wetlands, and in light of uncertainties surrounding the efficacy of vernal pool mitigation, this mitigation ratio seems substantially too low. Further, for occupied vernal pool branchiopod habitat, the RDEIR/SDEIS proposes a 2:1 mitigation ratio. RDEIR/SDEIS at 10-38. And "[f]or non-mitigation bank compensation, the performance standard for occupancy of the created/restored pools by listed vernal pool branchiopods is 5% of the total number of created/restored pools supporting listed vernal pool branchiopods over a 10-year monitoring period." RDEIR/SDEIS at 10-39. A 2:1 mitigation ratio for vernal pools occupied by ESA-listed wildlife is too low at the outset, and setting a performance standard for occupancy of restored or created pools at only 5 percent is unreasonable.[13] With such a low mitigation ratio and low expectation of success with

[13] Mitigation Measure WILD-1.3 is also confusing. It states that "[d]irect and indirect effects on occupied habitat will be mitigated by preserving occupied habitat at a 2:1 ratio (habitat preserved : habitat directly or indirectly affected) or by an equivalent or greater amount as determined during ESA Section 7 consultation with USFWS. In addition, direct effects on occupied habitat will be mitigated by creating or preserving occupied habitat at a 1:1 ratio (habitat created : habitat directly affected) or by an equivalent or greater amount as determined during ESA Section 7 consultation with USFWS." RDEIR/SDEIS at 10-38. Does this mean that, for direct

respect to occupancy, this measure is inadequate to minimize a significant, adverse impacts. The same combination of unacceptably low mitigation ratios and low performance standards emerges for several other species. *See, e.g.*, RDEIR/SDEIS at 10-48 (Mitigation Measure WILD-1.8 includes a mitigation ratio for elderberry longhorn beetle habitat at 3:1 for riparian habitat and 1:1 for non-riparian habitat, and establishes a performance standard of 60 percent survival over a five-year period for initial elderberry and native associate plantings).

Third, some mitigation measures are so vague that it is unclear whether the protective measures will actually be implemented. For example, for giant garter snakes, the RDEIR/SDEIS states that,

> [w]hen possible, all construction activity in suitable giant gartersnake aquatic habitat, and upland habitat within 200 feet of suitable aquatic habitat, will be conducted during the snake's active period (between May 1 and October 1). For work that cannot be conducted between May 1 and October 1, additional protective measures, such as installing exclusion fencing or additional biological monitoring, or other measures determined during consultation with USFWS and CDFW, will be implemented.

RDEIR/SDEIS at 10-80. What does "when possible" mean? Must construction occur during the active season so long as it is physically possible? Or can construction occur outside of the snake's active period to avoid additional costs or inconvenience, which would be problematic? For work that must occur during the snake's inactive season, a few examples of possible protective measures are mentioned, but formulation of a plan for minimizing impacts to this threatened species is improperly deferred until a later date.

(I) <u>The RDEIR/SDEIS Fails to Accurately Analyze Cumulative Impacts and Fails to Disclose that the Project Will Cause Cumulatively Significant Impacts</u>

Finally, the RDEIR/SDEIS fails to acknowledge that the impacts of the proposed project and alternatives are cumulatively significant. The RDEIR/SDEIS admits that despite requirements of the ESA and CESA, "the cumulative impact of past modifications and other past and present projects has contributed to the continuing decline in Central Valley and Delta fish populations and their habitats." RDEIR/SDEIS at 31-34. However, the RDEIR/SDEIS fails to conclude that "[t]his overall cumulative impact is significant," unlike DWR's final CEQA document for long term operations of the State Water Project which included the same sentence. *See* DWR, Final EIR, at 4-318 ("Despite these protections, the cumulative impact of past Delta modifications and other past and present projects has contributed to the continuing decline in Delta fish populations and habitat of protected species. This overall cumulative impact is significant.").

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effects on occupied habitat, the mitigation ratio is actually 3:1, with an opportunity for one acre of mitigation to occur through creation of occupied habitat?

Here, the RDEIR/SDEIS asserts that the proposed alternatives 1 and 3 "would not result in an incremental contribution to impacts on aquatic biological resources in the Sacramento River, its major tributaries and flood bypasses, and the Delta," *id*. at 3-36, because the proposed project and alternatives would only cause small changes less than 2 percent, *see id*. at 3-38. However, as shown above the proposed project and alternatives, even with the proposed mitigation measures, would cause significant impacts, and these impacts would cumulatively also be significant. Moreover, give the dire status of native fish populations, particularly Delta Smelt, winter-run Chinook salmon, Longfin Smelt, and other species listed under CESA and/or the ESA, the proposed project's contribution to cumulative impacts are likely to be significant.

For example, state and federal agencies have identified the need to significantly increase Delta outflow in the winter and spring months to prevent the extinction of Longfin Smelt, Delta Smelt, and other species (*see*, *e.g.*, the State Water Board's 2010 Public Trust flows report, the State Water Board's 2018 Framework), but the proposed project and alternatives would reduce Delta outflow in the winter and spring months. Even assuming for the sake of argument that these reductions in Delta outflow would not cause significant impacts from the proposed project by itself, the reduction in Delta outflow during these months would be cumulatively significant and the proposed project would make a considerable contribution to the reduction in Delta outflow. *See, e.g*., RDEIR/SDEIS at Table 5B3-5-1a to Table 5B3-5-1c (showing that Alternative 1A would reduce Delta outflow in March of Above Normal years by more than 5 percent, from 23,170 cfs to 21,860 cfs).

The RDEIR/SDEIS must be revised to adequately address the cumulative impacts of the proposed project and alternatives.

VII. Recirculation of a Revised EIS/EIR is Required

Because of the above-described deficiencies and because the RDEIR/SDEIS fails to disclose that the project and alternatives will cause significant environmental impacts and that the proposed mitigation measures are inadequate to reduce impacts to a less than significant level, recirculation of a revised RDEIR/SDEIS is legally required. *See, e.g., Vineyard Area Citizens for Responsible Growth, Inc. v. City of Rancho Cordova*, 40 Cal.4th 412, 447-449 (2007).

VIII. Conclusion

The RDEIR/SDEIS clearly fails to comply with the requirements of CEQA and NEPA. Among other flaws, it fails to consider a reasonable range of alternatives, fails to articulate a stable and accurate project description, fails to adequately account for climate change, fails to adequately analyze impacts to wide range of aquatic and terrestrial species, and fails to propose mitigation to reduce significant impacts to a less-than-significant level. For these reasons and because the RDEIR/SDEIS is riddled with significant errors, inadequacies, and omissions, the agencies must make substantial revisions to the document and recirculate the revised document for public review and comment.

Thank you for considering our comments.

Sincerely,

Doug Obegi
Natural Resources Defense Council

Rachel Zwillinger
Defenders of Wildlife

Jonathan Rosenfield
San Francisco Baykeeper

John McManus
Golden State Salmon Association

Gary Bobker
The Bay Institute

Barbara Barrigan-Parrilla
Restore the Delta

Jonas Minton
Planning and Conservation League

Mark Rockwell
Northern California Council
Fly Fishers International

Chris Shutes
California Sportfishing Protection Alliance

Ronald Stork
Friends of the River

Cindy Charles
Golden West Women Flyfishers

Mike Conroy
Pacific Coast Federation of Fishermen's Associations &
Institute for Fisheries Resources

Erin Woolley
Sierra Club California

Regina Chichizola
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EXHIBIT 1

Sites Reservoir Project

2021 Water Estimate

May 28, 2021

Agenda

- 2009 to 2020 Analysis
- Water Available to Whom, What Timeframe, and What Purpose
- Reclamation's Operation of the Shasta-Trinity Division
- Other Topics From the Group

2009 to 2020 Analysis

Sites

Overview

- Objective
  - Evaluated potential Sites Project operations for recent years not covered by the CalSim II simulation period
- Approach
  - Simple mass balance spreadsheet calculations
  - Estimated annual Sites Project diversion to fill and release using correlations between modeled results (RDEIR/SDEIS Alternative 1B) and historical information
- Results
  - Through the relatively dry period of 2009 – 2020, the average annual Sites Project fill and release values are 269 TAF and 216 TAF respectively
  - Average EOY September storage in Sites Project is 510 TAF

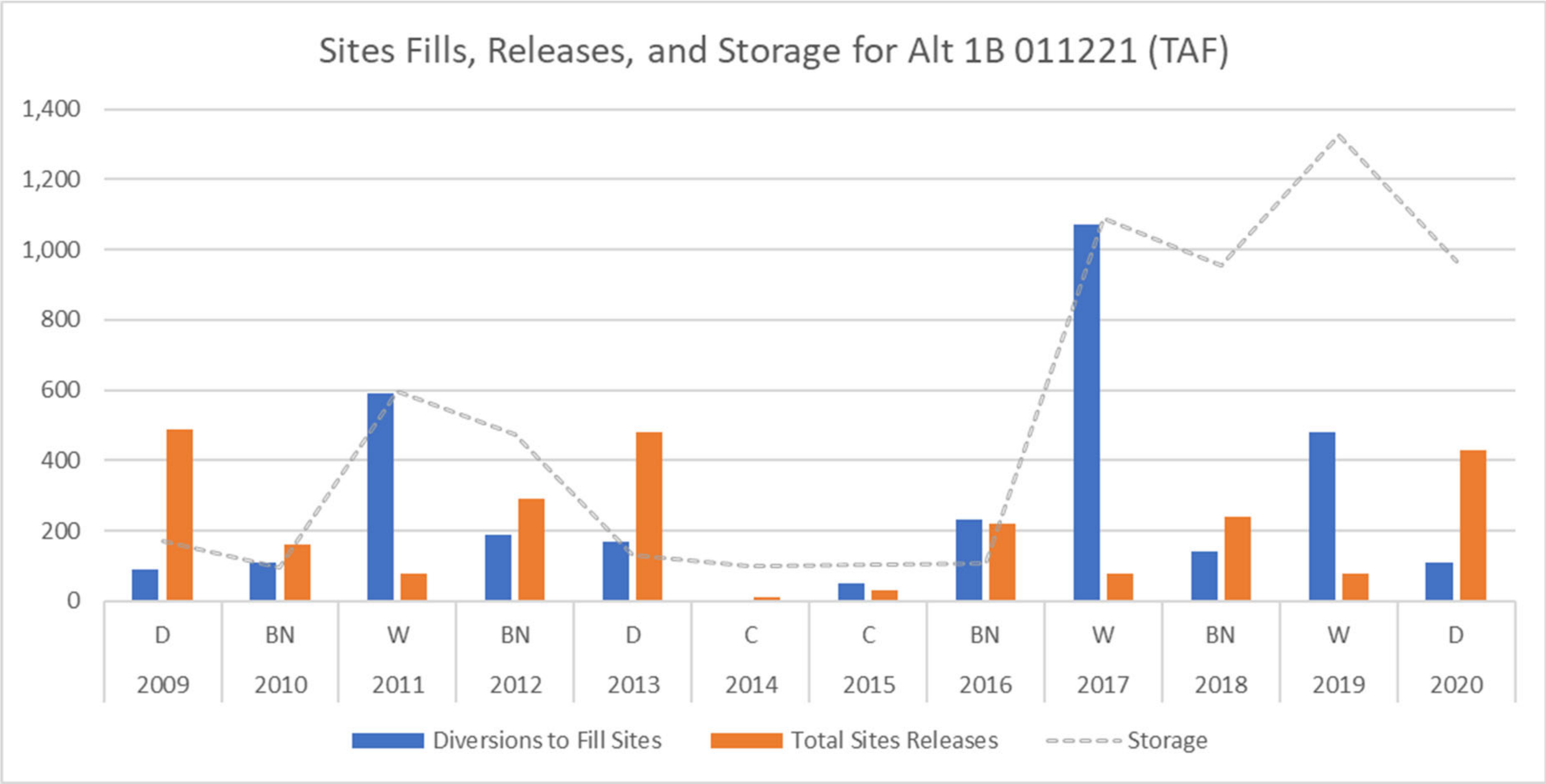
Analysis Performed

- Simple mass balance spreadsheet calculations
- Storage capacity of 1.5 MAF (Alternative 1B)
- Period of record analyzed 2009 – 2020
- Starting Storage for WY 2009 assumed at 600 TAF
- Sites Project Fills for WY 2009 – 2018 were estimated based on historical flow and water operations information (values determined for Alternative 1B using the Daily Divertible & Storable Flow Tool)
- Daily Divertible & Storable Flow Tool
  - Developed in 2018 to estimate the daily diversion potential for the Sites Project in WY 2009 – 2018 and potential effects of diversions on river hydrographs based on observed flow availability
  - Assumes Sites Project intake/conveyance constraints and diversion criteria
  - Tool simulates each year as a separate event and does not include storage or release operation

Analysis Performed

- Sites Project fills for WY 2019 – 2020 were estimated based on regression between historical full natural flows for Sacramento River at Bend Bridge and CalSim II results for diversions to fill Sites Project (Alt 1B)
- Sites Project releases are estimated based on a "similar years" relationship developed from CalSim II results for total releases from the Sites Project (Alt 1B) using historical Sacramento Valley Water Supply Index as the indicator of wetness
- Sites Project fills are constrained by available storage capacity based on annual mass balance calculations
- Sites Project releases are constrained to not exceed storage availability based on annual mass balance calculations (previous month's storage plus the current month's fill minus dead pool storage)

Results



- Results show Sites Project operations for generally dry conditions
- Project accrues fills in wet years to make releases during drier years

Results – Thousand AF

Water Year	Year Type	Diversions to Fill Sites	Total Sites Releases	Total Sites Storage (End of Water Year)
2009	D	90	490	170
2010	BN	110	160	100
2011	W	590	80	600
2012	BN	190	290	470
2013	D	170	480	130
2014	C	0	20	100
2015	C	50	30	110
2016	BN	230	220	110
2017	W	1,070	80	1,090
2018	BN	140	240	950
2019	W	480	80	1,320
2020	D	110	430	970
Average		269	216	510

Limitations

- Sites Project operations for the last twelve years are not evaluated at the same level of rigor as done in CalSim II
- Project fill quantities for 2009 – 2018 are developed rigorously, accurately reflecting hydrologic and operation constraints, however 2019 – 2020 values are approximate
- Project release quantities are approximate and have not been evaluated for consideration of benefits, schedules, and associated operations constraints

Water Available to Whom, What Timeframe, and What Purpose

Sites

Water Available to Whom?

- To all Sites Storage Partners based on:
  - Amount of water in their Storage Allocation
  - How much they request to be released
- Storage Principles Adopted in April 2021
  - Membership / participation (including State and Feds) based on a share of storage
    - For example, we expect the State to have about 244,000 AF STORAGE in the 1.5 MAF reservoir under Prop 1 or about 17.68% of the active storage
    - NOT an AF of water based allocation like the CVP and SWP

Water Available to Whom? (cont)

- Each member allocated a proportion of diversions
  - For example, if 275,000 AF of water is able to be diverted to Sites Reservoir in any one year = 20% of the total allocated storage space in Sites Reservoir (275,000/1.38 MAF = 20%)
  - Each Storage Partner would receive an amount of water equal to 20% of their Storage Allocation, unless the Storage Partner has opted out or their Storage Allocation is full
  - Example assumes a 1.5 MAF reservoir with about 120,000 AF allocated to dead pool
- Each member manages their Storage Allocation based on their needs

What Timeframe?

- Would work with CVP, SWP and State Board to determine
  - Possible environmental uses have more flexibility
    - Shasta exchange to help manage/extend cold water pool
      - Sites delivers to the TC and GCID customers in the spring, reducing releases from Shasta
      - Water that otherwise would have been released is held in Shasta
      - This water is then released later in the calendar year to benefit cold water species
    - Prop 1 water could be flexibly used based on State's request
  - South of Delta member water would move with the rest of transfer water in a year like 2021

What Purpose?

- Whatever purpose our members choose –
  - We are not limiting them beyond the limitations our water rights, Biological Opinions, ITP permits, and CA law

Reclamation's Operation of the Shasta-Trinity Division

Sites

Reclamation's Operations of Shasta-Trinity

- Shasta-Trinity Division would continue to operate under all of the same obligations that exist today
  - Trinity River Restoration ROD
  - Fall flow action ROD
  - 1959 Contract
  - State Water Board orders
  - Etc
- Reclamation's CVP water rights DO NOT include Sites as a Place of Use
  - Reclamation could not put CVP water in Sites without modifying its water rights
- Sites CANNOT request modifying the CVP water rights in our water right application
  - Sites is requesting to put Sites water in Sites – NOT CVP water in Sites

Other Topics from the Group

Sites

Thank you!

Sites

Sites

EXHIBIT 2

CDWR's modeling of the San Francisco Estuary Longfin Smelt population to evaluate new operational plans for the State Water Project and Central Valley Project: Critique

By Jonathan Rosenfield, Ph.D.,
San Francisco Baykeeper, Senior Scientist

with modeling assistance from
UC Davis Otolith Geochemistry and Fish Ecology Laboratory

Introduction

Longfin Smelt were once among the most abundant resident fish species in the San Francisco Bay Estuary (SFE). This population has experienced severe declines since sampling of the SFE's pelagic fish assemblage began in the late 1960's, including substantial declines in recent years. Other coastal populations of this species in California display low abundance and may have declined (CDFW 2009). Recent molecular evidence suggests that the SFE population may serve as a source of both genetic material and colonists for extant populations and unoccupied watersheds to the north (M. Finger. Personal communication, November 7, 2019). Thus, rapid reversal of declines in the SFE Longfin Smelt (LFS) population are important to the ecology of the SFE and may also be essential to the maintenance of this species throughout California.

Longfin Smelt are listed as a "threatened" species under the California Endangered Species Act. The SFE population of this species is "warranted but precluded" for federal listing. Given the well-established, strong, and persistent relationship between Delta outflow and Longfin Smelt abundance and productivity (Kimmerer 2002; Rosenfield and Baxter 2007. Kimmerer et al. 2009; Rosenfield 2010; Thomson 2010; Nobriga and Rosenfield 2016), current proposals to re-operate the Central Valley Project (2019 NMFS BiOp; 2019 USFWS BiOp; Reclamation 2019) and the State Water Project (CDWR 2019a,b) to increase exports and decrease Delta Outflow are likely to have a negative effect on the SFE Longfin Smelt population Thus, CDFW needs tools that can help the Department evaluate the effects of Project operations on LFS viability.

Nobriga and Rosenfield's population model

Nobriga and Rosenfield (2016) developed a quantitative population model (N&R Model[1]) for the SFE LFS population. The purpose of this model was to "*evaluate alternative conceptual models of Longfin Smelt population dynamics to better understand the forces that may constrain the species' productivity during different phases of its life cycle*." (Nobriga and Rosenfield 2016 at p. 44). Contrasting variants of a generalizable population model were parameterized using data from IEP's San Francisco Bay Study (Bay Study). These alternative models were evaluated for their ability to parsimoniously recreate historical LFS population dynamics, as reflected in the Fall Midwater Trawl (FWMT) time series. Results indicated that a

[1] For clarity, I distinguish here between the research presented in Nobriga and Rosenfield (2016) versus the best-fit model variant ("2abc") developed in that paper by referring to the latter as "N&R Model". Furthermore, I distinguish between the N&R Model and the computer code intended to recreate that model -- developed by ICF and MWD – by referring to the computer code as the "R-script".

two-stage population model with density-dependent terms for both recruits-per-spawner and spawners-per-recruit was superior to other conceptual models of local population dynamics that they studied.

Consistent with existing conceptual models and statistical analyses (Jassby et al. 1995; Kimmerer 2002; Rosenfield and Baxter 2007; Kimmerer et al. 2009; Rosenfield 2010; Thomson et al. 2010; Mac Nally et al. 2010), Nobriga and Rosenfield (2016) found that the effect of freshwater flow on relative abundance was statistically powerful and persistent – no other environmental variables contributed to the best-fit model. Nobriga and Rosenfield (2016) suggested that juvenile survival declined through the time series, but they could not demonstrate this conclusively or discriminate between a gradual, long-term decline in survival and a step-change in juvenile survival occurring in 1991.

Applying the N&R Model to compare outcomes among management alternatives

The N&R model was not designed or intended to be a predictive model of LFS population response to alternative management regimes. However, the model can be adapted to compare the relative impact of different management scenarios going forward. Properly applied, the N&R model can estimate (1) the relative differences in expected abundance among alternative operational scenarios; (2) the relative frequency of population growth under those scenarios; and (3) the relative frequency of quasi-extinction (a measure of extreme conservation risk) across scenarios. Also, certain aspects of the model that were of little consequence to Nobriga and Rosenfield's (2016) investigation could have important effects on model predictions in the context of comparing flow scenarios – the justification for these features should be investigated (see footnote 5, below).

Comparing outcomes from different management alternatives with the N&R model

Analyses of the outputs of the N&R model (or any quantitative model) must be valid and rigorous, especially when those outputs are used to evaluate proposed management alternatives. The use of the N&R model to compare alternative operational scenarios requires a different approach to analysis of model outputs than Nobriga and Rosenfield (2016) applied during their screening of conceptual models of LFS population biology. Because the N&R model was not designed to be predictive (in fact, it is known to under-estimate FMWT abundance indices; Nobriga and Rosenfield 2016), model outputs should be used for comparative purposes, to understand the relative difference between treatments. In this case, the appropriate basis for statistical comparisons are *differences* between alternatives *within* model runs (i.e., a paired analysis). By definition, sources of variance that are not related to Delta flow (e.g., randomization of model parameters or time trends that are not related to operational alternatives) should not affect the predicted *differences* among operational alternatives that only change Delta outflow. Consideration of non-flow sources of variance is not appropriate for evaluating the magnitude of differences among operational alternatives. Thus, even though the N&R model generates high variances in abundance indices under each operational alternative within model runs, this variance is of little consequence to the comparison between alternative operational scenarios. On the other hand, the model's predictions regarding the effect of changes to Delta outflow are expected to be highly consistent, all other non-flow related parameters being equal.

ICF/MWD R-script version of the N&R Model

In 2018, ICF International and Metropolitan Water District developed a version of the N&R model coded in R (the "R-script"; ICF/MWD, July 2, 2018). The R-script was originally developed to analyze the effects of the CA WaterFix project. Several other variants of this model exist, including one that formed the basis of DWR's 2018 CESA ITP application (CDWR 2018); another that produced results found in DWR's 2019 CESA ITP application (CDWR 2019a), and one used to support the CEQA analysis of proposed SWP re-operation alternatives (CDWR 2019c)[2]. Some of these variants compare LFS population dynamics under alternative flow regimes that include historical Net Delta Outflow Index (NDOI), NDOI ±10%, NDOI ±5%, and NDOI + SWP exports (i.e., elimination of SWP exports). I had access to a variant of the R-script that performed this kind of comparison and I asked Dr. Levi Lewis, from UC Davis, to determine how it calculated and presented outputs.

Results from the R-Script: Recruits-per-Spawner and Relative Abundance

The R-script compares alternatives based on modeled median outcomes of each operational alternative within hydrological year-types. Comparing the predicted median RPS or median predicted abundance index under different flow alternatives is statistically questionable as is comparing those results within water-year type. The median is not a stable metric in this context; it likely represents a single year in each replicate and in each alternative*year-type combination. This single year may vary across replicates and alternative*year-type combinations, so comparing medians across alternatives does not necessarily provide a valid comparison of expected population performance in any given year. Also, the median is intended to reflect the central tendency ("average" or "typical" value) of a population. But, median abundance does not represent a "typical" result when the population is known to be declining. The SFE LFS population has declined by orders of magnitude over the past several decades and is very responsive to Delta outflows, which are highly variable; there is no "typical" RPS or abundance in this situation, the median depends on the starting value, the length of the period studied, and the sequence of Delta hydrologies.

[2] I have not been able to identify metadata that would indicate which of these model variants is the most recent and what, if any, differences exist among the variants. The Bay Institute attempted to run the DWR variant of the R-script unsuccessfully (B. Bennett, personal communication). TBI contacted one of the model's authors (C. Phyliss) for assistance and received some modifications to the code in mid-June 2019. TBI passed this model revision to me but it still did not function until small modifications were made to (a) fix a miss-specified selection and (b) source all of the function scripts directly; (Levi Lewis, personal communication, December 2019). I make no claim that this version of the R-script is identical to other variants; however, like the original R-script, it does appear to recreate some of Nobriga and Rosenfield's (2016) results. Model results presented here are intended to illustrate general patterns among operational variants and presentation flaws (which appear common to all the variants I have seen) that indicate invalid statistical comparisons.

Furthermore, it is not appropriate statistically to compare medians (or differences between medians) to estimates of variance around the mean (e.g., standard error); the ITP makes this mistake (CDFW 2019a e.g., footnote 2 of Table 4-10 at p. 4-59[3]), as do all the previous applications of the ICF/MWD R-script that I have reviewed. This error is particularly misleading when medians and mean values are widely divergent, as they are in the case of the R-script's projections of LFS abundance (Figure 1). If the median values are much smaller than the mean values (as they are in this case), then dividing the median by the error around the mean will erroneously suggest that the difference in medians is "small" relative to the variance (see, for example, CDWR 2019a e.g., at p. 4-57).

Not only does the ITP (and other applications of the R-script) compare the wrong estimate of differences between alternatives to the wrong estimate of variance, the R-script grossly overestimates this variance by incorporating sources of variability that are not relevant to the comparison of operational alternatives (e.g., CDWR 2019a e.g., at p. 4-57). The R-script does not appear to track the differences in predicted recruits-per spawner (RPS) or abundance indices among model variants *within* model runs (randomized replicates). Instead, the R-script lumps together the results for each alternative across model runs (replicates) for all years in a water-year type. This conflates several sources of variance, including that associated with variation in flow (which is very large, even within water year types, Figure 2), randomization of non-flow related parameters (e.g., density dependence), and the orders-of-magnitude historical decline in the LFS population. Variance due to these sources is not related to that caused by *differences* among flow alternatives and it is inappropriate to imply that differences among the alternatives are small because the variance in model outputs is artifically high.

The R-script displays modelled outputs using pre-set graphics (i.e., the graphics are part of the script). These graphics are extraordinarily misleading. The graphics produced in the ITP and ICF/MWD (2018) illustrate the underlying flaw in the way that the R-script estimates variance for the alternatives and compares the alternatives. For example, we know from Table 4-10 of the ITP (also Table 4-12) that decreases in Delta outflow under the proposed project lead to consistent decreases in median abundance; yet, the decline is difficult to see because it is compared to an estimate of variance that has nothing to do with the *differences* between alternatives (Figure 3)[4]. I was not able to make the R-script run a paired comparison of alternatives, but I was able to determine the relative size of the differences predicted among alternatives considered by this R-script variant.

[3] The approach described in the table footnote is inappropriate, in general. In particular, the decision to divide "by the Existing 95% confidence interval" is ambiguous, arbitrary, and misleading. The 95% confidence interval is roughly twice as large as the denominator value used in a t-test and other standard statistics (i.e., 1 standard deviation), so, use of the "95% confidence interval" has the effect of making the difference in medians seem even "smaller" compared to the variance.

Scaling the differences among alternatives in water-year median recruitment as a percentage change from median recruitment under the "NDOI" scenario allows one to see the relative magnitude of the effect of different alternatives; this is the essence of what it means to compare alternatives. When the erroneous error estimates described above are removed from the graphics, the R-script output reveals that the operational alternatives will produce large proportional changes in recruitment (Figure 4, bottom panel). In fact, the proportional changes in recruitment are larger than the proportional changes in flow represented by the operational alternatives (Figure 5). In other words, the population response to changing Delta outflow is disproportionately high. The precise median values generated by the R-script are unimportant in this context (and, as described above, the median is a suspect metric); what is relevant is that median recruitment is higher than the status quo under alternatives with higher Delta outflows (NDOI + 5%, NDOI +10%, and NDOI + SWP) and lower than the status quo in alternatives with lower flows. Predicted increases in median recruitment under the NDOI + SWP alternative (Net Delta Outflow equals actual NDOI for a given year plus SWP exports that year) as compared to NDOI alone were 9%, 36%, 25%, 30%, and 34% in wet[5], above normal, below normal, dry, and

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[5] The lower percentage increase related to adding flows in wet years is counterintuitive and may not be justified. Where the R-script predicts counter-intuitive or largely unprecedented outcomes, the proper approach is to investigate what model attributes drive those outcomes and then explore the basis for those elements. Here, the counterintuitive predictions are likely linked to assumptions underlying two functions in the N&R model; these same two functions are likely responsible for Nobriga and Rosenfield's findings that their model was (a) "too strongly density dependent" and (b) underpredicted the historical FMWT time series. In the context of evaluating supplementing Delta outflows during very wet years, the strength of assumptions underlying these functions should be investigated.

(1) Both the N&R model/R-script assume a "Ricker" density dependence function – this is a very strong form of density dependence. Nobriga and Rosenfield (2016) did not explore different forms of the density dependent function (e.g., Beverton-Holt) because (a) finding the best representation of density-dependence was not necessary to their research and (b) there were not sufficient data to discriminate among density-dependent functions. The Ricker term in the N&R model may artificially reduce the difference between flow alternatives when LFS abundance is relatively high, as it is following wet years – i.e., the Ricker term is an equalizer, but there is not sufficient evidence to know whether this degree of density dependence occurs in nature.

(2) The N&R model describes the relationship between recruits-per-spawner (RPS) and Delta outflow as a quadratic equation -- this causes RPS to decline at extremely high Delta outflows (Figure 6). As a result, the model sometimes predicts declines in abundance during very wet years and declines for operational alternatives that increase Delta outflows in very wet years (e.g., in 2017). But empirical data reveal high variance of RPS at high flows and the decision to use a quadratic RPS-flow relationship (as opposed to a linear relationship, for example) is driven by only one year in the data set (1983; Figure 6, lower panel). Again, Nobriga and Rosenfield (2016) could not investigate the best shape of the RPS-flow relationship because of limited data under very high flow conditions. Correcting or at least describing this function (e.g., by bounding it with results of a sensitivity analysis) will improve understanding of how the population behaves under different flow scenarios.

Across a vast range of flows, the N&R model identifies large population-level benefits to increasing outflow; these results are consistent with empirical observations (i.e., the actual data from various fish population monitoring programs). If further investigation reveals that the two features of the N&R model identified above are justified, such that the R-script predicts declines in LFS abundance when additional flows are added to already very high Delta outflows (e.g., NDOI+SWP in a year like 2017), then DFW should consider this specific finding as it evaluates SWP and CVP operations *in years with very high outflows*.

critical year types, respectively. Given that population size in one generation affects population size in the next generation (Nobriga and Rosenfield 2016), these differences among alternatives would be expected to compound over time (until the system's carrying capacity is reached).

Results from the R-script: Quasi-Extinction

The difference in extinction probabilities across flow management alternatives has obvious relevance for evaluating the effects of alternative operational scenarios on LFS conservation status. The R-script attempts to compare alternative futures by assessing the rate of LFS quasi-extinction using the N&R model. This is an entirely different exercise than Nobriga and Rosenfield (2016) presented; they used quasi-extinction only to assess the ability of different models to recreate a known data series. The question CDWR asks the R-script to explore (how often is population abundance expected to drop below a level of extreme concern, aka "quasi-extinction"?) requires a different approach to the quasi-extinction frequency metric. For example, the "seed" value employed in the R-script is many times higher than recent index values for LFS. Because it overestimates the starting population, the R-script will tend to underestimate quasi-extinction frequency. This may generate the erroneous impression that the current LFS population is not at grave risk of extinction. Also, Nobriga and Rosenfield (2016) defined quasi-extinction as $FMWT_{LFSindex}$= 1 because they wanted to evaluate model stability. But, the R-script is trying to evaluate conservation status of the LFS population, so hire thresholds of quasi-extinction thresholds (FMWT >1) are warranted. Using a quasi-extinction threshold value that is relevant to DFW's management responsibilities will result in higher rates of predicted quasi-extinction.

As with the evaluation of predicted future abundance under different operational alternatives, the key comparison of interest in this case is the *relative difference* in quasi-extinction rates among scenarios. Regardless of adjustments to model seed or quasi-extinction threshold values, the R-script is only capable of describing *relative differences* in the frequency of extinction. ICF/MWD (2018) compares the proportional frequency of quasi-extinction under various flow alternatives rather than presenting the *difference* in quasi-extinction rates among alternatives. Again, in order to compare differences in the relative likelihood of extinction (or quasi-extinction), a paired analysis must be employed.

Performing a valid analysis of quasi-extinction probabilities across management scenarios will require adjustments to the R-script described in this appendix and to its quasi-extinction tracker, in particular. To be clear, recent analysis by The Bay Institute confirms that the probability of extirpation of the SFE LFS population is extremely high (see attachment to NRDC 2020), even absent the additional adverse impacts of proposed SWP.

Despite these problems with the ICF/MWD analysis of quasi-extinction it is possible to illustrate the proper application of the modeled quasi-extinction rate. I compared the R-script's quasi-extinction estimate for each operational alternative to the "background" quasi-extinction rate represented by the NDOI scenario. The results indicate that quasi-extinction rates are ~11%

higher in the “NDOI minus 5%” flow scenario (Figure 5). This is a large increase to the probability of extinction, which is already very high.

Summary

The major analytical issues identified above notwithstanding, the R-script analyses available to me at this time reveals that the flow scenarios under consideration generate substantial differences in LFS productivity (RPS), abundance, and rates of quasi-extinction. In general, scenarios with lower Delta outflows, such as those considered in CDWR 2019a and 2019c, result in lower RPS, lower recruitment, and higher probability of extinction. Modeling reveals that the effect of changing flows produces a disproportionate response in recruitment of Longfin Smelt. This outcome is not surprising because Delta outflow is the only environmental variable that corresponds strongly to LFS population dynamics (Jassby et al. 1995; Kimmerer 2002; Rosenfield and Baxter 2007; CDFG 2010; Mac Nally 2010; Thomson 2010; Nobriga and Rosenfield 2016) and Delta outflow is the only environmental variable that warranted inclusion in Nobriga and Rosenfield’s (2016) best fit model (the N&R Model).

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Figures

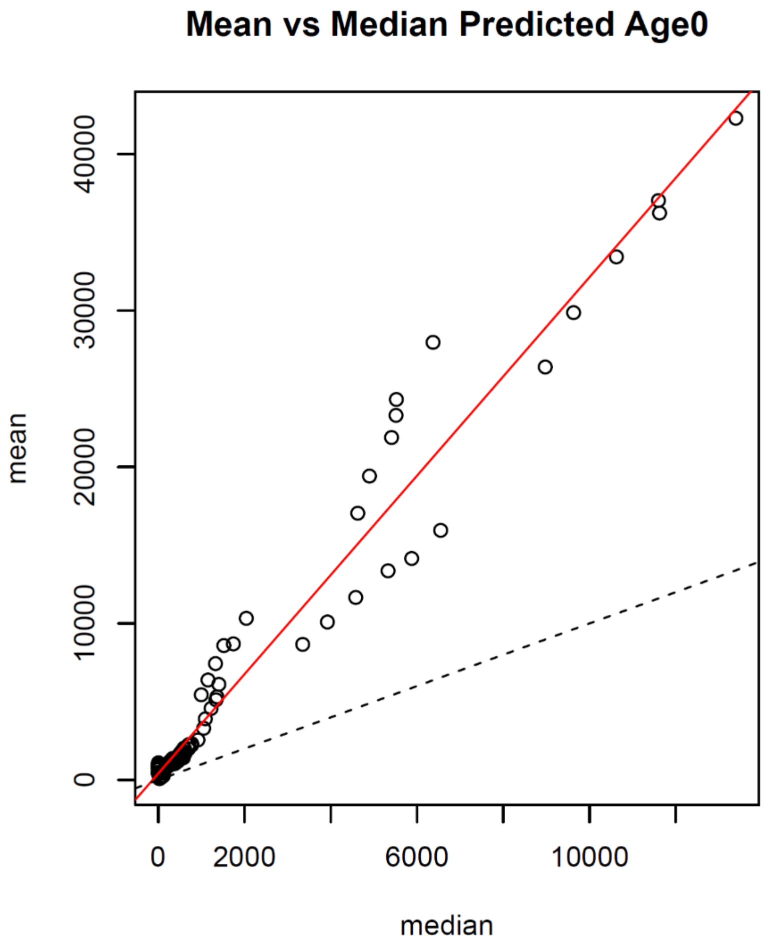


Figure 1: Median versus mean predicted Age 0 Longfin Smelt abundance as projected by the ICF/MWD 2018 R-script. The red-line is the best fit relationship between median and mean values; the dashed line represents a 1-to1 correspondence between the two types of average. Note that mean values modelled by the R-script are many times larger than corresponding median projections.

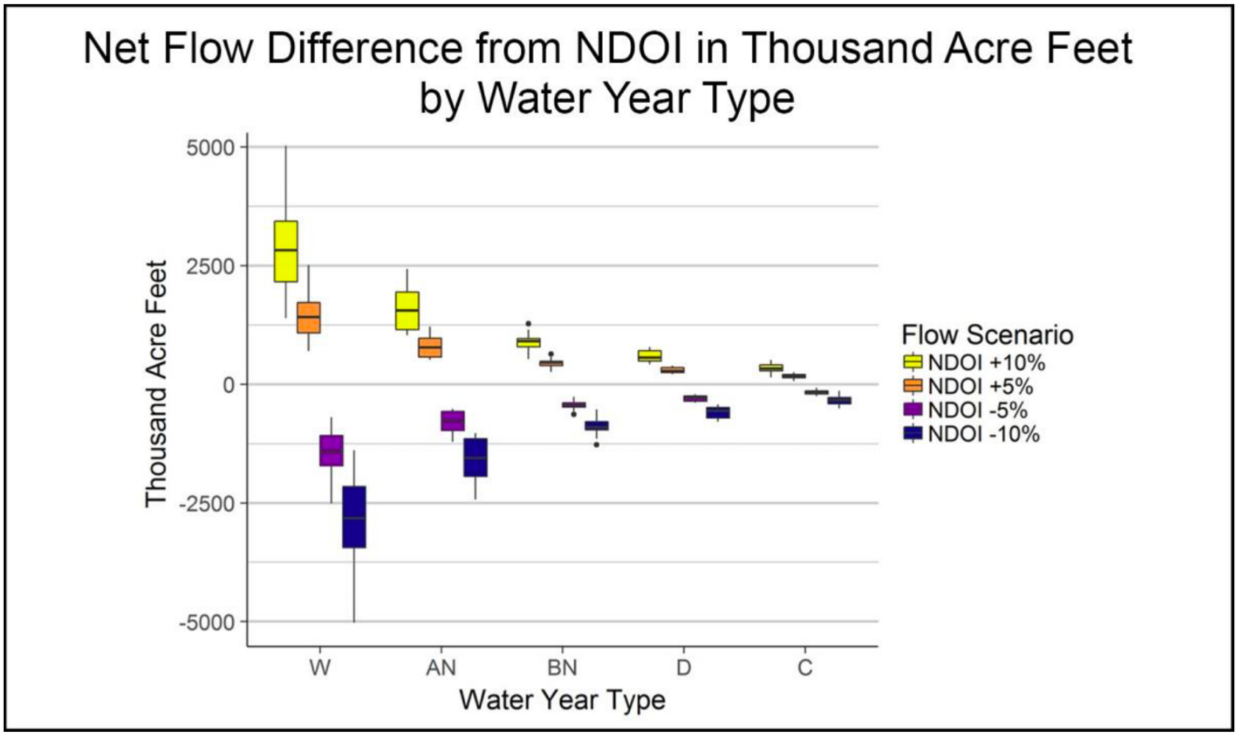
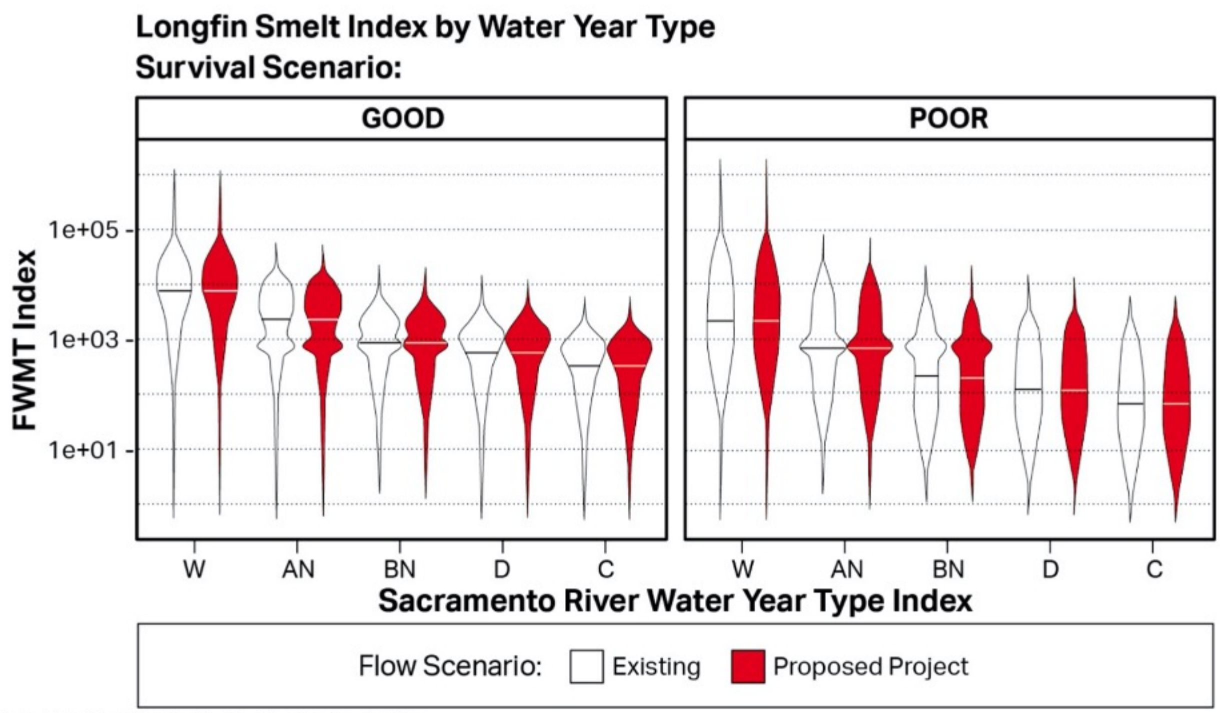


Figure 4-5. Box Plot Summary of Net Total December-May Delta Outflow Difference Between the NDOI Scenario and the Remaining Scenarios By Water Year Type

Figure 2: Differences in total December-May Delta outflow across different water year types and under different operational scenarios (colors of the boxes) as compared to NDOI (the status quo), which equals 0 on the y-axis, as modelled by CDWR (2018). Boxes and whiskers represent different boundaries on the variability of outflow in different water-year*operational scenario combinations. Note that outflow in wetter year-types is much more variable than in drier year types; variability of outflows within year-types contributes to high variability in LFS recruitment modeled by the ICF/MWD R-script. *Copied from CDWR 2018 Figure 4-5 at p. 6.*



Note: Median is indicated by the horizontal line.
FMWT = Fall Midwater Trawl

Figure 4-54. Violin Plots of Predicted Longfin Smelt Fall Midwater Trawl Index by Water Year Type

Figure 3: CDWR's portrayal of modelled differences in Longfin Smelt FMWT index values between existing and proposed operational alternatives for the SWP relative to modelled variance in those predictions. The consistent decline in predicted Longfin Smelt abundance under the proposed project versus existing conditions is obscured because medians (horizontal lines within the violin shapes) are inappropriately plotted in the context of total variance in predicted index values. Note that, viewed on this scale presented by the R-script, even doubling recruitment (for example) might be called a "small" change – but such a conclusion would be erroneous. *Copied from CDWR 2019a Figure 4-54 at p. 4-58.*

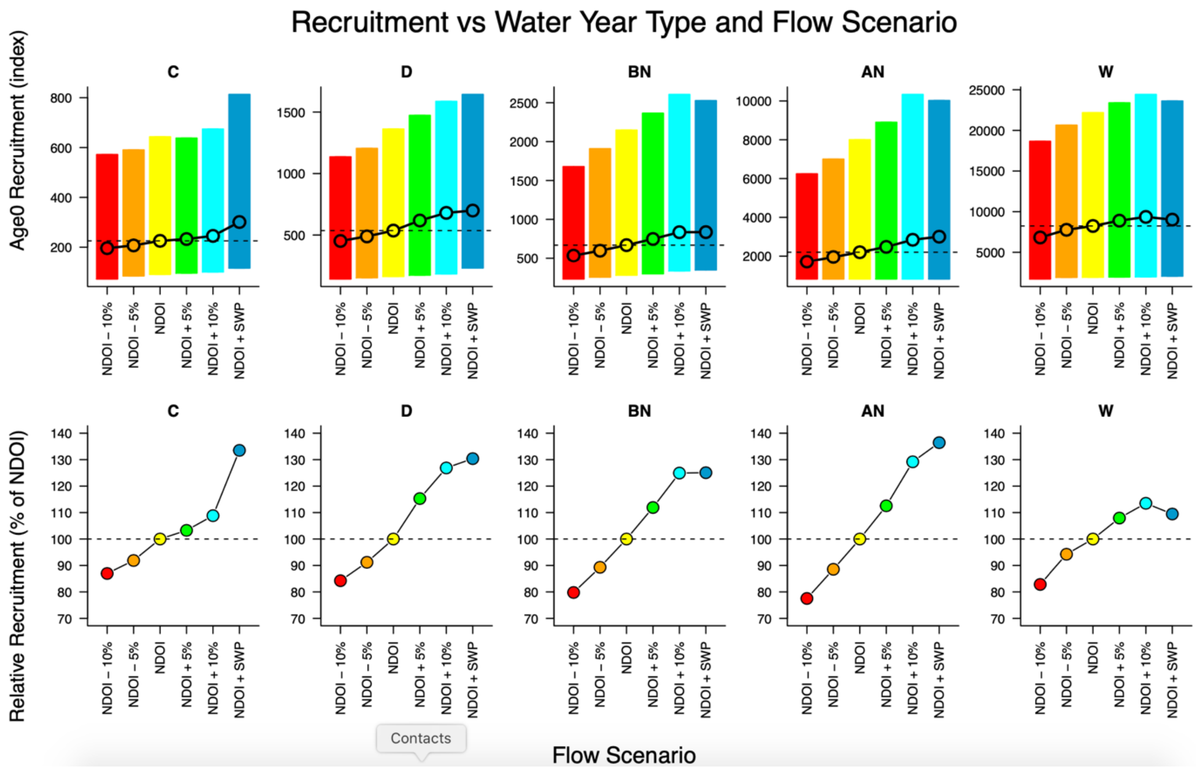


Figure 4: Longfin Smelt recruitment estimated by the ICF/MWD (2018) R-script for different water year types (C=Critically Dry; D=Dry; BN= Below Normal; AN=Above Normal; W=Wet) and operational scenarios (NDOI = net Delta outflow as it occurred in particular years). Top panel shows the median (circles) and variance across all model runs (colored bars) for each combination of year-type and operational scenario. Bottom panel shows the medians as a percentage of the NDOI scenario (status quo) – circles above the dashed line show higher median LFS recruitment than NDOI; circles below the dashed line show reduced LFS recruitment as compared to the status quo.

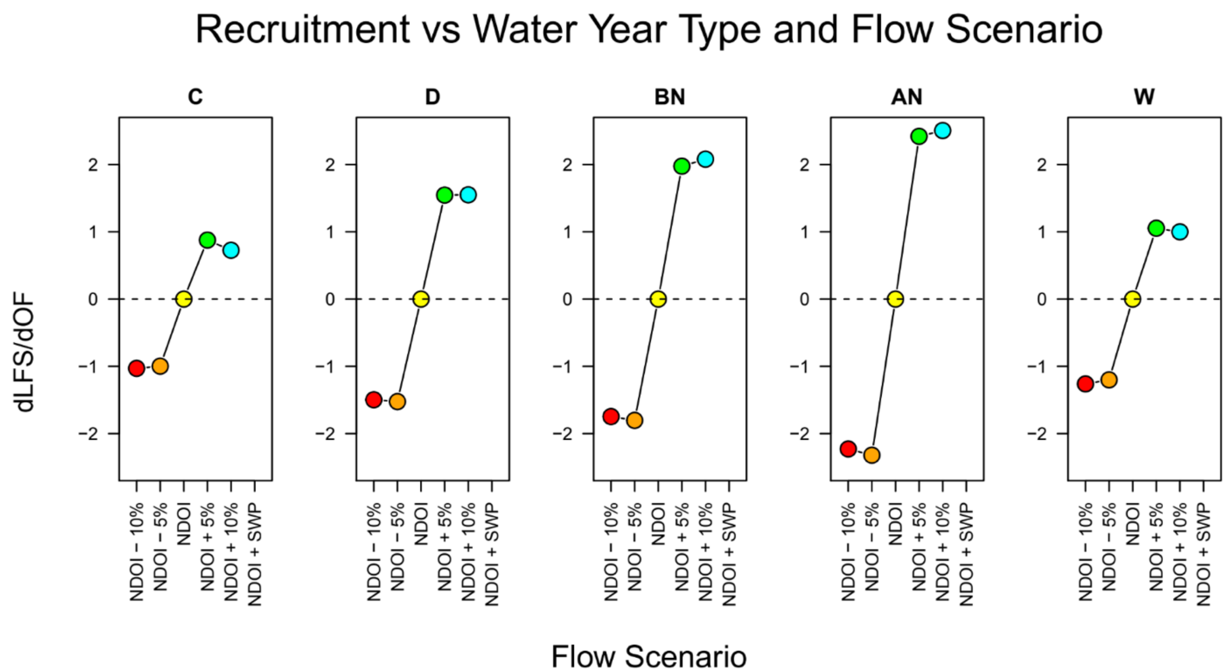


Figure 5: Relative change in Longfin Smelt recruitment (as predicted by the ICF/MWD 2018 R-script) under different operational scenarios. Scores reflect the percentage change in LFS recruitment (see figure 4) divided by the percentage change in the Net Delta Outflow Index for each scenario. Results are presented by water-year type. The status quo scenario (NDOI) is set to zero on the y-axis (i.e., it is the baseline). Values above the horizontal dashed line indicate positive changes in Longfin Smelt recruitment under a given scenario. Y-axis values greater than 1 indicate that the projected percentage change in Longfin Smelt recruitment under a given scenario was greater than the percentage change in flow under that scenario. (Values for the NDOI + SWP scenario are not shown because NDOI+SWP does not represent a consistent change in proportional outflow).

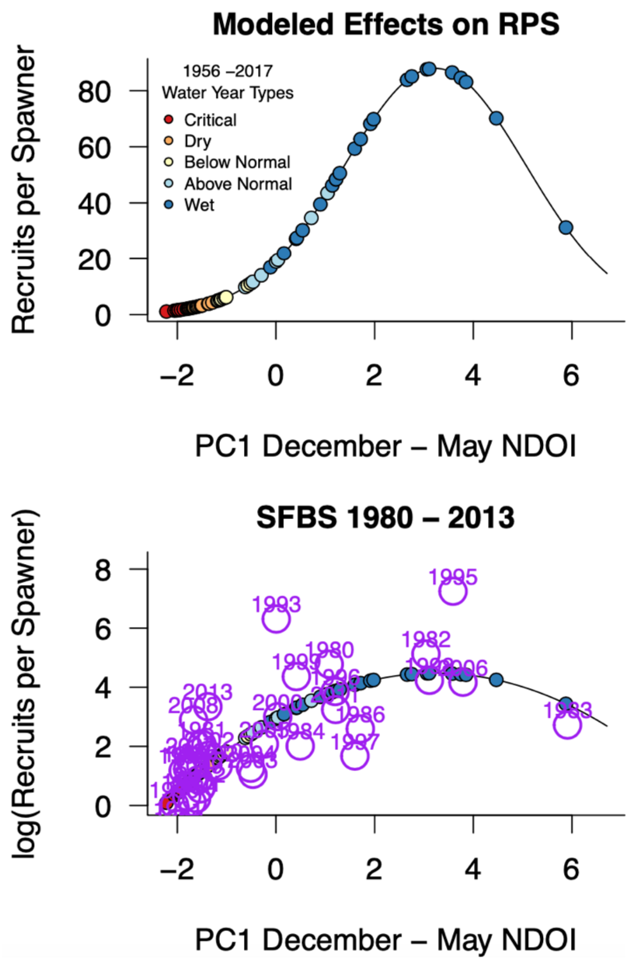


Figure 6: (referenced in footnote 5 of this appendix). Response of Longfin Smelt recruits per spawner (RPS) as a function of December through May NDOI, as modelled in the R-script (top panel) and as seen in actual data (open circles in the bottom panel). In years with the highest winter-spring outflows, the model forces a decline in RPS (top panel). When scenarios that add or subtract flow from NDOI are considered, scenarios that add Delta flows in very wet years (e.g., 1983, 2017) force the model to reduce Recruits-per-Spawner. However, this modeled decline in productivity is supported only by results in one year (1983). Nobriga and Rosenfield (2016) did not explore other forms of the RPS-flow relationship because they were evaluating conceptual models by their ability to recreate historic patterns in LFS abundance; they were not using the model to predict future outcomes of different operational scenarios.

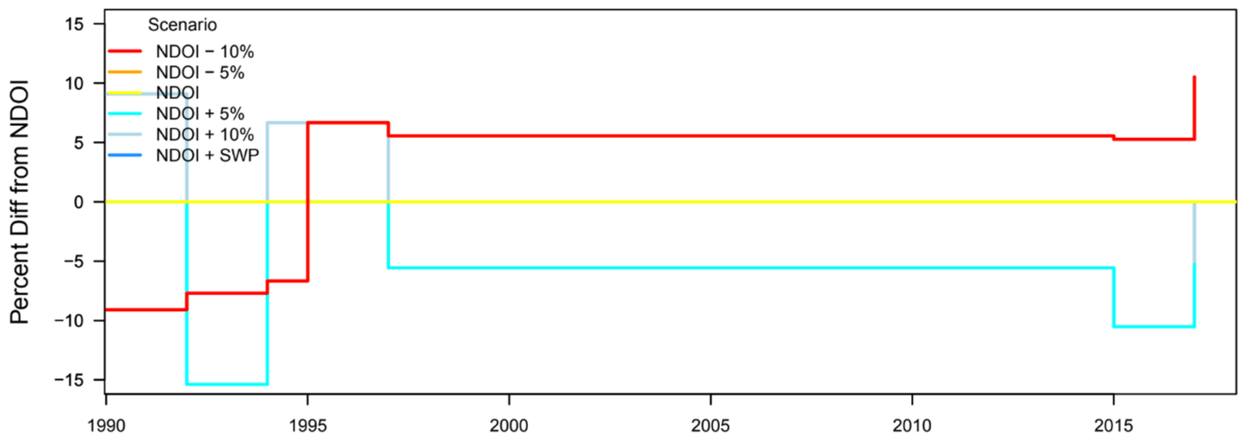


Figure 7: Percentage difference in the cumulative quasi-extinction of 100 replicates during modelled years 1990-2017, as estimated by the ICF/MWD (2018) R-script under different flow scenarios. Because the R-script is not designed to predict *actual* extinction events, but may be able to portray *relative* frequency of quasi-extinction, cumulative quasi-extinction events in each scenario are expressed relative to the NDOI baseline scenario (yellow line). Negative numbers indicate that cumulatively fewer model runs ended in quasi-extinction for a given scenario than for the baseline scenario, in the year indicated. This example is provided only to illustrate the appropriate use and comparison of quasi-extinction events among scenarios. More model runs ended in quasi-extinction in the lower outflow scenarios (after ~1995) compared to the status quo; by the last year of the scenario, quasi-extinctions occurred in ~11% more model runs under the NDOI-minus-10% outflow scenario than under the baseline scenario.

EXHIBIT 3

Making San Francisco Bay Better

July 29, 2014

Ryan Wulff
National Marine Fisheries Service
650 Capitol Mall, Suite 5-100
Sacramento, CA 95814

SUBJECT: Bay Delta Conservation Plan (BDCP) Draft Environmental Impact Report and Environmental Impact Statement

Dear Mr. Wulff:

Staff of the San Francisco Bay Conservation and Development Commission (BCDC) are pleased to commend the authors for BDCP's ground-breaking plan. As the first ever aquatic Habitat Conservation Plan/Natural Communities Conservation Plan (HCP/NCCP) in one of the most ecologically, legally and culturally complex areas in the world, the BDCP is an incredible first effort to craft a solution to many of the complex Bay and Delta issues.

In February 2014, Paul Helliker of the Department of Water Resources briefed BCDC Commissioners on the status of the multi-year BDCP project. In May, BCDC staff organized a panel discussion on the BDCP with Bay Area officials and experts (including Mr. Helliker) to highlight some of the concerns and questions the project raises with regard to resources found in San Francisco Bay and Suisun Marsh. Based on comments and questions during these events, the Commission's laws and policies, and staff review of the EIR/S prepared for the BDCP, staff prepared the following proposed comments on these environmental documents. On June __, 2014, BCDC Commissioners considered staff's recommended comments on the BDCP EIR/S and endorsed the comments in this letter.

To be clear, BCDC is commenting on the EIR/S as a responsible agency under CEQA. Implementing any or all of the conservation measure projects located in the Suisun Marsh or San Francisco Bay envisioned by BDCP will require BCDC-issued permits or consistency determinations. BCDC's policies that apply to the BDCP are noted in the last section of this letter.

Jurisdiction. BCDC is responsible for granting or denying permits for any proposed fill (earth or any other substance or material, including pilings or structures placed on pilings, and floating structures moored for extended periods), extraction of materials or change in use of any water, land or structure within the Commission's jurisdiction. Generally, BCDC's jurisdiction over San Francisco Bay extends from the Golden Gate south to San Jose and northeast to the confluence of the San Joaquin and Sacramento Rivers. It includes: tidal areas up to the mean high tide, including all sloughs, and in marshlands up to five feet above mean sea level; a shoreline band consisting of territory located between the shoreline of the Bay and 100 feet landward and parallel to the shoreline; salt ponds; managed wetlands (e.g., areas diked from the Bay and managed as duck clubs); and certain waterways tributary to the Bay. The Commission can grant a permit for a project if it finds that the project is either (1) necessary to the health, safety or welfare of the public in the entire Bay Area, or (2) is consistent with the provisions of the McAteer-Petris Act and the Suisun Marsh Preservation Act, and the San Francisco Bay Plan (Bay Plan) and the Suisun Marsh Protection Plan (Marsh Plan). The McAteer-Petris Act allows fill in the Bay for water-oriented uses in cases when there is no alternative upland location and requires that any fill that is placed in the Bay is the minimum that is necessary for the project. The McAteer-Petris Act also requires that proposed projects include the maximum feasible public access consistent with the project to the Bay and its shoreline.

Project components that extend into BCDC jurisdiction, including the Suisun Marsh, and may affect the waters and environmental resources farther downstream in San Pablo and San Francisco Bays, are subject to the BCDC policies and regulatory framework found in the McAteer-Petris Act, the Suisun Marsh Preservation Act, the Bay Plan, and the Marsh Plan where appropriate. In addition to any permits required under its state authority, BCDC must review federal actions, or federal permits and grants for actions, that affect the coastal zone pursuant to the federal Coastal Zone Management Act (CZMA), to determine their consistency with the Commission's federally-approved management program for the Bay.

San Francisco Bay and Suisun Marsh Effects. The EIR/S states that there would be no significant effects on San Francisco Bay. Commissioners, staff, other state agencies and members of the public raised concerns about possible project impacts west of the Delta in the Suisun Marsh and downstream in the San Francisco Bay. Some of these effects would be significant. Potential significant impacts include possible effects on salinity, sediment supply, and the consequences (intended and unintended) of various restoration programs, and their secondary impacts on Bay habitats and species. The Delta Stewardship Council's (DSC) Independent Science Board (ISB) concluded that more research and analysis is needed on areas west of the Delta to obtain a more complete picture of BDCP's cumulative effects. The ISB noted that "the hydrodynamic modeling needs to capture the entire domain of effects. The current Effects Analysis does not consider the influence of shifting timing of withdrawals on San Francisco Bay circulation patterns and ecology. This is a significant omission with ecologically important implications."

The ISB also noted that the BDCP did not evaluate areas downstream of the Delta (i.e., San Francisco Bay) even though the National Research Council (NRC) scientific review specifically stated that this area should be included. "Adequate justification for lack of consideration of impacts to San Francisco Bay was not provided ... in the document, although there are potential impacts. For example, the expected reduction in sediment supply has the potential impacts of: (1) tidal marshes in the Bay could be less resilient to sea level rise and; (2) increased water clarity in the Bay could render it more responsive to nutrient inputs." The EIR/S should better assess the potential effects on the Marsh and the Bay, identify potential impacts on salinity, sediment delivery and Bay species as potentially significant, and evaluate strategies to avoid or mitigate these effects. This analysis should establish clear standards and thresholds of significance, in consultation with scientific experts.

Water Quality and Salinity. Biological opinions from the National Marine Fisheries Service and the US Fish and Wildlife Service determined that habitat degradation in the Marsh for multiple sensitive species is due, in part, to reduced freshwater inflows from the Delta, yet the BDCP's analysis is lacking in this area. Current Delta fresh water outflows seem inadequate to support or recover endangered species. Studies project that the salinity in San Francisco Bay could increase by 0.30-0.45 practical salinity unit (psu) per decade due to the compounding effects of decreasing freshwater inflow and rising sea level (projected by Cloern et al. 2011 to rise approximately 4 inches per decade). Climate change will affect future Bay salinity and the restoration and conservation measures proposed in the EIR/S. Higher salinity in the Suisun

Marsh due to high diversion years would affect managed wetlands and the Bay's native species, such as the Dungeness Crab, that use the lower salinity of the Bay as a nursery. Also, waterfowl that rely on the lower salinity/freshwater of the Marsh as breeding habitat may be at risk, as higher salinity levels have been shown to be dangerous to ducklings. However, these species are not included in the BDCP's analysis.

The EIR/S states that the BDCP would be implemented using a "decision tree process, a focused form of adaptive management that will be used to determine at the start of new operations, the fall and spring outflow criteria that are required to achieve the conservation objectives of the BDCP for delta smelt and longfin smelt and to promote the water supply objectives of the BDCP. Other BDCP-covered fish species, including salmonids and sturgeon, may also be affected by outflow. Their outflow needs will also be investigated as part of the decision tree process." The EIR/S should clarify how the proposed pipelines will be managed in the long term (e.g., 50 years) given recurring droughts that require changes in future flow regimes. The BDCP should evaluate flow scenarios that provide greater freshwater flows to the Bay beyond the requirements of D1641[1] to recover declining fish populations. Decreased reliance on Delta freshwater diversions may become necessary to protect sensitive and threatened species. Scenario F (Alternative 8: pipeline/tunnel alignment, dual conveyance, intakes at 2, 3 & 5, with 9,000 cfs diversion) would increase Delta outflow up to 1.5 million acre-feet annually. A project alternative that provides for greater Delta outflows is likely necessary to meet the policy objectives in the *San Francisco Bay Plan* (Bay Plan) and the *Suisun Marsh Protection Plan* (Marsh Plan). Also, the EIR/S should evaluate potential impacts on non-listed Marsh and Bay species that rely on salinity levels characteristic of the Bay and the Marsh as required by current X2 standards.

Conservation Measures. Most Conservation Measures are discussed at a programmatic level, rather than at a project level in the EIR/S. The ISB noted that, "the difference in level of detail [of restoration project analyses] presented effectively treats the co-equal goals unequally. We are concerned that the merely programmatic analysis of habitat restoration provides too little basis for decision-making by the Delta Stewardship Council and other parties. Furthermore, the benefits of habitat restoration are assumed when a beneficial cumulative impact is concluded under NEPA or a less than significant cumulative impact is concluded under CEQA. Achieving beneficial conservation measures requires understanding limiting factors, ecosystem processes, sequencing, adaptive management responses, thresholds for certain actions, and interactions and other consequences of these actions...to describe how major uncertainties will be resolved." Also, the Effects Analysis recognizes that suspended sediment has been declining in the Sacramento River, but no analysis of the potential for corresponding increased algal blooms is addressed.

Specific locations for habitat improvements are not discussed in the restoration opportunity areas, including those in the Suisun Marsh. The EIR/S would benefit from further analysis of restoration patterns in the Marsh to determine how they affect salinity patterns in the Marsh and Delta. This may help focus the restoration efforts to specific regions of the Marsh to limit salinity intrusion. There is little discussion in the EIR/S of the effects of climate change on conservation measures. Some Conservation Measures that involve habitat restoration or enhancement should be addressed at a project level of detail in the EIR/S so that they can be implemented early in the project cycle, in timeframes consistent with Conservation Measure 1. Also, additional conservation measures may be needed to address project effects on the Marsh and the Bay, particularly those related to sediment management.

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[1] D1641 refers to a State Water Board water rights Decision of 2005 that set water quality (salinity) standards for various monitoring stations in the Bay and Delta and amends certain water rights by assigning responsibilities to the persons or entities holding those rights to help meet the salinity objectives.

Sediment. The BDCP EIR discusses a potential reduction in suspended sediment transport to the Suisun Marsh and San Francisco Bay of approximately eight to ten percent. The EIR/S does not characterize this change as a significant impact. The ISB report to the Delta Stewardship Council raises this as a significant issue. United States Geological Survey researchers have observed a steep reduction suspended sediment concentrations in the Bay and characterize San Pablo Bay as erosional. With projected sea level rise, further reduction in Bay sediment inputs should be considered significant, given Bay wetland restoration targets, current subsided diked-baylands, and the overall Bay-Delta sediment budget. Sediment settling in the new northern forebay, the relocation of flows from channels into underground pipes, new pumping regimes and proposed restoration conservation measures together and separately will alter sediment transport, delivery, and the rate of deposition downstream. Reduced suspended sediment in the Bay will exacerbate nutrient loading problems caused from the sewage treatment plants discharging into the Bay.

Construction of restoration projects, which are highly desirable in the Delta upstream of the Bay, likely will create sediment sinks, thus further reducing sediment flows to the Marsh and San Francisco Bay. The cumulative impacts analysis should consider all of these changes to the Bay sediment regime, using science-based thresholds of significance.

Cumulative Effects. There are several related projects that, cumulatively, could exacerbate the effects of BDCP and adversely affect the Bay and the Marsh that are not addressed in the EIR/S. These projects include, but are not limited to, dredging the Baldwin Ship Channel (between San Pablo Bay and the Port of Stockton) that may include constructing a sill in the Carquinez Strait; proposals to construct seasonal drought barriers or gates in the Delta; and, several proposed water storage projects on existing dams and reservoirs. The issue of storage should be addressed within BDCP, particularly planned projects. The EIR/S should address cumulative impacts of all relevant related projects.

BCDC's Relevant Policies and Related Agreements

Bay Plan Findings and Policies. The Commission's Bay Plan recognizes the tremendous ecological value of the Bay-Delta estuary and the importance of fresh water inflows from the Delta to the survival of fish and wildlife in the Bay and Suisun Marsh. When revising the EIR/S to respond to the Commission's comments and concerns, the authors should consider these applicable findings and policies:

Bay Plan findings on Tidal Marshes and Tidal Flats state, in part, that "San Francisco Bay is a substantial part of the largest estuary along the Pacific shore of North and South America and is a natural resource of incalculable value" and that "the sheltered waters of estuaries support unique communities of plants and animals specially adapted for life in the region where rivers meet the coast."

Bay Plan findings and policies recognize the importance of fresh water inflows to the ecosystem of the Bay. Bay Plan findings on Fish, Other Aquatic Organisms and Wildlife state, in part, that "conserving fish, other aquatic organisms and wildlife depends, among other things, upon availability of ...proper fresh water inflows, temperature, salt content, water quality, and velocity of the water." Fresh Water Inflow Finding A states that "[f]resh water flowing into the Bay, most of which is from the Delta, dilutes the salt water of the ocean flowing into the Bay through the Golden Gate....This delicate relationship between fresh and salt water helps to determine the ability of the Bay to support a variety of aquatic life and wildlife in and around the Bay."

Bay Plan findings and policies also recognize the impact of pollutants passing through the Delta into the Bay. Bay Plan findings on Water Quality state, in part, that "water from approximately 40 percent of California drains into San Francisco Bay carrying with it pollutants from point and nonpoint sources" and that "harmful effects of pollutants reaching the Bay can be reduced by maximizing the Bay's capacity to assimilate, disperse, and flush pollutants by maintaining and increasing...the volume and circulation of water flowing in and out with the tides and in fresh water inflow."

The Bay Plan's Fresh Water Inflow policies require limits on water diversions, preservation of the Suisun Marsh, and cooperation with the State Water Board to ensure adequate fresh water inflow. Policy 1 states that "[d]iversions of fresh water should not reduce the inflow into the Bay to the point of damaging the oxygen content of the Bay, the flushing of the Bay, or the ability of the Bay to support existing wildlife." Policy 2 states that "[h]igh priority should be given to the preservation of Suisun Marsh through adequate protective measures, including maintenance of fresh water inflows." Finally, Policy 3 states, in part, that the "Bay Commission should cooperate with the State Board and others to ensure that adequate fresh water inflows to protect the Bay are made available."

Suisun Marsh Preservation Act. The Nejedly-Bagley-Z'berg Suisun Marsh Preservation Act of 1974 directed BCDC and the California Department of Fish and Game (CDFG) to develop the Suisun Marsh Protection Plan, which was codified into law as the Suisun Marsh Preservation Act of 1977. The Act recognizes the important role of the Suisun Marsh in providing wintering habitat for waterfowl using the Pacific Flyway and critical habitat for other wildlife, including rare and endangered species.

The Suisun Marsh, where salt and fresh water meet and mix, contains approximately 85,000 acres of tidal marsh, managed wetlands, and waterways in southern Solano County. It is an important part of the Bay-Delta ecosystem and requires adequate fresh water inflows to maintain its fish and wildlife habitat.

Section 29003 of the Act finds that continued wildlife use of Suisun Marsh requires, among other things, "[p]rovision for future supplemental water supplies and related facilities to assure that adequate water quality will be achieved within the wetland areas."

Section 29010 finds that "[w]ater quality in the marsh is dependent on the salinity of the water in sloughs of the marsh, which depends in turn on the amount of fresh water flowing in from the Delta."

Suisun Marsh Protection Plan. The Plan recognizes that Suisun Marsh contains "the unique diversity of fish and wildlife habitats characteristic of a brackish marsh." The Plan emphasizes the need to maintain adequate fresh water inflows to preserve this unique habitat.

Water Supply and Quality Finding 2 of the Plan states, in part, that "[t]he most important source of fresh water inflow to the Suisun Marsh is the outflow from the Sacramento-San Joaquin River Delta."

Finding 9 states, in part, that "[t]he State Water Resources Control Board in its Delta Decision, and the Environmental Protection Agency and the Regional Water Quality Control Board in the Water Quality Control Plan for the San Francisco Bay Basin, have set water and soil salinity standards for the Marsh."

Finding 10 states, in part, that "[a]ssuring that sufficient quantities of fresh water will be available to the Marsh to meet the standards and marsh management requirements is as important as determining appropriate water quality standards for the Marsh."

Water Supply and Quality Policy 1 states, in part, "there should be no increase in diversions by State or Federal Governments that would cause violations of existing Delta Decision or Basin Plan standards."

Policy 2 states, "Adequate supplies of fresh water are essential to the maintenance of water quality in the Suisun Marsh. Therefore, the State should have the authority to require the Bureau of Reclamation to comply with State and Federal water quality standards for the Delta and the Marsh. This should be accomplished through Federal legislation if necessary."

Policy 4 states, in part, that "[w]ater quality standards in the Marsh should be met by maintaining adequate inflows from the Delta."

Finally, BCDC staff want to thank you again for providing the Commission with such tremendously helpful opportunities to learn about BDCP. If you have any questions about the comments in this letter or any other matter, please do not hesitate to contact me at (415) 352-3653 (lgoldzband@bcdc.ca.gov), or Joe LaClair, Chief Planner at (415) 352-3656 (joel@bcdc.ca.gov).

Sincerely,

Lawrence J. Goldzband
Executive Director

cc: Commissioners and Alternates
Paul Helliker, Department of Water Resources
Carl Wilcox, Department of Fish and Wildlife
Dan Ray, Delta Stewardship Council

EXHIBIT B

State of California – Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
Water Branch
P.O. Box 944209
Sacramento, CA 94244-2090
www.wildlife.ca.gov

GAVIN NEWSOM, Governor
CHARLTON H. BONHAM, Director

January 28, 2022

Alicia Forsythe
Environmental Planning and Permitting Manager
Sites Project Authority
P.O. Box 517
Maxwell, CA 95955
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SITES RESERVOIR PROJECT RECIRCULATED DRAFT ENVIRONMENTAL IMPACT REPORT/ SUPPLEMENTAL DRAFT ENVIRONMENTAL IMPACT STATEMENT (RDEIR/SDEIS) SCH# 2001112009

Dear Ms. Forsythe:

The California Department of Fish and Wildlife (CDFW) received and reviewed the Notice of Availability of a Recirculated Draft EIR/ Supplemental Draft EIS (RDEIR/SDEIS) from the Sites Project Authority (Authority) for the Sites Project (Proposed Project) pursuant the California Environmental Quality Act (CEQA) statute and guidelines.[1] It is important to note that CDFW has previously submitted comments to the Authority on January 12, 2018, in response to the Notice of Availability of the Draft EIR prepared on August 10, 2017, as part of an earlier phase of Project development.

Thank you for the opportunity to provide comments and recommendations regarding those activities involved in the Proposed Project that may affect California fish and wildlife. Likewise, we appreciate the opportunity to provide comments regarding those aspects of the Proposed Project for which CDFW, by law, may need to exercise its own regulatory authority under the Fish and Game Code. CDFW appreciates that with most large projects there may be a continuing effort to analyze impacts and revise the various project alternatives. CDFW remains available for coordination for those purposes.

CDFW ROLE

CDFW is California's **Trustee Agency** for fish and wildlife resources and holds those resources in trust by statute for all the people of the State. (Fish & G. Code, §§ 711.7, subd. (a) & 1802; Pub. Resources Code, § 21070; CEQA Guidelines § 15386, subd. (a).) CDFW, in its trustee capacity, has jurisdiction over the conservation, protection, and management of fish, wildlife, native plants, and habitat necessary for biologically

[1] CEQA is codified in the California Public Resources Code in section 21000 et seq. The "CEQA Guidelines" are found in Title 14 of the California Code of Regulations, commencing with section 15000.

sustainable populations of those species. (*Id.*, § 1802.) Similarly for purposes of CEQA, CDFW provides, as available, biological expertise during public agency environmental review efforts, focusing specifically on projects and related activities that have the potential to adversely affect fish and wildlife resources.

CDFW may also act as a **Responsible Agency** under CEQA. (Pub. Resources Code, §21069; CEQA Guidelines, § 15381.) The Proposed Project may be subject to CDFW's lake and streambed alteration regulatory authority. (Fish & G. Code, § 1600 et seq.) Likewise, to the extent the Proposed Project's implementation may result in "take" as defined by State law of any species protected under the California Endangered Species Act (CESA) (Fish & G. Code, § 2050 et seq.), such activities are prohibited by the Fish and Game Code. CDFW also administers the Native Plant Protection Act, Natural Community Conservation Program, and other provisions of the Fish and Game Code that afford protection to California's fish and wildlife resources.

PROJECT DESCRIPTION SUMMARY

Proponent: Sites Reservoir Authority

Project Overview: In October 2019, the Authority pursued a value planning process to refine Proposed Project construction and operational alternatives presented in the 2017 Draft EIR/EIS. Through the value planning process, the Authority selected three alternatives for assessment in the RDEIR/SDEIS (i.e., a 1.5 MAF Sites Reservoir, alternatives 1 & 3 and a 1.3 MAF Sites Reservoir, alternative 2), in addition to a No Project/ No Action Alternative. Proposed Project alternatives 1 & 3 differ only in the level of investment by the Bureau of Reclamation (Reclamation), with Reclamation investing up to 7% in the Proposed Project under alternative 1, versus 25% under alternative 3. Alternative 1 is the Authority's preferred alternative. Consistent to all alternatives, the Proposed Project would use existing infrastructure to divert water from the Sacramento River at Red Bluff and Hamilton City and convey water to the new off stream Sites Reservoir approximately 10 miles west of the town of Maxwell, in Glenn and Colusa counties, California. New and existing facilities would move water out of the reservoir via existing canals and a new pipeline located near Dunnigan, eventually returning water to the Sacramento River system downstream. The 1.5 MAF Project alternative would include two dams, seven saddle dams, and two saddle dikes with construction of a bridge crossing the reservoir and construction of the Dunnigan Pipeline extending from the Tehama-Colusa (TC) Canal to the Colusa Basin Drain (CBD). The 1.3 MAF Project alternative would include two dams, four saddle dams, and three saddle dikes with construction of a bypass road and the Dunnigan Pipeline extending to the Sacramento River allowing the Sacramento River to serve as the primary release location with only partial discharges to the CBD. Components of the individual Proposed Project alternatives could be interchanged as determined necessary by the Project.

Location: The Proposed Project area (Figure 1) for the purposes of CEQA includes the inundation area of Antelope Valley (between 13,200 and 12,600 acres) located in Glenn and Colusa counties, and Project components located in Tehama County, Glenn County, Colusa County, and Yolo County. The Proposed Project would influence biological resources in the Sacramento River, Colusa Basin Drain, Funks Creek, Stone Corral Creek, Hunters Creek, Feather River, American River, and Delta, as well as both Sutter and Yolo bypasses.

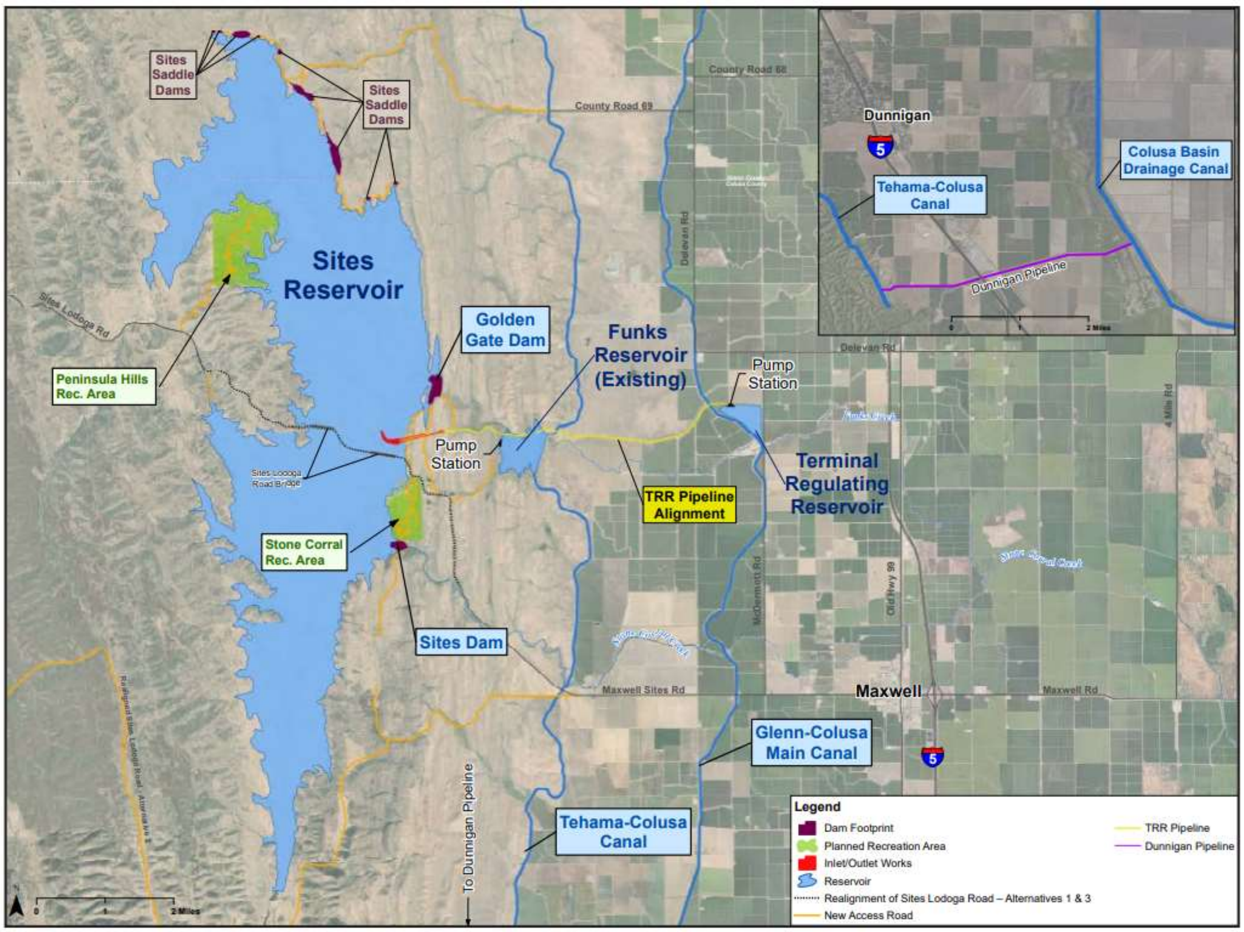

Figure 1: Proposed Project Location and Facilities (Sites Reservoir Project RDEIR/SDEIS Fact Sheet 2021).

OVERVIEW OF ATTACHED COMMENTS

CDFW appreciates the Authority's continued effort to address the impacts of the Proposed Project on the State's biological resources. CDFW offers the comments and recommendations in the attached Appendix to assist the Authority in its role as lead agency in adequately identifying and mitigating the Proposed Project's significant, or potentially significant, direct and indirect impacts on fish and wildlife resources. The comments and recommendations are also offered to aid the Authority in identifying a reasonable range of alternatives that would avoid or minimize adverse impacts.

Consistent with CDFW's trustee role, the attached comments address all fish and wildlife resource areas. However, CDFW acknowledges the Proposed Project's potential impacts on aquatic species are of particular note. Therefore, CDFW prioritized efforts to address those impacts. While the attached comments are extensive, CDFW understands the Authority is seeking all possible input and CDFW strove to be thorough in the review of the RDEIR/SDEIS in order to be of the greatest assistance to the Authority. CDFW looks forward to continuing to work with the Authority to refine the Proposed Project and associated mitigation measures.

ENVIRONMENTAL DATA

CEQA requires that information developed in environmental impact reports and negative declarations be incorporated into a database which may be used to make subsequent or supplemental environmental determinations (Pub. Resources Code, § 21003, subd. (e)). Accordingly, please report any special status species and natural communities detected during Project surveys to the California Natural Diversity Database (CNDDB). The CNNDB field survey form can be found at the following link: http://www.dfg.ca.gov/biogeodata/cnddb/pdfs/CNDDB_FieldSurveyForm.pdf. The completed form can be mailed electronically to CNDDB at the following email address:CNDDB@wildlife.ca.gov. The types of information reported to CNDDB can be found at the following link:
http://www.dfg.ca.gov/biogeodata/cnddb/plants_and_animals.asp.

FILING FEES

The Project, as proposed, would have an impact on fish and/or wildlife, and assessment of filing fees is necessary. Fees are payable upon filing of the Notice of Determination by the Lead Agency and serve to help defray the cost of environmental review by CDFW. Payment of the fee is required in order for the underlying project approval to be operative, vested, and final. (Cal. Code Regs, tit. 14, § 753.5; Fish & G. Code, § 711.4; Pub. Resources Code, § 21089.)

CONCLUSION

Pursuant to Public Resources Code §21092 and §21092.2, CDFW requests written notification of proposed actions and pending decisions regarding the Proposed Project. Written notifications should be directed to: California Department of Fish and Wildlife P.O. Box 944209, Sacramento, CA 94244-2090. CDFW appreciates the opportunity to comment on the RDEIR/SDEIS to assist in identifying and mitigating Proposed Project impacts on biological resources. CDFW personnel are available for consultation regarding biological resources and strategies to minimize and/or mitigate impacts. Questions regarding this letter or further coordination should be directed to Kristal Davis Fadtke, Environmental Program Manager, at (916) 701-3226 or Kristal.Davis-Fadtke@wildlife.ca.gov.

Sincerely,

DocuSigned by:
Josh Grover
703E59B6647A482...

Joshua Grover, Chief
Water Branch

Enclosures: Appendix A - Comments and Recommendations
Appendix B – References

ec: State Clearinghouse, state.clearinghouse@opr.ca.gov

California Department of Fish and Wildlife

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Chapter or Appendix - Section	**Page(s)**	**Comments and Recommendations**
Chapter 1 - Section 1.1, Sites Project Authority	p. 1-2	The RDEIR/SDEIS states that "[California Department of Water Resources] *DWR, on behalf of the State of California, is also a non-voting member of the Reservoir Committee. The State of California would provide funding through the California Water Commission (CWC) for the Project and receive ecosystem, recreation, and flood control benefits from the Project"* (p. 1-2). While DWR is a member of the Reservoir Committee, they do not represent the State's interests in administration of ecosystem benefits. Suggest removing "*on behalf of the State of California*" since DWR will not be administering ecosystem benefits.
Chapter 2 - Section 2.4, No Project/No Action Alternative	pp. 2-7,8	The RDEIR/SDEIS states, *"Because none of the facilities would be constructed or operated, the No Project Alternative would not materially change conditions as compared to existing conditions. Section 3.2.1 describes how the reasonably foreseeable future conditions under the No Project Alternative would not be materially different from the existing conditions that were used as the environmental baseline. The No Project Alternative assumes the same regulatory criteria as existing conditions"* (pp. 2-7,8). The purpose in the California Environmental Quality Act (CEQA) of the No Project Alternative is to allow decision makers to compare the impacts of approving the Proposed Project with the impacts of not approving the Proposed Project. As a result, there could be a difference between existing conditions (i.e., baseline conditions) and the No Project Alternative. The No Project Alternative should include an analysis that is comparable to the other Project Alternatives, considering changing conditions such as climate change and/or include reasonably foreseeable future project or operational changes, such as the Delta Conveyance Project (DCP). Existing conditions should be a set point in time (typically the Notice of Preparation or the current conditions at the time of analysis). It is important a project assess the baseline conditions in the proposed area including the continuing trends in those conditions (i.e., the No Project Alternative) to evaluate both future impacts and benefits of a project. California Department of Fish and Wildlife (CDFW) recommends the Authority include a separate analysis in the Final Environmental Impact Report/ Final Environmental Impact Statement (FEIR/FEIS) considering a No Project Alternative which incorporates climate change projections and foreseeable future projects or operational changes that will impact water supply or water quality, additional to the existing baseline.
Chapter 2 - Project Description and Alternatives	General Comment	Alternative 1, 2, and 3 in the RDEIR/SDEIS all have the same operational diversion criteria. CDFW finds the Proposed Project, as currently described, and the mitigation measures currently proposed in the RDEIR/SDEIS are not sufficient to reduce impacts to less than significant for salmonids, Delta Smelt, and Longfin smelt (see CDFW comments on Chapter 11 impact analyses and mitigation measures). CDFW recommends the FEIR/FEIS include an Alternative with operational criteria that both meets Proposed Project objectives and includes bypass flow criteria at Wilkins Slough of at least 10,712 cfs across the entire salmonid migration period of October to June, in addition to the other currently proposed operational diversion criteria, to minimize impacts to aquatic resources.

Chapter or Appendix - Section	Page(s)	Comments and Recommendations
Chapter 2 - Section 2.5.1.1, GCID Main Canal Diversion and System Upgrades	p. 2-9	The RDEIR/SDEIS states that "*The Project would involve the installation of a new 3,000-cfs GCID Main Canal head gate structure about 0.25 mile downstream of Hamilton City Pump Station*" (p. 2-9). However, the existing head gate structure would be left in place to continue to serve as a bridge and continue to be operated during construction of the new head gate. The FEIR/FEIS should include the monitoring protocols necessary to ensure the new setbacks do not increase fish entrainment.
Chapter 2 - Section 2.5.1.2, Funks Reservoir	p. 2-13	The RDEIR/SDEIS states that "*The Project would not alter the footprint of Funks Reservoir; however, 740,000 cubic yards of sediment that has accumulated since its constructed would be excavated from the reservoir*" (p. 2-13). This could significantly impact native fish species that may be present in the reservoir. CDFW recommends listing existing fish population in Funks reservoir, detailing the work window when the excavation will occur, and where the excavated material will be deposited.
Chapter 2 - Section 2.5.1.4, Inlet/Outlet Works	p.2-17	Insufficient information was provided to assess whether the I/O Tower port elevations will provide sufficient flexibility in the management of water temperature and/or water quality. CDFW recommends conducting an analysis of operational flexibility resulting from the proposed port locations for inclusion in the FEIR/FEIS.
Chapter 2 - Section 2.5.1.4, Dams and Dikes	p. 2-20	The RDEIR/SDEIS states that *"Water in Stone Corral Creek would be diverted directly into the creek diversion pipeline through the Sites Dam abutment and re-enter the creek channel on the east side of the Sites Dam work area. The outlet tunnel with two 84-inch-diameter fixed cone valves would accommodate these releases, and an energy dissipating chamber would reduce the velocity of the water released"* (p. 2-20). CDFW recommends the FEIR/FEIS include provisions to monitor the velocities and temperatures of water releases into Funks and Stone Corral creeks.
Chapter 2 - Section 2.5.1.5, Dunnigan Pipeline	p. 2-22	The RDEIR/SDEIS states that "*construction would include open cut of approximately 100 feet to cross Bird Creek in the dry season*" (p. 2-22). CDFW recommends that the FEIR/FEIS include baseline conditions for Bird Creek in the Proposed Project analysis.
Chapter 2 - Section 2.5.1.6, Recreation Areas	p. 2-22	CDFW recommends defining what exact uses are planned for the recreation area regarding angling and hunting. The reservoir is likely to attract a large contingent of migratory waterfowl, deer, dove, and turkey populations. The fluctuating water level will likely result in regions of green vegetation due to receding water, creating a potential for increased tule elk usage. CDFW recommends considering coordination and use of lawful public hunting to manage increased populations.
Chapter 2 - Section 2.5.1.7, New and Existing Roadways	p. 2-23	The RDEIR/SDEIS states that *"It is anticipated that all construction activities associated with the recreation areas would occur within the footprints of the recreation areas and the temporary and permanent access road areas*" (p. 2-23). The RDEIR/SDEIS should include details on what restoration activities are planned for areas impacted by temporary access roads.

Chapter or Appendix - Section	Page(s)	Comments and Recommendations
Chapter 2 - Section 2.5.1.7, Construction Access	p. 2-27	The FEIR/FEIS should disclose Proposed Project impacts related to increased traffic. If these impacts are considered significant, the FEIR/FEIS should disclose additional avoidance, minimization and or mitigation measures to offset the impacts.
Chapter 2 - Section 2.5.2.1, Water Operations	p. 2-29	The timing and magnitude of reservoir releases for Storage Partners along the Colusa Basin Drain (CBD), Yolo Bypass, and North Bay Aqueduct is unclear. The RDEIS/SDEIS states that reservoir releases for Storage Partners "*would generally be made from May to November but could occur at any time of the year, depending on a Storage Partner's need and capacity to convey water to its intended point of delivery*" (p. 2-29). However, all analyses related to flow deliveries through the Yolo Bypass were limited to the August-October time-period. CDFW recommends providing more detail about the timing and magnitude of releases for Storage Partners along the CBD, Yolo Bypass, and North Bay Aqueduct. If the timing and/or magnitude of these releases are substantially different from the proposed "habitat flows" from August-October, additional analyses on the potential impacts of moving that water through the region is needed.
Chapter 2 - Section 2.5.2.1, Diversion to Sites Reservoir	p. 2-30	The RDEIR/SDEIS states that "*up to 2,100 cfs, plus losses would be diverted at the RBPP for the Project*" (p. 2-30). CDFW recommends the FEIR/FEIS explains what is meant by the term "losses" and quantifies the magnitude of these losses.
Chapter 2 - Section 2.5.2.1, Water Operations, Bend Bridge Pulse Protection	pp. 2-31, 32	The RDEIR/SDEIS included a pulse protection that is flow based because real-time fish monitoring and presence-based pulse operational adjustments cannot be captured in a model. Commonly, the intention of a pulse flow protection measure is to protect pulses of fish migration rather than pulses of water, with flow-based pulse protection modeled as a proxy for real-time fish presence-based protection. Similarly, real-time fish monitoring and associated criteria are the norm rather than the exception for large scale diversion projects in the Sacramento-San Joaquin Delta ecosystem (CDFW 2019 State Water Project Incidental Take Permit (ITP), United States Bureau of Reclamation (USBR) 2019 Biological Assessment (BA)). CDFW supports the inclusion of pulse flow protection in the operation of the Proposed Project and anticipates working with the Authority to develop a process to implement this measure in real time based on fish presence.
Chapter 2 - Section 2.5.2.1, Diversion to Sites Reservoir	p. 2-32	A ramping schedule will need to be developed to ensure that when pumping resumes upon cessation of the pulse event, flows in the river are not decreased at such a rapid rate that fish are adversely impacted.
Chapter 2 - Section 2.5.2.1, Diversion to Sites Reservoir	p. 2-32	Three Core-1 Central Valley (CV) spring-run tributaries, two Core-2 CV spring-run tributaries, 3 Core-1 CV steelhead tributaries and 2 Core-2 CV steelhead tributaries (Antelope, Mill, Deer, Big Chico, and Butte Creeks) enter the Sacramento River downstream of Red Bluff Diversion Dam (RBDD). The Adaptive Management Plan and fish monitoring program should take these into consideration and use existing or new juvenile monitoring programs to inform Proposed Project operations.

Chapter or Appendix - Section	Page(s)	Comments and Recommendations
Chapter 2 - Section 2.5.2.1, Water Operations	p. 2-35	The RDEIR/SDEIS states, "*The Authority is currently working with Reclamation and DWR to establish operating principles with both agencies that would describe the details of the coordination and collaboration that would take place during the operation of the Project*" (p. 2-35). Coordinating operations between the Proposed Project, Central Valley Project (CVP), and State Water Project (SWP) is complicated and there could be unintended consequences resulting from proposed water transfers and exchanges. Little detail is provided describing coordinated operations between the three entities, which hinders the evaluation of potential impacts of the Proposed Project. The information provided suggests that there may be impacts associated with the proposed coordinated operations.
Chapter 2 - Section 2.5.2.1, Shasta Lake Exchanges	p. 2-36	The critical months for cold water pool management are incorrectly listed as August through September. CDFW recommends correcting this statement in the FEIR/FEIS and any subsequent analyses to cover the critical period for cold water pool management of August through November.
Chapter 2 - Section 2.5.2.1, Funks Creek and Stone Corral Creek Releases	p. 2-38	CDFW recommends the Proposed Project consider including all perennial creeks and rivers potentially impacted in the baseline studies.
		CDFW requests that all baseline data (not synthesized data) be shared with CDFW.
Chapter 2 - Section 2.5.2.4, Reservoir Management Plan	p. 2-43	CDFW recommends the development of a site-specific Aquatic Invasive Species Management Plan, coordinated with CDFW.
Chapter 2 - Section 2.5.2.4, Reservoir Management Plan	p. 2-43	CDFW recommends the development of a site-specific Fisheries Management Plan, coordinated with CDFW.
Chapter 2 - Section 2.5.2.4, Recreation Management Plan	p. 2-43	CDFW recommends considering hunting and firearm use, and their respective limitations or regulations, within the Recreation Management Plan. CDFW recommends considering the management and regulation of public use facilities to discourage habituation of wildlife to people.
Chapter 5 - Hydraulic Modeling Results	General Comment	The RDEIR/SDEIS presented hydrologic modeling results as averaged percent changes in flow and storage by water year type. Averaged results across water year type can obscure potentially significant impacts as there can be substantial hydrologic variation within the same water year type. CDFW recommends that the Proposed Project examine and present the results of individual years on the extreme ends of the water year type classification, wet and critically dry, to provide a better understanding of the magnitude of range in flow and storage under the different alternatives. The Proposed Project's hydrologic analysis suggests that the greatest impacts from Proposed Project operations occur in drier years. CDFW recommends that the Proposed Project analyze and discuss the potential impacts from Proposed Project operations under successive dry and critically dry years in the FEIR/FEIS, as there is the potential that under drought conditions impacts from the Proposed Project may be compounded and warrant additional avoidance, minimization, and mitigation measures.

Chapter or Appendix - Section	Page(s)	Comments and Recommendations
Chapter 5 - Section 5.3, Hydrologic Modeling Methods	p. 5-26	The CalSim II model does not include inflow or outflow for Funks and Stone Corral creeks. The USRDOM should include estimates for these, as well as "emergency spill" operations, minimum flows in the creeks, and channel maintenance pulses (if proposed). As the operational requirements are drafted and refined, a detailed operations model is needed that includes all inflows and outflows of the Proposed Project.
Chapter 5 - Section 5.4.1, CALSIM	General Comment	The CalSim II model uses a monthly time step leading to the use of monthly averaged flow data as inputs. Proposed Project diversion operations are most likely to occur on a sub-monthly time step targeting specific flow events with many associated impacts likewise occurring on a sub-monthly flow event specific basis; therefore, the use of average monthly flow data is unlikely to capture the relative peak timings of flows and outmigration of the more vulnerable life stages. Similarly, the use of summary statistics as inputs and grouping of results can dampen the level of modeled effect fish may experience at a smaller time scale, which may underestimate the actual impact of modeled operations on fish survival. As such, presentation of results in this format coupled with analysis dependent on CalSim II monthly average flow inputs may be incapable of detecting, accurately quantifying, or portraying the comparative effect of significant impacts of Proposed Project operations alternatives on fish species (Simenstad et al. 2017).
Chapter 5 - Section 5.4.1.1, Summary of General Changes in Hydrology	pp. 5-30, 5-33	The Proposed Project would exchange water with Shasta Lake to help preserve the cold water pool and provide benefits to anadromous fish. The hydrologic analyses presented in the RDEIR/SDEIS (Table 5-11, p. 5-30) shows on average no increases in Shasta Lake storage in wet years and minimal increases (2-4%) on average in critically dry years, while flow on the Sacramento River decreases by 10-11%, on average, in May (Table 5-16, p. 5-33) of critically dry years due to the exchanges, when compared with the No Action Alternative. There are many factors that affect Shasta Lake cold water pool management and preserving relatively small volumes of water in Shasta Lake in the spring and summer will not necessarily result in meaningful temperature benefits later in the year. CDFW is concerned that any benefit derived from these exchanges may be overshadowed by the adverse impacts to anadromous fish caused by the reduction in flow on the Sacramento River, due to exchanges, in the spring of critically dry years.
Chapter 5 - Section 5.4.1.1, Summary of General Changes in Hydrology	p. 5-33	The RDEIR/SDEIS shows potentially significant adverse impacts to aquatic biological resources due to Proposed Project diversions on the Sacramento River during the October-June period for Alternatives 1, 2, and 3. CDFW is concerned that reductions in flow due to Proposed Project operations are most pronounced in critically dry years, when biological aquatic resources are stressed and most vulnerable to further reductions in flow. For example, Table 5-16 (p. 5-33) shows an average 5-11% reduction in flow in critically dry years, near Wilkins Slough, for the period between December-May when flows during that time are on average already significantly below the 50% survival threshold of 10,712 cfs (Michel et. al. 2021) for juvenile Chinook salmon. Adverse impacts, caused by the reduction of flow from Proposed Project diversions, are likely to occur to many aquatic species, not just juvenile Chinook salmon, already stressed in the Sacramento River system. As a result, CDFW recommends the Proposed Project increase minimum bypass flow requirements to reduce the adverse impacts of diversions to less than significant.

Chapter or Appendix - Section	Page(s)	Comments and Recommendations
Chapter 5 - Section 5.4.1.1, Summary of General Changes in Hydrology	p. 5-36	The Proposed Project proposes exchanges that would preserve storage and the cold water pool in Lake Oroville for use later in the season (August and September). The preservation of the cold water pool in Lake Oroville is generally not an issue of concern given the depth of the reservoir and sufficient volume of cold water through the summer. CDFW is concerned that these exchanges could alter flows on the Feather River adversely impacting biological aquatic resources. For example, the Proposed Project increases flow in the fall of critically dry years by 5-25% (Table 5-23, p. 5-36), which could result in the dewatering of fall-run Chinook salmon redds and steelhead redds when flows recede. The RDEIR/SDEIS's hydrologic analysis also shows flow declines of 3-14% (Table 5-23, p. 5-36) on the Feather River in critically dry years, in the months of June and July, which has the potential to adversely impact migrating and emigrating spring-run Chinook salmon and green sturgeon. CDFW is also concerned that the proposed exchanges could interfere with Oroville Reservoir operations, potentially impacting future planned ecosystem water releases out of the reservoir. CDFW recommends that the FEIR/FEIS include a detailed analysis of the effects of the proposed exchanges on Oroville Reservoir operations, to assess potential impacts and weigh the costs versus benefits of conducting the proposed exchanges.
Chapter 5 - Section 5.4.1.1, Summary of General Changes in Hydrology	p. 5-37	Folsom Lake Exchanges could potentially lead to decreased releases from Folsom Lake in the spring and early summer, which could result in decreased rearing habitat and elevated temperatures for steelhead. The RDEIR/SDEIS's hydrologic analysis shows further cause for concern as flows on the American River in the spring and summer of critically dry years decrease on average by 1-9% (Table 5-25, p. 5-37), under the preferred action alternative. Additionally, higher releases in the fall often result in fall-run Chinook salmon redd dewatering when flows cannot be maintained for egg-incubation through to emergence. CDFW recommends that the FEIR/FEIS include a detailed analysis of spring, summer, and fall releases from Folsom Lake to assess potential impacts that may result from the proposed exchanges with the Proposed Project.
Chapter 6- Surface Water Quality	General Comment	Water quality analyses depend on models that use outputs from CalSim II, for which the output is on a monthly time step. However, daily and weekly changes to water quality can often have lethal or sub-lethal effects on aquatic resources, which a monthly time step cannot capture. Although the timestep for the Sacramento River temperature model (HEC-5q) is 6-hours, the inputs and outputs were monthly-averaged. To adequately analyze and disclose potentially significant impacts, CDFW recommends that the RDEIR/SDEIS's analyses of water quality impacts include a daily time series analysis. Additionally, the worst-case conditions must be analyzed on a daily time-step, e.g., Sacramento River daily maximum temperature increases in summer due to maximum allowable diversions.
Chapter 6 - Section 6.2.2.6, Harmful Algal Blooms (HABs)	p. 6-23	Harmful algal blooms (HABs) include a wide range phytoplankton such as diatoms and dinoflagellates, in addition to cyanobacteria. Cyanotoxins may be present in water, sediment, and biological organisms even if a bloom isn't observed. Microcystis is the dominant cyanobacteria in California, but Aphanizomenon and Dolichopermum are becoming more abundant (Lehman et al. 2021). CDFW recommends that the FEIR/FEIS consider other potential sources of HABs in its analysis.

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Chapter 6 - Section 6.3.2.5, Water Temperature	p. 6-34	Model limitations may obscure the magnitude of the Proposed Project's temperature impacts to the Sacramento River. The Sites reservoir temperature model does not include inflows or outflows for Funks Creek or Stone Corral Creek. It is assumed that the reservoir will stratify as a typical Northern California Reservoir, but the pump outlet location and flat topography (higher winds) may lead to a well-mixed reservoir. An example from another "off-channel" storage project, the San Luis Reservoir Draft Resource Management Plan (2012, p. 2-19) states "*Because of constant pumping and mixing of its water, San Luis Reservoir does not typically develop a thermocline.*" CDFW recommends further analysis on the Proposed Project's stratification potential.
Chapter 6 - Section 6.3.2.5, Water Temperature	p. 6-34	The RDEIR/SDEIS's temperature modeling does not consider agricultural runoff, which may increase the solar radiation potential of the discharged water. Warm releases from the Proposed Project are targeted for rice farming, and this water will warm further on the rice fields, which presumably will be returned to the Yolo Bypass and/or Sacramento River. This has the potential to impact water quality in the Yolo Bypass and Sacramento River through reductions in dissolved oxygen and increases in water temperature. CDFW recommends that the FEIR/FEIS include an analysis of the effects of agricultural runoff, resulting from Project operations, on dissolved oxygen levels and water temperature.
Chapter 6 - 6.3.2.8, Harmful Algal Blooms (HABs)	pp. 6-37, 38	The RDEIR/SDEIS takes into consideration reservoir water levels and potential effects of HABs. However, it is unclear and unlikely that the reservoir modeling conducted can evaluate whether or not HABs or toxins will be released from the reservoir. CDFW recommends the creation of a monitoring plan of phytoplankton and cyanotoxins that includes the reservoir and downstream locations.
Chapter 6 - Section 6.3.2.9, Mercury and Methylmercury	p. 6-38	CDFW suggests that the FEIR/FEIS provide additional analysis on the potential impacts of increased flooding on methylmercury formation in the Yolo Bypass due to August-October flows and releases for Storage Partners. Table 11-13 (p.11-115) indicates that Yolo Bypass flooding could increase by hundreds of acres between August-October due to these flows, which would potentially increase methylmercury formation. Releases for Storage Partners along the CBD, Yolo Bypass, and North Bay Aqueduct may also impact methylmercury formation if releases are not contained within the Tule Canal/Toe Drain.

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Chapter 6 - Impact WQ-2, Violate any Water Quality Standards or Waste Discharge Requirements or Otherwise Substantially Degrade Surface Water Quality During Operation	p. 6-72	The RDEIR/SDEIS states that "*Sites Reservoir releases to the Yolo Bypass would not be expected to violate water quality standards or waste discharge requirements or otherwise substantially degrade water quality in Yolo Bypass . . . with regard to . . . [Dissolved Oxygen] DO*" (p. 6-72). CDFW disagrees with this conclusion as DWR's recent synthesis report for the North Delta Food Subsidy study from 2013-2019 showed DO levels in the Yolo Bypass Toe Drain at Lisbon Weir were reduced during the flow pulse in all years (Davis et al. 2021). As indicated in Appendix 6A, the CBD and Knights Landing Ridge Cut (KLRC) are both on the 303(d) List of Impaired Water Bodies for DO. Conveying water through the CBD and KLRC has the potential to transport low-DO water downstream into the Yolo Bypass. The proposed Yolo Bypass habitat flows will occur within a three-month period between August-October, potentially impacting DO levels in the Yolo Bypass during the entire release period. Releases for Storage Partners along the CBD, Yolo Bypass, and North Bay Aqueduct may also impact DO levels. CDFW recommends providing additional analysis on the potential impacts of transporting water through the Yolo Bypass on DO levels. CDFW suggests including relevant findings from the 2013-2019 North Delta Food Subsidy study related to DO.
Chapter 6 - Impact WQ-2, Sites Reservoir	pp. 6-88, 89	The RDEIR/SDEIS considers that the concentration of cyanotoxins would depend on the magnitude of the bloom, but the assumptions listed in the RDEIR/SDEIS for considering causes of concern are overly simplistic. Microcystis has a pelagic and benthic state. Microcystins can be found in water, sediment, and biological organisms. Latour et al. 2007 found benthic Microcystis colonies at 70 centimeters deep in sediment, with an approximate age of 14, suggesting Microcystis and it's toxin can persist in lake sediments. Biodegradation does occur but it depends on other conditions such as adsorption rate, temperature, and pH. A strain of microcystin, Microcystin-LR, has high affinity to organic matter (Wu et al. 2011; Pawlick and Kornijo et al. 2010). Dissolved microcystins can adsorb to suspended particulate matter as a pathway of transport to downstream regions, including marine environments. (Liu et al. 2008). Bivalves, or clams, can have long depuration phase of removing toxins as found in Miller et al. 2010 and Gibble et al. 2016. CDFW recommends that the Proposed FEIR/FEIS acknowledge the complexities of cyanobacteria as being both pelagic and benthic. Cyanotoxins are extremely complex and while they may biodegrade and photodegrade, they can be present in water, suspended sediment, bottom sediment, and biological organisms.
Chapter 6 - Impact WQ-2, Yolo Bypass and The Delta	p. 6-90	Aulacoseira is a diatom, which is considered a good food source in general. However, results from Jungbluth et al. 2020, suggests Aulacoseira may not serve as an accessible food source. The North Delta Food Subsidy Synthesis (Davis et al. 2021) found the flow action in 2016 significantly lowered biovolume (Figure 4-1 and Table 4-2). While Aulacoseira was detected in downstream stations, it is unlikely that it was transported from the north due to the flow action since Aulacoseira was observed at very low levels at the upstream stations. Frantzich et al. 2021 conclude phytoplankton taxa were not significantly different before, during, and after the flow pulse.

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Chapter 6 - Impact WQ-2, Violate any Water Quality Standards or Waste Discharge Requirements or Otherwise Substantially Degrade Surface Water Quality During Operation	p. 6-90	The RDEIR/SDEIS states that "*according to the* [Harmful Algal Blooms] *HABs voluntary reports database (California HABs Portal maintained by the California Water Quality Monitoring Council; State Water Resources Control Board 2021a) HABs have not been reported in Yolo Bypass in previous years.*" (p. 6-90) Microcystis has been observed in the north delta and Yolo Bypass areas in the datasets from the following sources: DWR's Yolo Bypass Fish Monitoring Program; DWR's North Central Region Office dataset; CDFW's Fall Midwater Trawl Survey; and CDFW's Summer Townet Survey. The California HABs portal currently is missing all or most of Interagency Ecological Program data. CDFW suggests that the Proposed Project incorporates this information into their impact analysis in the FEIR/FEIS.
Chapter 6- Pesticides	pp. 6-91, 92	The RDEIR/SDEIS states that "*there is still some uncertainty about whether augmented flows through the Yolo Bypass could cause increases in pesticide levels in the bypass that might be detrimental to fish or could cause increases in pesticide levels in plankton within the bypass that may provide food for fish in the Cache Slough Complex*" (p. 6-91,92). CDFW agrees that there is uncertainty surrounding this issue but is concerned that the RDEIR/SDEIS's pesticide impact analysis is based on a qualitative rationale that only considers why "*Sites Reservoir releases through the Yolo Bypass could have a limited effect on pesticides in the Delta*" (p. 6-91). There is evidence to suggest that increased flows through the Yolo Bypass could increase pesticide concentrations and that exposure to these pesticides could adversely impact aquatic biological resources. Davis et al. 2021, found significantly higher pesticide concentrations in water and zooplankton during flow pulses (Figure 3-60 and Figure 3-62). In some cases, pesticides detected exceeded EPA aquatic life benchmarks for chronic and acute toxicity. Additionally, synergistic or additive effects of pesticides, along with other stressors, may have a significant adverse impact on biological aquatic resources. 11A.1.8.4 of the RDEIR/SDEIS states that "*sturgeon are at risk of harmful accumulations of toxic pollutants in their tissues, especially pesticides such as pyrethroids and heavy metals such as selenium and mercury (Israel and Klimley 2008; Stewart et al. 2004)*" (p. 11A-56). Additionally, Fong et al. 2016, noted that Delta Smelt populations and other pelagic organisms are in decline likely due to the effects of multiple stressors. CDFW recommends that the FEIR/FEIS's impact analysis consider the potential impacts that may occur should the Proposed Project operations increase pesticide levels through the Yolo Bypass. CDFW also recommends that the FEIR/FEIS consider adding a section to the Water Quality chapter discussing impacts that could occur as a result of synergistic effects from multiple stressors related to water quality.
Appendix 6D - Section 2.1.2, Modeling Input Data	p. 6D-2	The only meteorological input mentioned for the CE-QUAL W2 model is evaporation, which itself was not mentioned or detailed in Appendix 5B or its references. Typically, reservoir temperature models also require wind direction and speed, air temperature, and solar radiation as meteorological inputs. CDFW recommends including more meteorological inputs to CE-QUAL W2 to increase confidence in the results or expand on the description of inputs if others were included in the model.

Chapter or Appendix - Section	Page(s)	Comments and Recommendations
Chapter 7 - Impact FLV-1, Substantially Alter the Existing Drainage Pattern of the Site or Area	p. 7-1	The Proposed Project is estimated to have a 2% reduction in suspended sediment as a result of direct diversions from the Sacramento River. This analysis does not consider the additional sediment reduction from the impoundment of sediment due to the 12,000-acre drainage area of Sites Reservoir itself. CDFW recommends analyzing the impacts due to the reduction in sediment and if necessary, mitigating for reduced sediment supply in the Delta in the FEIR/FEIS.
Chapter 7 - Section 7.3.2, Operation	p. 7-10	The RDEIR/SDEIS used suspended sediment transport, bedload, and river meandering models that "*were previously utilized in the 2017 Draft EIR/EIS for a 1.8-MAF reservoir with a Delevan Intake location on the Sacramento River*" (p. 7-10). The RDEIR/SDEIS states that the previous model results are valid for the Proposed Project, because "*the previous modeling results are generally conservative (i.e., higher in volume) relative to the amount of diverted water (and sediment) being considered under Alternatives 1, 2, and 3*" (p. 7-10). However, while the overall amount of water being diverted has decreased in comparison to the previous configuration of the Proposed Project, the amount of water being diverted further upstream has increased to compensate for the loss of the Delevan Intake. This could result in impacts that are not captured in the current modeling. CDFW recommends that the modeling be updated to reflect the current configuration of the Proposed Project.
Chapter 7 - Section 7.3.2, Operation	p. 7-10	The RDEIR/SDEIS states that "*the flood metrics evaluated are monthly average flows exceeded 10% of the time because this is the percent of time during which flows are relatively high and most of the geomorphic work would be performed on the Sacramento River system. These values are very close to the 2-year flood event at each station*" (p. 7-10). CDFW believes that the 10% exceedance of monthly averaged flow does not have a significant meaning for geomorphic work. No supporting documentation is provided that shows that the flow values are close to the 2-year flood event. It is incorrect to assert that a change to the 2-year peak flow (50% annual exceedance probability) is equivalent or proportional to a change in the monthly-averaged 10% exceedance value. CDFW recommends that the Proposed Project complete an impact analysis using changes to 1.5 or 2-year peak flows (67% or 50% annual exceedance probability, respectively).

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Chapter 8 - Groundwater Resources	General Comment	The RDEIR/SDEIS relies on modeling from the 2017 DEIR/DEIS. The baseline conditions, as well as the alternatives, have changed since groundwater modeling was last completed. The timing and magnitude of diversions, and reservoir depth and storage all have an impact on the groundwater modeling results. The models used (CalSim, CVHM, and SACFEM) are large in geographic scope, and may not be calibrated well to local hydrology and monitoring wells. No information was provided about the localized calibration or validation of these models. For example, CalSim II does not include any local inflow to the Proposed Project, nor releases to Funks or Stone Corral creeks. Additionally, the RDEIR/SDEIS states "*because diversions required to operate a larger reservoir capacity would have minimal effects on groundwater elevation and groundwater/surface water interaction (Section 8.3.2, Operation), it is reasonable to assume these effects would be even smaller under Alternatives 1, 2, and 3 because less water would be diverted for operations*" (p. 8-15,16). While the RDEIR/SDEIS considers a smaller reservoir, it has also eliminated the Delevan diversion point and diversion rates at the two remaining diversion points may be higher than modeled. Therefore, the potential impact to groundwater elevations and river stage is unknown but will likely be greater than originally modeled. CDFW recommends that the Authority update the modeling to reflect the Proposed Project's current configuration and that local impacts to groundwater be modeled with the state-of-the-art and locally focused groundwater model used by the Colusa Groundwater Authority for the Colusa Subbasin: CV2SimFG-Colusa.
Chapter 8 - Groundwater Resources	General Comment	It is anticipated that the Colusa, Yolo, and Red Bluff groundwater subbasins will formally adopt groundwater sustainability plans (GSPs) by January 31, 2022. Sustainable Management Criteria, as established in each basin's GSP, will determine what impacts to groundwater resources would be considered significant or unreasonable. CDFW recommends that the FEIR/FEIS compare the Proposed Project's anticipated impacts on groundwater resources throughout the study area to the Sustainable Management Criteria adopted in each subbasin's GSP when making significance determinations for each Project alternative.

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Chapter 8 - Impact GW-2, Substantial Decrease in Groundwater Supplies or Substantial Interference with Groundwater Recharge That Would Impede Sustainable Groundwater Management of the Basin	pp. 8-13-8-18	The RDEIR/SDEIS estimates that the Proposed Project will use up to one million gallons of groundwater per day for construction needs over a period of 4.5 years (p. 8-13), amounting to as much as 15% of the total annual groundwater use within the basin (p. 8-18). The RDEIR/SDEIS also anticipates that construction techniques would require dewatering (i.e., pumping and removing water from the aquifer) down to depths as great as 30 feet below ground surface to install features such as the Dunnigan pipeline (p. 8-15). Following construction, the RDEIR/SDEIS also anticipates that Proposed Project operation will reduce groundwater elevations near the diversion points. Specifically, based on the previous groundwater modeling, which as noted above likely underestimates impacts, groundwater elevations may decrease as much as 2.5 feet near the Red Bluff Pumping Plant and the GCID Hamilton City Pump Station (p. 8-15). The RDEIR/SDEIS states that the construction groundwater use "*would result in a less-than-significant reduction in groundwater supply*" (p. 8-18). However, the RDEIR/SDEIS only considers the potential impacts of temporary construction-related and ongoing operation-related decreased groundwater levels on sustainable groundwater management for human users of groundwater but does not consider the potential impacts on environmental users of groundwater, such as groundwater dependent ecosystems and interconnected surface waters. According to the Natural Communities Commonly Associated with Groundwater dataset (DWR 2021) (https://gis.water.ca.gov/app/NCDatasetViewer/), there are groundwater dependent ecosystems located both near the construction area (along Stone Corral Creek and Funks Creek in between the proposed reservoir location and the Glenn Colusa Canal) and near the diversion points. Decreased groundwater elevations for multiple years in these areas could negatively impact groundwater dependent ecosystems and interconnected surface waters. CDFW recommends that the FEIR/FEIS quantitatively assess the potential impacts of reduced groundwater levels, both due to construction and ongoing operations, on environmental users of groundwater near the construction area and the diversion points. Resources developed for preparation of Groundwater Sustainability Plans may be helpful, such as the Plant Rooting Depth Database (developed by The Nature Conservancy, https://groundwaterresourcehub.org/sgma-tools/gde-rooting-depths-database-for-gdes).
Chapter 9- Mitigation Measure VEG-1.1, Conduct Appropriately Timed Surveys for Special-Status Plant Species Prior to Construction Activities	p. 9-26	Mitigation Measure VEG-1.1 discusses conducting surveys for special-status plant species prior to construction and states the Authority will comply with the "*Protocols for Surveying and Evaluating Impacts to Special Status Native Plant Populations and Natural Communities (California Department of Fish and Wildlife 2018)*" (p. 9-26), or the most current protocols, specifically with respect to the number and timing of surveys, use of reference populations, and evaluation of negative findings. Surveys for rare annual plants need to consider compounding influences from low rainfall and rainfall timing conditions. Many annual species of the rare plants may not germinate during a prolonged drought or may be affected by rainfall timing. In some instances, it may be feasible to assume the species are present, especially if habitat is present and the species have been reported on the habitat in previous year surveys. CDFW recommends the FEIR/FEIS be updated to include rare plant surveys on the Proposed Project site will be conducted on the entire Proposed Project area where habitat is present and over multiple growing seasons before assuming that the species are not present within Proposed Project areas.

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Chapter 10, Impact WILD-1g: California Red-legged Frog	p. 10-68	The RDEIR/SDEIS establishes minimum flows between 0 to 100 cfs and the use of larger pulse flows to maintain habitat present immediately downstream from the Proposed Project. The minimum flows and the larger pulse flows are an estimation and will be finalized later after the RDEIR/SDEIS is certified. The RDEIR/SDEIS determines that many of the impacts to species and habitat present downstream from the reservoir within Funks and Stone Corral Creeks are less than significant based on the assumption that minimum and larger pulse flows will continue after construction of the Proposed Project. Minimum bypass flows and pulse flows are essential to maintain the habitat characteristics and the existing geomorphology of these creeks. The RDEIR/SDEIS cannot guarantee the existing Proposed Project design allows for larger pulse flows, but the less than significant determination to the species and habitat relies on the assumption that these larger pulse flows will continue after construction of the Proposed Project. Therefore, due to the uncertainty of whether these pulse flows can continue, CDFW recommends that the FEIR/FEIS include provisions to modify the Proposed Project design to allow for adequate releases that will be calculated after the document is certified. If these post-certification modifications are not feasible, the FEIR/FEIS should include an impact analysis to the species and habitat present within Funks and Stone Corral Creeks caused by missing adequate pulse flows and describe any additional avoidance, minimization, and/or mitigation measures that would be needed to reduce any potentially significant impacts to a less-than-significant level.
Chapter 10, Mitigation Measure WILD-1.24: Conduct Surveys for Western Burrowing Owl	p. 10-89	Mitigation Measure WILD-1.24 of the RDEIR/SDEIS states that the Authority will "*conduct burrowing owl surveys in accordance with CDFW's 2012 Staff Report on Burrowing Owl Mitigation (2012 Staff Report) (California Department of Fish and Game 2012*)" (p. 10-89). The 2012 Staff report concludes that because burrowing owls may re-colonize a site after a few days, subsequent surveys should be conducted if more than two days pass between Proposed Project activities. CDFW recommends the FEIR/FEIS state that additional surveys will be conducted if a lapse in Proposed Project activities of two days or greater occurs.

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Chapter 10, Mitigation Measure WILD-1.26: Rodenticide Use	p. 10-91	The 2012 Staff Report also includes avoidance measures to help avoid negative impacts that could result in take of burrowing owls, nests, or eggs through efforts to control nuisance animals as the use of rodenticides may impact non-target wildlife. Anticoagulant rodenticides, including diphacinone, have been detected in the majority of predators and scavengers tested in California (Hosea 2000), including bobcats (Lynx rufus) (Serieys et al. 2015) and raptors (Kelly et al 2014). Acute rodenticides, such as zinc phosphide, and fumigants carry much less risk of secondary exposure in wildlife and should be prioritized over anticoagulant rodenticides. CDFW recommends that the FEIR/FEIS include a measure for the Authority to develop an Integrated Pest Management Plan (IPMP) which focuses on long-term prevention of pest damage through habitat modification (Van Vuren et al 2014), incorporates biological control methods such as raptor perches and owl boxes to increase natural raptor predators, and includes limited and targeted rodenticide use when necessary. The IPMP should include measures to reduce rodent density before any anticoagulant baits are placed to reduce the number of contaminated rodents available to predators and scavengers. It should also include regular monitoring to ensure rodent control measures are taken only in response to current rodent activity. Additionally, CDFW recommends that rodenticides, anticoagulant or non-anticoagulant, are not broadcast to minimize the risk to non-target species from ingesting it directly. Furthermore, CDFW recommends that the Authority consult with California Department of Pesticide Regulation's PRESCRIBE database (https://www.cdpr.ca.gov/docs/endspec/prescint.htm) prior to any vertebrate pest control activity. The database incorporates section by section coordination with CDFW's Biogeographic Information and Observation System (BIOS) and the California Natural Diversity Database (CNDDB) to provide species-specific use restrictions over and above anything generic already on the pesticide label including use of modified bait stations (and what those modifications must be).
Chapter 10 - Mitigation Measure WILD -1.28	p. 10-97	A requirement in Mitigation Measure WILD-1.28 states that, *"a minimum of two aerial surveys or ground observation periods lasting at least 4 hours each will be conducted…to confirm presence/absence of golden eagle"* (p. 10-97). Aerial survey methods can cover more area than ground survey efforts. CDFW recommends increasing the minimum time spent conducting ground surveys to no less than 6 hours. CDFW also requests that the Authority coordinate with CDFW regarding any potential mitigation related to bald eagle and golden eagle.
Chapter 10 - Mitigation Measure WILD-1.31, Compensate for the Loss of Foraging Habitat for Swainson's Hawk and White-tailed Kite	p. 10-106	The Proposed Project will result in the significant loss of foraging habitat, which could contribute to the reduction of Swainson's hawk range and abundance in Glenn County and California. To reduce the impacts to a less than significant level, CDFW recommends the FEIR/FEIS require acre for acre habitat replacement in the form of fee title acquisition with a conservation easement to protect Swainson's hawk foraging habitat. Implementation of this mitigation measure would ensure consistency of the FEIR/FEIS with the Yolo Habitat Conservation Plan/Natural Community Conservation Plan and the South Sacramento Habitat Conservation Plan mitigation strategies for this species.

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Chapter 10 - Mitigation Measure WILD-1.23, Conduct Preconstruction Surveys for Non-Raptor Nesting Migratory Birds and Implement Protective Measures if Found	p. 10- 114	It is unknown if the Proposed Project will impact some of the state-listed species with the potential to occur in the Proposed Project area until surveys are conducted. CDFW recommends that Mitigation Measure WILD-1.23: Conduct Preconstruction Surveys for Non-Raptor Nesting Migratory Birds and Implement Protective Measures if Found is revised in the FEIR/FEIS to also implement protective measures if preconstruction surveys detect state-listed bird species in areas outside their modeled habitat. This is especially important if the species or their nesting habitat are located within the direct project footprint. CDFW recommends that if state-listed species are found during surveys that the FEIR/FEIS includes provisions to contact CDFW to establish compliance with CESA and obtain any applicable permits prior to impacting the species. If the Proposed Project results in permanent impacts to any of these species, mitigation already disclosed in the RDEIR/SDEIS should also be implemented.
Chapter 10 - Impact WILD-1o: Bank Swallow	p. 10-117	Timing of flow releases can have both direct and indirect impacts to bank swallow populations. Direct impacts and potential take can occur if high flows during the late spring and summer nesting season cause inundation of burrows or loss of nests caused by localized bank sloughing. Indirect impacts could occur with changes in flow regimes as bank swallows need winter and early spring flows to allow refreshing of erosional banks. Therefore, a change from current operations of flows on the Sacramento River as a result of the Proposed Project could beneficially or adversely impact bank swallows depending on the timing, duration, and volume of flows. CDFW recommends the FEIR/FEIS include the consideration of bank swallow life cycle in any changes in flows as a result of the Proposed Project, especially during nesting season (April 1 - August 31).
Chapter 10 - Mitigation Measure WILD -1.26	p. 10-134	Mitigation Measure WILD-1.26 includes the installation of signage discouraging feeding of wildlife to aid in the reduction of potential nuisance rodents. While signage can be effective at reducing the number of visitors feeding wildlife, it does not eliminate feeding or the resulting wildlife dependency on handouts. Example regulations include, the California Code of Regulations Title 14, section 251.3, which specifically states that it is illegal to feed big game mammal; section 251.1, which addresses feeding as “harassment” of animals. “Harass,” as defined in this section, as an “*intentional act which disrupts an animal’s normal behavior patterns, which includes, but is not limited to, breeding, feeding or sheltering*.” Any applicable local regulations should also be considered by the Proposed Project.
Chapter 11 - Section 11.3.2, Operations	p. 11-57	The RDEIR/SDEIS states that "*where feasible, and when modelers indicate using them is appropriate, daily model outputs are utilized*" (p. 11-57). However, use of USRDOM daily time step hydrologic data is limited to juvenile stranding analysis, redd scour, and redd dewatering analysis for evaluating impacts FISH-2 through FISH-5 as stand-alone, not cumulative projections of impacts.

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Chapter 11 -Impact Fish-2, Delta	General Comment	CDFW is concerned that important changes in location and timing of available Delta rearing and migratory habitat under the Proposed Project are not being captured by model projections in the RDEIR/SDEIS. Delta abiotic factors that influence habitat suitability and the subsequent rearing and survival components of salmonid life history is a significant knowledge gap that is not currently resolvable. This should be acknowledged throughout the text of Chapter 11. However, it is well established that the quality and quantity of habitats available for Chinook salmon and steelhead in the Delta depend on inflows from the Sacramento River (del Rosario et al. 2013). CDFW recommends that the Proposed Project utilize the California Water Fix analysis done for potential impacts to reduced inundation of river adjacent floodplain bench habitat to assess changes in the location and timing of available Delta rearing and migratory habitat due to Proposed Project operations.
Chapter 11- Yolo Bypass and Fremont Weir Spill Flow and days of Yolo Bypass Inundation	p. 11-114	As noted in the RDEIR/SDEIS, Proposed Project operations could reduce recruitment of juvenile salmonids onto the Yolo Bypass via Fremont Weir during overtopping events and through the proposed Fremont Weir Notch Project headworks structure. CDFW is concerned that the analyses conducted are lacking in fully evaluating the potential impact of operations on juvenile salmonid access to floodplain rearing habitat in the Yolo Bypass. The RDEIR/SDEIS analysis for flow reductions at Fremont Weir only spans January-June, thereby missing November and December when overtopping may occur. Additionally, the total reduction in inundated habitat is skewed by adding modeled inundated habitat in the August-October period during conditions when juvenile salmon most likely will not have access to that habitat. To fully assess potential impacts, CDFW suggests the RDEIR/SDEIS include an analysis of how Proposed Project diversions will reduce flow entering the Yolo Bypass on a daily time-step during Fremont Weir overtopping events and through the proposed Fremont Weir Notch headworks structure for the time period of November 1 through May 31, to adequately capture Fremont Weir spill events and Fremont Weir notch operations. Changes in flow entering the Yolo Bypass on a daily time scale may be more important than monthly changes to inundated acres because it is assumed that fish access to the Bypass is the limiting factor for rearing rather than total inundated acres. CDFW suggests using the two-dimensional TUFLOW model developed for the Fremont Weir Notch EIR/EIS (BOR and DWR 2019). Reductions in flow should be related to reductions in juvenile salmonid entrainment onto the Yolo Bypass using best available information such as entrainment models developed for the Fremont Weir Notch Project.
Chapter 11 - Floodplain Inundation and Access	General Comment	A key objective of the Fremont Weir Notch Project is to improve connectivity between the Sacramento River to provide safe and timely passage for adult winter- and spring-run Chinook salmon, Central Valley steelhead, and green sturgeon. CDFW recommends the FEIR/FEIS include an impact analysis of Proposed Project operations to the Fremont Weir Notch Project, considering impacts to the number of adult fish passage days. This analysis should be based upon the fish passage criteria developed for the Fremont Weir Notch Project. Since the Fremont Weir Notch Project is also a mitigation project for CVP & SWP operations, any changes to floodplain inundation frequency and duration should be considered when developing mitigation strategies to address those potential impacts.

Chapter or Appendix - Section	Page(s)	Comments and Recommendations
Chapter 11 - Impact Fish-2, Yolo Bypass Inundated Area	pp. 11-115, 11-301	In the analysis of changes in access to suitable juvenile salmonid (and splittail) rearing habitat, the RDEIR/SDEIS describes the August - October flows through Yolo Bypass as creating "habitat". The RDEIR/SDEIS also notes very few to no juvenile salmonids (or splittail) will be present or able to access this flooded land and, therefore, additional flows through the Yolo Bypass in August - October will not provide "suitable habitat" or "habitat acreage". CDFW recommends the FEIR/FEIS reflect this clarification and that analysis of changes in access to suitable rearing habitat not include the additional flows proposed to be released through the Yolo Bypass in August - October.
Chapter 11 - Floodplain Inundation and Access for Sutter Bypass	pp. 11-118,119; 11-147; 11-179; 11-205	"*The results of the frequency analysis of weir spills shows reductions in the number of spills, especially for the Sutter Bypass, indicating a reduction in bypass entry opportunity for juvenile salmonids*" (p. 11-118, 119). Similar analyses are provided on p. 11-147 for spring-run Chinook salmon, p. 11-179 for fall and late-fall-run Chinook salmon, and p.11-205 for Central Valley steelhead. CDFW believes that the existing analyses and discussion of results on the potential impact of operations on juvenile salmonid access to floodplain rearing habitat in the Sutter Bypass do not fully capture potential impacts. It is not clear from the text what time period was modeled to assess reduction in weir spill events, the modeling results are not presented and the impact of the described reduction in weir spill event is not evaluated. Like for the Yolo Bypass, Sites operations could reduce beneficial recruitment of listed juvenile salmonids onto the Sutter Bypass via Moulton, Colusa, and Tisdale Weirs. Operations also have the potential to impact juvenile rearing habitat at the southern end of the Sutter Bypass due to a reduction of floodplain inundation arising from backwatering around the confluence of Sacramento River and Feather River. CDFW recommends that the same level of detail in-text as is provided for Yolo Bypass for potential changes to weir spill flows, days of inundation, and inundated area in Sutter Bypass. As for the Yolo Bypass, additional analyses should be conducted to better assess how operations will impact juvenile salmonid access to floodplain rearing habitat in the Sutter Bypass. This should include an analysis of how Sites proposed diversions will reduce flows in the Sutter Bypass on a daily time-step. CDFW suggests using the two-dimensional TUFLOW model developed for the Big Notch Project EIR/EIS (BOR and DWR 2019). Reductions in flow should be related to reductions in juvenile salmonid entrainment onto the Sutter Bypass using best available information.
Chapter 11 - Floodplain Inundation and Access for Sutter Bypass	General Comment	The potential impacts of operations on adult fish passage through and out of the Sutter Bypass were not analyzed. Proposed Project operations may reduce the number of days that adult salmonids and acipenserids can pass from the Sutter Bypass back to the Sacramento River during weir overtopping events (e.g., at Moulton, Colusa, and Tisdale Weirs) and at the planned fish passage notch in Tisdale Weir. Additional analyses should be conducted to better understand how the Proposed Project will impact adult fish migration within Sutter Bypass and out of Sutter Bypass. This should include an analysis of how diversions will reduce flow entering the Sutter Bypass on a daily time-step over associated flood weirs and at the planned fish passage notch at Tisdale Weir. Flow reductions should be related to the adult fish passage criteria for depth and velocity that were developed for the BNP (DWR 2017).

Chapter or Appendix - Section	Page(s)	Comments and Recommendations
Chapter 11 - Impact Fish-2, Yolo Bypass Inundated Area	p. 11-118	Katz et al. 2017 and Bellido-Leiva et al. 2021 do not provide evidence that the Yolo Bypass provides good rearing habitat for juvenile salmonids. Please remove and provide additional reference by Sommer et al. (2001).
Chapter 11 - Impact Fish-2, Delta	p. 11-125	Appendix 11J does not include specific information regarding the sensitivity analysis (e.g., What were the assumptions and parameters of the sensitivity analysis? What time of year was the Georgiana barrier assumed operational?). It is unclear if 50% reduction in mortality is an appropriate assumption under all alternatives, given the study did not take into consideration reduced outflow conditions as a result of Sites proposed alternatives. Also, it is not clear if 50% should be assumed across all flow conditions, months, and water years. The BAFF was only studied in 2011 (wet WY) and 2012 (below normal WY); therefore, there are no above normal, dry, or critical years studied. CDFW suggests including a detailed description of the modeling assumptions included in the sensitivity analysis.
Chapter 11 - Tables 11-17, 11-18, 11-27, and 11-28	p. 11-126, 27, 11-154	The current Salvage Density Method only includes water years 2009-2019, which omits above normal water year types. Previous applications of this model (i.e., SWP EIR and Incidental Take Permit Application) included all water years analyzed with CalSim (1922-2003), which includes above normal water year types. CDFW recommends the interpretation of the results from this analysis and how they are applied to the evaluation of potential impacts consider the limited years of data used, which may underestimate potential impacts.
Chapter 11 - Tables 11-17, 11-18, 11-27, and 11-28	p. 11-126, 11-127, 11-206	The results of the Salvage Density Method are averages across water year type rather than by month and water year type. For winter-run and spring-run Chinook Salmon, salvage is not consistent across the year therefore the modeling results may underrepresent any changes to salvage during the months of peak salvage. Historically, peak salvage of winter-run Chinook Salmon occurs in March (with a smaller peak in January) and peak salvage of spring-run Chinook Salmon occurs in April. CDFW suggests presenting the results of the Salvage Density Method by month and water year type.
Chapter 11 - Life Cycle Models	pp. 11-127 - 11-129	The OBAN winter-run Chinook salmon life cycle model was run to provide an analysis of the potential integrated effects of Alternatives 1, 2, and 3 on the species relative to the NAA. As noted in the RDEIR/SDEIS, OBAN does not have a flow survival component capable of analyzing primary impacts of the Proposed Project on winter-run Chinook salmon. Given the absence of a flow survival component, OBAN provides limited utility for evaluation of Proposed Project impacts on winter-run Chinook salmon.
Chapter 11- Mitigation Measure FISH-2.1: Wilkins Slough Flow Protection Criteria	pp. 11-131,132	The Flow Threshold Survival Analysis to Assess Potential Effects of Sites Reservoir Project Mitigation Measure FISH-2.1 should be conducted separately for winter-run Chinook salmon because the key input relies on a Wilkins Slough Bypass Flow of 10,172 cfs from March through May after which most winter-run Chinook salmon have passed Wilkins Slough. Thus, winter-run Chinook salmon are not currently accounted for in this analysis.

Chapter or Appendix - Section	Page(s)	Comments and Recommendations
Chapter 11 - Impact Fish-4, Sites Reservoir Release Effects	pp. 11-180, 11-206	Any inundation of lands in Yolo Bypass that occurs between August-October will impact landowners in the Bypass. Relevant land uses (and approximate timing) include waterfowl season (typically mid-October to through mid-January); flooding of seasonal wetlands (typically September or October through April); rice harvest (typically September to October). CDFW recommends that the Proposed Project provide additional analysis on the potential impacts to landowners from conveying flow deliveries through the Yolo Bypass.
Chapter 11 - Impact Fish-4, Sites Reservoir Release Effects	pp. 11-180; 11-206	"*Fall-run Chinook salmon entering the Toe Drain may eventually reach the Wallace Weir, where fish rescue and relocation to the Sacramento River by CDFW occurs, either at the recently completed Wallace Weir Fish Rescue Facility or by beach seine in the vicinity of the Wallace Weir*" (p. 11-180 for fall-run, p. 11-206 for steelhead). Operations of the Wallace Weir Fish Salvage Facility should not be considered an avoidance or minimization measure for potential impacts from conveying water through the Yolo Bypass on adult salmonids. The purpose of the Wallace Weir Fish Rescue Facility is to prevent listed adult fish from entering the Colusa Basin Drain and increase the efficiency of potential fish salvage operations. The long-term goal for the Yolo Bypass fisheries enhancement efforts is to reduce fish salvage at Wallace Weir. Increasing reliance on the facility to reduce impacts from Proposed Project deliveries conflicts with this goal. As such, it is inappropriate to use operations of the fish rescue facility as a rationale for explaining why Proposed Project reservoir releases would not impact adult fall-run Chinook salmon and steelhead. Additionally, increased flows through Colusa Basin Drain and Wallace Weir may impact the operational capacity of the Wallace Weir Fish Rescue Facility, further increasing the chance of stranding, migratory delays, and exposure to poor water quality conditions to fish being present downstream of Wallace Weir between August and November. Increased reliance of the Wallace Weir Fish Rescue Facility should be put in context of the objectives of the facility and a discussion of how handling and transporting anadromous fish potentially impacts their fitness should be included. Overall, the Proposed Project should provide a more objective description of the potential impacts of reservoir releases through the Yolo Bypass on increased stranding of fall-run Chinook salmon and steelhead, as well as impacts to operations of Wallace Weir Fish Rescue Facility.
Chapter 11 - Impact Fish-6, Flow Effects	p. 11-223	Fish screen entrainment assessment is based on pallid sturgeon (Mefford and Sutphin 2008). This species is a poor proxy for green or white sturgeon. More suitable references would be products of the Cech or Fangue labs at UC Davis such as Poletto et al. 2014 and Mussen et al. 2014.
Chapter 11 - Impact Fish-6, Flow Effects	p. 11-223	The RDEIR/SDEIS states that "*The* [green sturgeon] *adults spawn primarily from March through July, although they periodically spawn in late summer and fall (as late as October) (Heublein et al. 2009, 2017, NMFS 2018b)*" (p. 11-223). This statement is not consistent with the cited literature. The first two citations do not support this statement and the last citation (NMFS 2018) states that larvae have been found in late summer and fall. The latest reports of larvae have been around early October, which would correspond to spawning in July or August, not in the fall. Green sturgeon have never been reported spawning that late in the season.

Chapter or Appendix - Section	Page(s)	Comments and Recommendations
Chapter 11 - Impact Fish-6, Table 11-48	p. 11-228	The RDEIS/SDEIS notes flow at Hamilton City will be reduced to 5-13% of average flow. This is of concern for green and white sturgeon. January – February corresponds with peak adult white sturgeon up-migration, and March with the start of green sturgeon up-migration for spawning. While it is unlikely that these reductions would be enough to limit passage, it is not known if they would impact migratory cues and change or alter the timing of migrations. CDFW recommends this potential impact be addressed in the FEIR/FEIS.
Chapter 11 - Impact Fish-6, Table 11-48 and Flow Effects, Adult Migration and Holding	p. 11-240	Green sturgeon spawning in the Feather River is limited to wet and above normal years due to blocked passage at Sunset Weir (as noted on p. 11-240); however, there are ongoing plans to improve passage at that barrier. If passage is improved, it is likely that spawning will occur in the Feather River in lower water years. Even if passage is improved, the reductions in flow predicted in June and July would impact rearing of larval green sturgeon. Note that one of the reasons the species was listed was that there was only one small spawning area in the Sacramento River, making the species susceptible to catastrophic events. Enhancing and supporting spawning in the Feather River (and other rivers) is an important component of the NMFS Recovery Plan (NMFS 2018). CDFW recommends the FEIR/FEIS address potential impacts to larval green sturgeon rearing habitat.
Chapter 11 -Impact Fish-6, Appendix 11L Sturgeon Delta Analyses	General Comment	The RDEIR/SDEIS finds the Proposed Project to have Less Than Significant (LTS) effects on both green sturgeon and white sturgeon. However, the Proposed Project has the potential to impact sturgeon survival and recruitment due to reductions in Sacramento River flow associated with input flows to the reservoir, which are not sufficiently offset by protective bypass flow criteria. Additionally, as larval sturgeon could likely be in close proximity to points of diversion at the time of diversion for the Proposed Project, an analysis of the screening efficacy on larval sturgeon may be warranted.
Chapter 11 -Impact Fish-6, Appendix 11L Sturgeon Delta Analyses	General Comment	Spawning success and juvenile recruitment are poorly understood for both species of sturgeon due to the difficulty of monitoring the benthic, dispersed, and cryptic early life stages of these fishes. The best available evidence indicates that white sturgeon only have large, successful recruitment events approximately every 8-10 years, correlated with wet water years, especially those associated with high spring outflow (Fish 2010; Stevens and Miller 1970). It appears that green sturgeon show a similar pattern. Reports from the USFWS Red Bluff office show green sturgeon eggs captured on egg mats and larvae captured in both rotary screw traps and benthic D-nets show high numbers in wet years with high water levels (B. Poytress, USFWS, personal communication). Operations of Proposed Project that reduce flows during wet and above normal years, during the periods of egg development, larval rearing, and juvenile migration carry a strong risk of harming those early life stages and reducing these rare successful recruitment years. To minimize these potential impacts, Proposed Project operations should time reservoir inflow so that it does not meaningfully reduce flows in the Sacramento River during critical sturgeon rearing and migration, especially during the wettest years. Additionally, monitoring of early life stage abundance or YCI should be funded through the Proposed Project in order observe the effects of Proposed Project operations on sturgeon and inform adaptive management of Proposed Project operations, as necessary.

Chapter or Appendix - Section	**Page(s)**	**Comments and Recommendations**
Chapter 11 - Impact Fish-6, Delta Outflow Effects	p. 11-242	The RDEIR/SDEIS suggests that even if upstream passage of adults is blocked briefly, "*it is likely adults would hold and continue their migration and spawning after flow subsequently increased*" (p. 11-242). There is nothing in the literature to suggest this. Evidence suggests that when passage is blocked, green sturgeon will move back downstream (e.g., adults blocked by the insertion of the gates at Red Bluff Diversion Dam prior to 2011; Heublein et al. 2009). It is not known whether they attempt to spawn lower in the system or simply abort the migration and return to salt water. Suggesting that Proposed Project operations will not have an impact on sturgeon should not be based on the assumption that they will wait until later to migrate, as it is possible that the fish will not spawn at all.
Chapter 11- Impact-Fish-8: Operations Effects on Delta Smelt	pp. 11-250 - 11-258	The RDEIR/SDEIS's analysis of effects from reservoir releases to CBD/Yolo Bypass begins by asserting that providing flow through CBD and Yolo Bypass may benefit Delta smelt. This section cites Bush (2017) to assert that 23% of the population may benefit from releases through the Yolo Bypass. This is not an accurate representation of the findings of that study. Bush (2017) found that the proportion of freshwater resident Delta smelt was variable and that summer water temperature was likely the main driver of the proportion of freshwater residents that are present in the Cache Slough complex. Furthermore, the North Delta food web actions (NDFA) have not demonstrated a measurable improvement in the Delta smelt population, habitat, or abundance of prey items. The only NDFA having a phytoplankton bloom observation, occurred in 2016 and was comprised of Aulacoseira, a long chain-forming diatom that copepods (a major food item for Delta smelt and longfin smelt) do not consume at high rates during blooms (Jungbluth et al. 2020). Other NDFA have resulted in no observed increase in phytoplankton. These results show the uncertainty associated with food web benefits of the NDFA. Further discussion of this action in the RDEIR/SDEIS describes the uncertainty in the extent to which Delta smelt could be affected by an increase in pesticides in the lower Yolo Bypass, as Proposed Project habitat flows would redirect CBD water that is relatively high in pesticides into the Yolo Bypass, and the potential deleterious effects that Delta smelt in the Yolo Bypass could experience due to exposure to low dissolved oxygen (p. 11-255). The RDEIR/SDEIS also acknowledges water temperature in this region is frequently at the cusp of the upper thermal maximum for Delta smelt, concluding that as a result "*there is some uncertainty in the potential for effects on Delta Smelt*" (p. 11-258). As stated above, Bush (2017) found that high water temperature may lead to lower frequency of freshwater resident Delta smelt in the North Delta. Therefore, any increase in water temperature in the Yolo Bypass or North Delta is likely to reduce the frequency of freshwater resident Delta smelt. CDFW suggests revising this section for clarity and clearly stating the potential benefits, uncertainties, and potential deleterious effects of reservoir releases to CBD/Yolo Bypass on Delta smelt.
Chapter 11- Impact-Fish-8: Operations Effects on Delta Smelt	General Comment	The RDEIR/SDEIS does not currently address the role of outflow on the transport and dispersal of Delta smelt larvae. Reduced delta outflow reduces the transport and dispersal of Delta smelt larvae downstream to areas of higher quality habitat (IEP MAST 2015, CDFW 2020). Polansky et al. 2021 also found that outflow is important for post-larval survival. CDFW suggests adding in a discussion of the Proposed Project's operational effects on survival of Delta smelt larvae in the FEIR/FEIS to better inform Proposed Project impacts to Delta smelt.

Chapter or Appendix - Section	Page(s)	Comments and Recommendations
Chapter 11- Impact-Fish-8, Flow-Related Effects	pp. 11-260, 261	The RDEIR/SDEIS analyzed expected decreases in Delta outflow and the abundance of Eurytemora affinis, a copepod that is an important food for Delta smelt and found that there would be less prey available to Delta smelt in spring under all three operational scenarios compared to the No Action Alternative (p. 11-260). However, these analyses used statistical relationships between outflow and Eurytemora abundance observed over several months of the spring period. The largest decrease in Delta outflow under the operational scenarios would be in March, with relatively little change in Delta outflow in April and May. Therefore, decreases in food availability in March would be expected to be greater than those represented in Table 11-58 (averaged over March through May) and Table 11-59 (averaged over March through June) (p. 11-261). The conclusion that such small decreases are unlikely to be "statistically detectable" does not mean that such decreases would not be biologically significant or deleterious to a species already suffering from food limitation. The ability to statistically detect the decrease in Eurytemora abundance is influenced by the large variability in the zooplankton data, which is inherent in zooplankton data as copepod distribution is patchy. Even at relatively low abundance, Eurytemora is highly positively selected for by Delta smelt in spring and increasing or extending its period of abundance provides feeding benefits to larval and small juvenile Delta smelt (Slater and Baxter 2014). Therefore, the negative impacts to Delta smelt from reduced prey availability may be greater than what is presented in the RDEIR/SDEIS.
Chapter 11- Impact-Fish-8, Flow-Related Effects	pp. 11-263, 264	The RDEIR/SDEIS highlights a debate regarding the importance of low salinity zone habitat to Delta smelt, citing a small set of references (pp. 11-263, 264). Yet, throughout the Delta Smelt Flow-Related Effects section (pp. 11-260-264), the RDEIR/SDEIS states that an average of 23% of Delta smelt surviving to adulthood are freshwater residents and the remainder either migrate to the low salinity zone or are resident there (Bush 2017). This contradicts the assertion that the low salinity zone is possibly not an important habitat for Delta smelt, when an average of 76% of Delta smelt surviving to adulthood reside there or migrate there for a portion of their life. CDFW suggests the Proposed Project either remove the suggestion the low salinity zone is not an important habitat for Delta smelt or expand the discussion. Specifically, the discussion should include the importance the Suisun Bay where habitat quality is maximized (Feyrer et al. 2007, Feyrer et al. 2011, Kimmerer et al. 2013) and Delta smelt foraging efficiency and success is greater (Hammock et al. 2017, Hammock et al. 2019). Recent statistical analyses conducted by USFWS also provide strong support for the importance of fall habitat to recruitment of Delta smelt (Polansky et al. 2019 and Polansky et al. 2021).

Chapter or Appendix - Section	Page(s)	Comments and Recommendations
Chapter 11- Impact FISH-9: Operations Effects on Longfin Smelt and Appendix 11A	General Comment	There is a well-documented positive correlation between winter and spring Delta outflow and the abundance of longfin smelt the following fall. Adults, immature sub-adults, eggs, larvae, and young juveniles are all present during some portion of this period and may be affected by various factors associated with Delta outflow. While the underlying mechanism or mechanisms driving this relationship remain unclear, the correlation between outflow and longfin smelt abundance has remained strong across multiple decades and through a substantial decrease in abundance (Maunder et al. 2015; Nobriga and Rosenfield 2016; Rosenfield and Baxter 2007; Stevens and Miller 1983; Tamburello et al. 2019; Thomson et al. 2010). Other analyses examined the magnitude of Delta outflow associated with positive longfin smelt population growth (State Water Resources Control Board (SWRCB) 2017, Rosenfield et al. 2010). The magnitude of outflow required varied depending on what averaging period was considered, however, both examinations concluded that the probability of positive population growth decreases with reduced outflow (SWRCB 2017) indicating that further reduction in winter/spring outflow may exacerbate the current decline in longfin smelt population.
Chapter 11- Impact FISH-9: Operations Effects on Longfin Smelt and Appendix 11F	General Comment	The effect that Proposed Project operations would have on longfin smelt was modeled using a reconstruction of analysis conducted by Nobriga and Rosenfield (2016). The intent of the original Nobriga and Rosenfield analysis was to test various life history conceptual models using contrasting variants of a generalized population model. The analysis using Nobriga and Rosenfield approach may not accurately convey Proposed Project impacts. Visual examination of model fit as presented in Figure 11F-1 showed that the model 2abc median differed from empirical data by as much as an order of magnitude in some years and that the 95% confidence intervals spanned multiple orders of magnitude indicating a high degree of uncertainty. The results are presented in such a way that mask Proposed Project effects by including all variation due to all factors including a multiple order of magnitude decline in the population and error associated with model coefficients. To facilitate clearer interpretation of impacts to longfin smelt, the results should be presented as a proportional change in the modeled FMWT index under NAA conditions prior to averaging by water year type. A second approach based on previously published regression analysis described by Kimmerer et al. (2009) and Mount et al. (2013) was also presented. The results of this second approach were similar to the Nobriga and Rosenfield method in that there was a high degree of uncertainty and that the Proposed Project operations resulted in a net negative impact on longfin smelt abundance.

Chapter or Appendix - Section	Page(s)	Comments and Recommendations
Chapter 11- Mitigation Measure FISH-9.1: Tidal Habitat Restoration for Longfin Smelt and Appendix 11F.5 Tidal Habitat Restoration Mitigation Calculations for Longfin Smelt	p. 11-274 and pp. 11F-32, 33	The proposed mitigation to offset the effect of reduced outflow used an equation described by Kratville (2010). This equation may not be appropriate due to the fact that it was developed to calculate the acreage required to mitigate the direct and indirect loss of larval Delta smelt associated with SWP/CVP exports. The equation is based on the findings of Kimmerer and Nobriga (2008) which applied a particle tracking model to estimate the proportion of simulated Delta smelt larva that would be entrained into the south Delta Export facilities from various locations in the Delta. Kratville (2010) does state that this analysis is generally representative of the effects that SWP/CVP exports have on longfin smelt larvae in dry years. However, it does not encompass the full period in which larval longfin smelt are present. Larval longfin smelt are present in the estuary beginning as early as mid-December when the E:I ratio is 65%. Therefore, this equation may be appropriate to calculate the acreage needed to offset any increase in south Delta exports associated with Proposed Project operations, if it is adjusted to account for the different E:I ratio in December and January. However, it does not account for impacts associated with reduced Delta outflow due to Proposed Project diversions.
Impact Fish-10 through Impact Fish-17	General Comment	The projections of Proposed Project effects on native and introduced fish species (Impact Fish-10 through Impact Fish-17) do generally use the best available species life history accounts and current information. The uncertainty associated with projections of less than significant Proposed Project impacts on these fish is especially high because there is no precedent for these effects because quantitative models and analysis of fish response for a project of this type and scale are nonexistent. In other words, the best available science to evaluate Proposed Project effects on these fish species results inevitably in conclusions that are speculative. Because of this uncertainty, CDFW recommends that the FEIR/FEIS fully describe this level of uncertainty and include these fish species in the adaptive management program.
Appendix 11A - Section 11A.1.3.2, Life History and General Ecology	p. 11A-25	RDEIR/SDEIS states: "*Until recent years, salmon passage was not possible above the Coleman Hatchery barrier weir located on Battle Creek.*" This is not correct. Fish passage is always possible at the Coleman National Fish Hatchery barrier weir. The Coleman National Fish Hatchery controls fish passage at the weir for hatchery operations.
Appendix 11A - Section 11A.1.3.2, Table 11A-2	p. 11A-27	The RDEIR/SDEIS uses National Marine Fisheries Service 2019 for their table of general life stage timing for winter-run Chinook salmon. However, this table should be updated to include Glenn Colusa Irrigation District's long-term winter-run monitoring data and Tisdale's Rotary Screw Trap data from CDFW's Tisdale Monitoring Program to reflect best available science and provide winter-run emigration information between RBDD and Knights Landing.
Appendix 11A - Section 11A.1.4.3, Distribution and Abundance	p. 11A-32	The RDEIR/SDEIS states "*Today, only the mainstem Sacramento River and Butte, Mill, and Deer Creeks maintain wild spring-run Chinook salmon populations*" (p. 11A-32). Battle Creek should be added to the list of creeks containing wild spring-run (NMFS 2016).
Appendix 11A- Section 11A.1.4.4, Stressors	p. 11A-36	The reference National Marine Fisheries Service 2014 appear to have been taken out of context with regards to discussing stressors on spring-run Chinook salmon. The text should be revised to reflect the literature cited or removed. Specifically, stressors in Deer, Mill, and Antelope creeks include agricultural water diversions primarily, with loss of habitat due to urban development secondary.

Chapter or Appendix - Section	Page(s)	Comments and Recommendations
Appendix 11F - Section 11F.5	p. 11F-34	The RDEIR/SDEIS calculated tidal habitat restoration mitigation for longfin smelt. *"The overall area of effect for each scenario was calculated as 10% of the area of the above calculations, consistent with calculations for the mitigation requirements used by California Department of Fish and Game (2009) and California Department of Water Resources (2019)*" (p. 11F-34). However, the description is confusing, and it is unclear how the overall area for each scenario was calculated. CDFW suggests the FEIR/FEIS provide a clear step-by-step description of the calculation.
Appendix 11I - Winter-Run Chinook Salmon Life Cycle Modeling	General Comment	Clarification is needed on the flow scenarios used for IOS CalSim II inputs specific to the Proposed Project and to determine if Yolo (including Big Notch restoration project) and Sutter Bypass Project associated flow changes are accounted for in IOS. Temperature inputs for the Sacramento River are derived from the USBR SRWQM temperature model but it is not clear if the modeling is specific to the Proposed Project based on the documentation. Temperature inputs are only applied to the spawning reach from Keswick to Balls Ferry, but Proposed Project related flow changes are not accounted for in this section of the Sacramento River. Therefore, redd dewatering is another component of IOS that was not modeled. Chinook salmon redd dewatering could occur or be exacerbated by Proposed Project operations depending on water year type and water transfers.
Appendix 11I - Winter-Run Chinook Salmon Life Cycle Modeling	General Comment	IOS has been updated to include a flow survival component for migrating winter-run smolts. The simple linear regression presented was based on seven years of winter-run Chinook salmon acoustic tag data; however, the specific years utilized are not provided and the linear regression does not include the data points that were used to develop the linear regression (Figure 4, Appendix 11I). The survival values range from approximately 25% at 3,250 cfs to 37% at 60,000 cfs from Bend Bridge to Verona. It is unclear how the regression was interpolated, extrapolated, and fit to the data points utilized. It has been shown in other flow survival analyses that there may be inflection points and thresholds of flow related survival that are vastly different than what was presented in the RDEIR/SDEIS analysis (Michel et al. 2021). Therefore, the actual impact of Proposed Project operations on salmonid survival in the Sacramento River may be under-represented.
Appendix 11I - Winter-Run Chinook Salmon Life Cycle Modeling	General Comment	The Delta Passage Model (DPM) component of IOS relies on monthly average CalSim II flows as an input and variable entry timing for each year in the model simulation. It is unclear if river migration has a pulse flow component or is simply a function of smolt maturation, and how year-specific entry to the Delta curves are generated. As such, CDFW cannot determine if these entry curves coincide with actual Proposed Project diversions. When coupled with the use of monthly averaged flow inputs, there is significant potential for the IOS model to under-represent Proposed Project impacts on through Delta survival. It is also unclear if the DPM component of IOS relies on Perry 2010 or if it has been updated to the more recent Perry 2018 model. CDFW recommends that the DPM component of IOS including the smolt entry component of the IOS life cycle model be more thoroughly documented in Appendix 11I-2.

Chapter or Appendix - Section	**Page(s)**	**Comments and Recommendations**
Appendix 11K - Weighted Usable Area Analysis	General Comment	The RDEIR/SDEIS relies on Weighted Usable Area (WUA) curves developed by USFWS to determine potential impacts to salmonid rearing habitat in the Sacramento River and states "*The results of the analyses suggest that Alternatives 1–3 would cause few large changes in spawning WUA in any of the rivers and would generally result in more increases than reductions in rearing WUA in the Sacramento River, especially for juveniles (53% increases in total)*" (p. 11K-77). Salmonids tend to rear in off-channel and side-channel habitat, characteristic of slower velocities and shallower depths. As a result, decreased flow in the Sacramento River subsequently leads to slower and shallower conditions, potentially indicating higher WUA. However, the assessment presented in the RDEIR/SDEIS is inadequate in analyzing impacts to rearing habitat in the Sacramento River as it fails to assess other important habitat components including the potential for habitat fragmentation, inundation frequency and duration, as well as complexity. Therefore, the potential impacts to salmonid rearing habitat may be underestimated. CDFW recommends the FEIR/FEIS include additional assessment of the Proposed Project's impacts to rearing habitat availability within the Sacramento River system, as well as the other systems (i.e., the American and Feather Rivers) impacted by the Proposed Project.
Appendix 11K - Weighted Usable Area Analysis	General Comment	The RDEIR/SDEIS states that "Rearing habitat WUA was estimated only for the Sacramento River because no adequate flow versus rearing WUA curves located for the Feather or American River were available. The available flow versus rearing WUA information for these rivers is old, limited, and potentially unreliable (Appendix 11K)" (p. 11-58). Instream juvenile rearing habitat data for fall-run Chinook salmon from instream flow studies conducted by Mark Gard (CDFW) for the American River are available online at http://cvpia-habitat-docs-markdown.s3-website-us-west-2.amazonaws.com/watershed/american_river.html (Gill and Tompkins 2020a). Instream spawning and rearing habitat data for fall-run Chinook salmon and steelhead in the Feather River are available online at http://cvpia-habitat-docs-markdown.s3-website-us-west-2.amazonaws.com/watershed/feather_river.html (Gill and Tompkins 2020b). Additionally, instream spawning and rearing habitat data for fall-run Chinook salmon and steelhead in the Feather River from the California Department of Water Resources (DWR) and from Thomas R. Payne & Associates were used in instream flow evaluations for the relicensing of the Oroville facilities. These evaluations determined relationships between flow and both suitable spawning and rearing habitat for 23.25 miles of the Feather River. In addition, the CVPIA Structured Decision Making process utilizes the DWR Federal Energy Regulatory Commission (FERC) instream spawning and rearing habitat data for the Feather River. CDFW recommends the Proposed Project utilize these WUA curves to assess potential impacts to rearing Weighted Usable Area for juvenile salmonids in the Feather and American River systems.
Appendix 11M - Section 11M.2.1, Bypass and Side Channel Inundated Habitat Area	p. 11M-1	The one-meter threshold for optimal floodplain depth is somewhat arbitrary, from both a fish ecology perspective and in context of the modeling accuracy. CDFW recommends an analysis of changes to inundated surface area with removal of discussion related to optimal/suboptimal depths.

Chapter or Appendix - Section	Page(s)	Comments and Recommendations
Appendix 11M - Section 11M.2.2, Bypass Flow and Weir Spill	p. 11M-5	The RDEIR/SDEIS Appendix 11M states, "*Note, however, that the total flow in the bypass is not always a good indicator of suitable habitat availability, as shown in Figures 11M-1 and 11M-2*" (p. 11M-5). CDFW disagrees with this statement. Flow is a good metric of available suitable habitat in both Sutter Bypass and Yolo Bypass, as increased flows equal increased entrainment of fish.
Appendix 11P - Riverine Flow-Survival	Figure 11P-1	The RDEIR/SDEIS's analysis showed that estimated survival for the status quo and Proposed Project scenarios was similar (Figure 11P-1), with the exception of two wet years (2011 and 2017). This illustrates that the Proposed Project diversion criteria generally minimize diversions during the historical periods of fish movement, as reflected in Red Bluff rotary screw trap data. However, fish presence/passage at the RBDD rotary screw traps is an incomplete reference point to assess impacts of Proposed Project diversions on juvenile salmonid flow-survival relationships. Listed fish (Central Valley spring-run Chinook and steelhead) enter the Sacramento River downstream of Red Bluff Diversion Dam (RBDD) (e.g., Antelope, Deer, Mill Creek populations) October through June. Additionally, peak passage events of fish at the RBDD rotary screw traps should be evaluated by juvenile life-stage (e.g., fry, parr, smolt). For example, fry life-stage individuals are caught at much higher rates than larger-sized individuals, and flow-survival impacts should be weighted towards parr and smolt life stages, which are more actively out-migrating through Sacramento River mainstem to reach the ocean versus fry life-stages that are still rearing in the lower Sacramento River and Delta, often for extended periods of time. This is a key consideration for evaluating survival for status quo and Proposed Project scenarios and concluding whether or not survival would be similar in real-life scenarios based on the fish presence criteria used in the Sites Diversion tool. The analysis also omits Proposed Project impacts on Butte Creek and Feather River origin salmonids, including CESA listed salmonids which enter the Sacramento River below Wilkins Slough.
Appendix 11P - Riverine Flow-Survival	p. 11P.2	The RDEIR/SDEIS analyzes the effects of in-river flow generally utilizing the best flow survival science available (Michel et. al. 2021) and has documented the methodology well in Section 11P.2. The RDEIR/SDEIS assesses the proposed diversion criteria by application of published flow-survival relationships to daily flow data, while accounting for historical fish migration patterns as represented in monitoring data. The Sites Reservoir Daily Divertible & Storable Flow Tool provided daily Sacramento River at Wilkins Slough flows for the flow-survival analysis, which include daily diversions by the Red Bluff and Hamilton City diversions. However, the period of record is limited to 2009-2018 and does not include above normal year types during which Proposed Project diversions would be expected.

Chapter or Appendix - Section	Page(s)	Comments and Recommendations
Chapter 16 - Section 16.2.2.1, Table 16-2	p. 16-4 -16-6	Table 16-2 Key Recreational Characteristics of Recreation Area Potentially Affected by Proposed Project-Related Changes to SWP or CVP Operations is missing the Yolo Bypass Wildlife Area, a significant public recreation area in the Yolo Bypass. Additionally, some recreational areas are grouped while others are not (e.g., Sutter Bypass and Sutter National Wildlife Refuge are grouped within Sutter Bypass Wildlife Area). Table 16-2 inconsistently identifies acreage as part of each recreational area description. These details are important for understanding the scale of potential Proposed Project impacts. CDFW recommends the FEIR/FEIS include an updated table that identifies each individual wildlife area potentially affected, with each area's acreage clearly stated.
Chapter 28 - Section 28.4.1.3, Sites Reservoir Operation	General Comment	The modeling conducted in the RDEIR/SDEIS compares both with and without climate change future scenarios for all alternatives. The results from the analyses were then used to qualitatively assess the impacts and benefits that the Proposed Project might have with climate change. The RDEIR/SDEIS states that overall, it is not expected to have adverse effects on aquatic species under climate change (p.28-29). However, analyses in the RDEIR/SDEIS demonstrate that the Proposed Project operations will have an adverse impact on aquatic species and results from the climate modeling indicate the Proposed Project under climate change would likely exacerbate these adverse impacts. For example, the RDEIR/SDEIS states that it "*would result in larger reductions to flow under climate change in Critically Dry Water Years from December to March and larger increases in August to make up for the significantly decreased flow*" (p. 28-16). A reduction in flow in the months of December to March, particularly in critically dry years, which are predicted to increase under climate change, would have adverse effects on rearing and emigrating salmonids. Likewise, the RDEIR/SDEIS's analysis indicates that Delta outflow decreases with climate change, which could further exacerbate impacts to longfin smelt. CDFW recommends establishing more protective bypass flow criteria and include in the Proposed Project's adaptive management plan strategies to address how the Proposed Project may alter future operations to account for the potential adverse effects of climate change.
Chapter 31 - Section 31.3.1, Surface Water Resources and Water Quality	pp. 31-18, 19	Section 31.3.1 discusses diversions within the Central Valley and Delta as related to Table 31-1. However, the discussion does not include the Delta Conveyance Project (DCP) (although it is included in Table 31-1). The DCP has planned exports ranging from 3,000 cfs to 7,500 cfs, which will affect water supply and water quality. CDFW recommends revising the text to include proposed DCP construction and operations in analyzing the cumulative effects of the Proposed Project with past, present, and foreseeable future projects.

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EXHIBIT C

State Water Resources Control Board

JAN 28 2022

Sites Project Authority
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P.O. Box 517
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Dear Ms. Forsythe:

COMMENTS ON DRAFT REVISED DRAFT ENVIRONMENTAL IMPACT REPORT/SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT (STATE CLEARINGHOUSE #2001112009) FOR THE SITES RESERVOIR PROJECT IN COLUSA, GLENN, TEHAMA, AND YOLO COUNTIES

Thank you for the opportunity to comment on the draft Revised Environmental Impact Report/Supplemental Environmental Impact Statement (REIR/SEIS) for the Sites Reservoir Project (Project).

The mission of the State Water Resources Control Board (State Water Board) and the nine Regional Water Quality Control Boards throughout the state (Regional Boards) (collectively Water Boards) is to preserve, enhance, and restore the quality of California's water resources and drinking water for the protection of the environment, public health, and all beneficial uses, and to ensure proper water resource allocation and efficient use, for the benefit of present and future generations.

The State Water Board administers water rights in California and the State and Regional Boards have primary authority over the protection of the State's water quality. The Sites Project will require both water right and water quality approvals from the State Water Board and Central Valley Regional Water Quality Control Board (Central Valley Water Board). Accordingly, the Water Boards are responsible agencies for the Project pursuant to the California Environmental Quality Act (CEQA).

As responsible agencies under CEQA, the Water Boards must review and consider the environmental effects of the Project identified in the draft REIR/SEIS that are within their purview and reach their own conclusions on whether and how to approve the project. (Cal. Code Regs., tit. 14, § 15096, subd. (a).) Responsible agencies should also comment on draft environmental impact reports and negative declarations for projects that will require the responsible agencies' approval. (*Id.*, § 15096, subd. (d).)

Accordingly, the Water Boards submit these joint comments. General comments regarding the Project are included below whereas specific comments are included in a comment table as an attachment to this letter. In addition, for each comment in the attached table, the commenting Water Board (or Section within the State Water Board) is identified to facilitate follow up discussion between staff if warranted. Should you have questions or topics for discussion regarding these comments, please contact the appropriate staff identified below.

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General Comments

Consideration of CEQA by the Water Boards
The Water Boards, as responsible agencies under CEQA, will review and consider the draft REIR/SEIS prepared by the Sites Project Authority (Authority) for the Project. Consideration of environmental effects is required before taking any final action, such as issuing a water right permit or a water quality certification pursuant to section 401 of the Clean Water Act. Accordingly, these comments are intended to assist in development of a robust CEQA document capable of supporting actions by the Water

Boards for the Project. Addressing the Water Boards comments provided in this letter may take additional time at this stage for the Project, but availability of this information is expected to result in more timely processing of the Authority's applications for permits and other approvals from the Water Boards. In exercising their independent authority, however, the Water Boards may reach determinations that differ from those presented in the draft REIR/SEIS.

Water Rights
The Project will involve the diversion and use of surface water from the Sacramento River and will require a water right permit. The draft REIR/SEIS states that the Authority intends to file a water right application to appropriate water by permit with the State Water Board. Consideration of such an application is a discretionary action that requires a determination that unappropriated water is available, a review of potential impacts to public trust resources, and a determination that the appropriation of water is in the public interest.

Water Right Processing, Timing, and Hearing
Water right applications can vary greatly in processing time depending on the size and complexity of the project. When a water right application is submitted to the State Water Board, staff will review the application for completeness within 30 days. However, if deficiencies are found that make the application incomplete, the State Water Board will send a deficiency letter which will provide a minimum of 60 days to address deficiencies.

The State Water Board will begin processing the application once it is deemed complete. The Board's first step will be to prepare a public notice of the application. Public noticing of water right applications includes publication to provide existing water right holders and other stakeholders that may be affected by the proposed project information about the project and the opportunity to file protests against approval of the application. The noticing period for the Project would be 60 days. Individuals and other entities may file protests against the water right application if they think that the proposed action will cause injury to an existing water right holder, adversely affect public trust resources, have an adverse environmental impact, or not be in the public interest.

If a valid protest is received during the noticing period, the water right applicant will be prompted to conduct protest resolution. (Wat. Code, § 1333.) Protest resolution typically lasts a minimum of 180 days. Depending on the number and content of the protests, protest resolution may be a lengthy process. Protest resolution may also result in the water right applicant and/or the protestants providing additional information to support their findings and/or claims. (Wat. Code, § 1334.) Protest resolution may result in the applicant conducting additional analysis to investigate matters raised by protestants. A robust draft REIR/SEIS and supporting documentation should assist a water right applicant in resolving protests. In addition to the notice and protest process, other processing steps run concurrently, such as evaluation of water availability and potential impacts to public trust resources, as discussed below.

This project may involve a petition to acquire a state-filed application. A water right hearing is required if a petition for assignment of a state-filed application is filed. (Wat. Code, § 10504.1.) A water right hearing is also required if there are outstanding protests on a water right application that raise disputed issues of material fact. (Wat. Code, § 1350, 1351.) Whenever practicable, a hearing on a petition for assignment of a state-filed application will be combined with any required hearing on a related application. (See Cal. Code Regs., tit. 23, § 739.) If the water right application for the Project requires a water right hearing, the hearings process generally runs after the steps discussed above, as information generated during processing is relied upon during the hearing. As mentioned above regarding protests, a robust draft REIR/SEIS, addressing all State Water Board comments is expected to greatly assist with this process.

A hearing may take several years to complete. The California Water Commission has provided resources for State Water Board staffing to assist with processing of Proposition 1 Water Storage Investment Program (WSIP) projects, including this project. This dedicated staffing allows for expedited processing. The Authority should be aware that even when a project is considered expedited, hearing on an expedited project will be prioritized as appropriate in regard to other high priority efforts, such as other WSIP projects and other high priority matters that require a hearing, and reprioritization of State Water Board efforts due to drought conditions is a possibility. The Authority has indicated during its CEQA public scoping meetings and in the construction schedule (table 2C-18) in the draft REIR/SEIS that it would like to have all permit approvals for the Project, including any approvals from the State Water Board, by mid-2023. The Authority should be aware that processing a water right application for the Project will take a considerable amount of time due to the complexity of the Project, and the Authority should be prepared to accommodate a process that is likely to take longer to complete than 18 months. The applicant can help speed the hearing timeline, and the entire water rights process, by completing a robust water availability analysis and resolving protests prior to the hearing.

Water Availability and Public Interest
The State Water Board will consider the hydrologic analyses, diversion criteria, and water availability findings included in the draft REIR/SEIS while processing the water right application filed for the proposed project. However, the Authority is advised that the State Water Board is required under the Water Code to make its own independent findings on the availability of unappropriated water to supply the proposed project as a prerequisite to any water right permitting decision. In determining the amount of water available for appropriation, the State Water Board must take into consideration the public interest and the relative benefit to be derived from all beneficial uses of the water concerned, including irrigation, municipal, industrial, recreation, preservation and enhancement of fish and wildlife resources, and the water quality needed to protect

beneficial uses. In order to inform the State Water Board's decision making, the environmental document should include an evaluation of a range of operating criteria as discussed further below. If such analyses are not included in the environmental document, additional hydrologic analyses will likely be required during the water right permitting process to inform and support the State Water Board's water availability findings. These additional analyses may ultimately lead to water availability findings and associated restrictions on the proposed diversions that differ from those presented in the draft REIR/SEIS.

Public Trust
In addition to the State Water Board's obligations under CEQA and the Water Code, the State Water Board has an independent obligation to consider the effect of an application for a water right permit on public trust resources, and avoid or minimize harm to those resources to the extent feasible and in the public interest. (*National Audubon Society v. Superior Court* (1983) 33 Cal.3d 419, 446-447.). The common law public trust doctrine protects public uses of navigable water bodies, including fishing, recreation, and the preservation of fish and wildlife habitat. Under the public trust doctrine, the State Water Board has a duty of continuing supervision over the appropriation of water. The Board is not confined by past allocation decisions, and the CEQA baseline should not be construed as the appropriate baseline for consideration of the need to protect public trust resources. In addition, it is the policy of this state that all state agencies, boards, and commissions seek to conserve endangered species and threatened species and use their authority in furtherance of the purposes of the California Endangered Species Act. State agencies should not approve projects which would jeopardize the continued existence or habitat of any endangered species or threatened species if there are reasonable and prudent alternatives available consistent with conserving the species or its habitat which would prevent jeopardy. (Fish & G. Code, §§ 2053 & 2055.)

Range of Alternatives
The State Water Board acknowledges the significant benefit of a major new water supply project such as Sites Reservoir to enhance California's water resiliency, where such projects can be designed and operated in a manner that does not exacerbate existing pressures on the Delta ecosystem. In order to provide for the timely processing of the Sites Project water right application and associated approvals, the draft REIR/SEIS should include an evaluation of a reasonable range of operational alternatives, specifically including operating constraints that would result in concentrating diversions during high flow periods when there is excess flow in the system and avoiding proposed diversions during lower flow periods when those flows provide for protection of water quality, fish, and wildlife. As described in the draft REIR/SEIS, the mitigation actions may not be sufficient to reduce operational impacts of the proposed project to less than significant for salmonids, delta smelt, and longfin smelt. Current science indicates that average Delta outflows as high as 42,800 cfs from January through June provide benefits to longfin smelt and other Delta species. Evaluating a range of bypass flows needed to achieve outflows up to this level and other levels that current science identified in the State Water Board's 2017 Scientific

Basis Report indicates is protective of Delta species is important to understand the benefits and tradeoffs of this Project.

The alternatives evaluated in the draft REIR/SEIS all have very similar operational constraints, with relatively minimal bypass flow criteria. Additional operational alternatives should be evaluated in order to provide a reasonable range of alternatives to inform the public and other decision makers of the benefits and impacts of the Project. The alternatives are also needed to provide adequate information to support the State Water Board's independent decision-making process to determine if, and under what conditions, to issue a water right permit or water quality certification for the Project. The operating constraints for the Project identified in the draft REIR/SEIS are based largely on existing regulatory requirements applicable to the existing operations of the State Water Project (SWP) and Central Valley Project (CVP) that were developed without consideration of the Sites Project. Many of these requirements are in the process of being updated to strengthen environmental protections, including the water quality and flow objectives included in the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Bay-Delta Plan) and the federal biological opinions issued under the federal Endangered Species Act for the long-term operation of the SWP and CVP.

In prior comments on the Project's environmental documentation, the State Water Board has consistently indicated that a range of operating criteria should be evaluated for the Project to inform the State Water Board's decision making. Specifically, the State Water Board has commented that operating criteria should be evaluated that are consistent with possible updates to the Bay-Delta Plan, which are reasonably foreseeable, as identified in the State Water Board's 2017 scientific basis report in support of potential update and implementation of the Bay-Delta Plan (www.waterboards.ca.gov/water_issues/programs/peer_review/docs/scientific_basis_phase_ii/201710_bdphaseII_sciencereport.pdf) and the State Water Board's 2018 Framework for possible updates to the Bay-Delta Plan. Specifically, bypass flow criteria should be evaluated that are consistent with achieving inflows and outflows of 55 percent of unimpaired flow, with a range of 45 to 65 percent. This information is needed to evaluate water availability for permitting purposes and the potential to meet state approved water quality objectives and standards for certification purposes. If this information is not included in the EIR/EIS, then supplemental analyses may be needed, which could result in longer processing timelines for the Sites water right application and could delay other decisions by the Water Boards.

As you are aware, the California Environmental Protection Agency and California Natural Resources Agency are engaged in efforts to develop a voluntary agreement to implement updates to the Bay-Delta Plan that, if successful, will be submitted to the State Water Board and potentially incorporated into the Bay-Delta Plan. A voluntary agreement, however, would not necessarily contemplate or address operating criteria for new diversion projects or other diverters that are not part of any voluntary agreement. Ideally, the draft REIR/SEIS would evaluate how the project would affect tributary and Delta outflows that would be provided through a voluntary agreement and demonstrate, though imposition of appropriate operational criteria, that the project would not detract from voluntary agreement flows, including new flows or ambient flows that a voluntary agreement would rely on. This would facilitate a project design that is harmonized with a voluntary agreement and one that is potentially consistent with updated Bay Delta plan criteria. Absent this analysis, the Authority runs the risk of advancing a project that is not compatible with a voluntary agreement.

Evaluation of the Effects of the Project
The environmental document should fully describe how the Project is proposed to be integrated with other major existing and planned water infrastructure projects, many of which involve participants in the Sites project, including planned operations and accounting for those operations. The lack of explanation of how these projects would work together prevents a full understanding of the project. Further, the environmental document relies on the development of future plans to mitigate impacts of the project on water quality and fish and wildlife. The major details of these plans are needed in order to fully evaluate the effectiveness of these mitigation measures and the full impacts of the project.

Water Quality Certification
Section 401 of the Clean Water Act (33 U.S.C. § 1341) requires any applicant for a federal license or permit for an activity that may result in any discharge to waters of the United States to obtain certification from the State that the project will comply with the applicable water quality requirements, including water quality standards promulgated pursuant to section 303 of the Clean Water Act (33 U.S.C. § 1313). Clean Water Act section 401 directs that certifications shall prescribe effluent limitations and other conditions necessary to ensure compliance with the Clean Water Act and with any other appropriate requirements of state law, which includes the Porter-Cologne Water Quality Control Act (Wat. Code, § 13000 et seq.). Conditions of certification shall become a condition of any federal license or permit subject to certification. The Project requires one or more federal permits and will result in a discharge to waters of the United States, and therefore must obtain a water quality certification from the State Water Board. Since the Project involves a water right activity, the application for a Water Quality Certification should be submitted to the State Water Board, which will coordinate with the Central Valley Water Board on its processing.

The State Water Board's certification must ensure compliance with applicable water quality standards as listed in regional and state water quality control plans. Water quality control plans designate the beneficial uses of water that are to be protected (such as municipal and industrial, agricultural, and fish and wildlife beneficial uses), water quality objectives for the reasonable protection of the beneficial uses and the prevention of nuisance, and a program of implementation to achieve the water quality objectives. (Wat. Code, §§ 13241, 13050, subds. (h), (j).) The beneficial uses, together with the water quality objectives contained in the water quality control plans, and applicable state and federal anti-degradation requirements, constitute California's water quality standards for purposes of the Clean Water Act. In issuing water quality certification for a project, the State Water Board must ensure consistency with the designated beneficial uses of waters affected by the project, the water quality objectives developed to protect those uses, and anti-degradation requirements. (*PUD No. 1 of Jefferson County v. Washington Dept. of Ecology* (1994) 511 U.S. 700, 714-719.)

Although the draft REIR/SEIS analyzes the Project's potential impacts to environmental resources in comparison to baseline (existing) environmental conditions, the water quality certification process will evaluate the Project's consistency with water quality standards. The evaluation of the Project's consistency with water quality standards may require actions in addition to proposed CEQA mitigation measures.

Central Valley Water Board

The Central Valley Water Board is responsible for protecting the quality of surface and groundwaters of the state through regulatory actions and permitting authorities as provided below. The Project must comply with the requirements listed below by the Central Valley Water Board which includes the Basin Plan, Antidegradation Considerations, Total Maximum Daily Loads (TMDLs) and Impaired Water Bodies, Construction Storm Water General Permit, Waste Discharge Requirements, Dewatering Permit, Limited Threat General NPDES Permit, and NPDES permit.

Basin Plan

The Central Valley Water Board is required to formulate and adopt Basin Plans for all areas within the Central Valley region under Section 13240 of the Porter-Cologne Water Quality Control Act and has developed the Water Quality Control Plan for the Sacramento and San Joaquin River Basins. Federal regulations require each state to adopt water quality standards to protect the public health or welfare, enhance the quality of water and serve the purposes of the Clean Water Act. Water quality standards are also contained in the National Toxics Rule, 40 CFR Section 131.36, and the California Toxics Rule, 40 CFR Section 131.38. For more information on the *Water Quality Control Plan for the Sacramento and San Joaquin River Basins*, please visit our website: www.waterboards.ca.gov/centralvalley/water_issues/basin_plans

Antidegradation Considerations

All wastewater discharges must comply with the Antidegradation Policy (State Water Board Resolution 68-16) and the Antidegradation Implementation Policy contained in the Basin Plan. The antidegradation analysis is a mandatory element in the National Pollutant Discharge Elimination System and land discharge Waste Discharge Requirements (WDRs) permitting processes. The Antidegradation Implementation Policy is available on page 74 at:
www.waterboards.ca.gov/centralvalley/water_issues/basin_plans/sacsjr_201805.pdf

In part it states:

Any discharge of waste to high quality waters must apply best practicable treatment or control not only to prevent a condition of pollution or nuisance from occurring, but also to maintain the highest water quality possible consistent with the maximum benefit to the people of the State.

This information must be presented as an analysis of the impacts and potential impacts of the discharge on water quality, as measured by background concentrations and applicable water quality objectives.

<u>Total Maximum Daily Loads (TMDLs) and Impaired Water Bodies</u>
Shasta Lake, Sacramento River, Lake Oroville, Feather River, Folsom Lake, American River, Yolo Bypass, and the Sacramento-San Joaquin Delta are currently on the Clean Water Act Section 303(d) List of Impaired Waters due to a wide variety of constituents of concern, including chlordane, chlorpyrifos, DDT (Dichlorodiphenyltrichloroethane), diazinon, dieldrin, group A pesticides, invasive species, mercury, PCBs (Polychlorinated biphenyls), and toxicity. Central Valley Water Board staff recommends referencing the most current 303(d) list and requirements contained in existing TMDLs for the potential discharge area of the reservoir within the draft REIR/SEIS.

The Yolo Bypass Sacramento River is identified on the Clean Water Act Section 303(d) List as impaired by mercury because of elevated methylmercury concentrations in fish that pose a risk to wildlife and humans who consume fish. Due to historical mercury and/or gold mining in the watershed, the project boundary likely has deposits of mercury-containing sediments. As project construction is occurring, Central Valley Water Board staff recommends project proponents implement practices to control erosion and minimize discharges of mercury and methylmercury. For instance, Central Valley Water Board staff recommends the implementation of turbidity curtains and/or cofferdams for in-water work to limit the discharge of suspended solids downstream, which will reduce the risk of methylation downstream of mercury that is attached to those suspended solids. The goal is to minimize erosion of the mercury-containing soils in order to protect beneficial uses in this portion of the Sacramento River and to reduce mercury and methylmercury loads moving downstream.

The Central Valley Water Board requests that the Project proponent coordinate with Central Valley Water Board TMDL staff to develop a monitoring plan that would reduce the potential for methylation and mercury contamination, or contamination of any other constituents of concern, in the surrounding areas that may be influenced by discharge from the reservoir from regular operation, as identified within mitigation measures discussed in Chapter 6 of the draft REIR/SEIS. Furthermore, due to concerns with likely spikes in methylmercury with the operation of the reservoir, the Central Valley Water Board recommends that reservoir managers monitor and report mercury in fish tissue periodically (minimum every 10 years) in a range of species, following Surface Water Ambient Monitoring Program (SWAMP) Safe To Eat Workgroup protocols.

Construction Storm Water General Permit

Dischargers whose project disturb one or more acres of soil or where projects disturb less than one acre but are part of a larger common plan of development that in total disturbs one or more acres, are required to obtain coverage under the General Permit for Storm Water Discharges Associated with Construction Activities (Construction General Permit), Construction General Permit Order No. 2009-009-DWQ. Construction activity subject to this permit includes clearing, grading, grubbing, disturbances to the ground, such as stockpiling, or excavation, but does not include regular maintenance activities performed to restore the original line, grade, or capacity of the facility. The Construction General Permit requires the development and implementation of a Storm Water Pollution Prevention Plan (SWPPP). For more information on the Construction General Permit, visit the State Water Board website at:
www.waterboards.ca.gov/water_issues/programs/stormwater/constpermits.html

Waste Discharge Requirements – Discharges to Waters of the State

If USACE determines that only non-jurisdictional waters of the State (i.e., "non-federal" waters of the State) are present in the proposed project area, the proposed project may require a Waste Discharge Requirement (WDR) permit to be issued by Central Valley Water Board. Under the California Porter-Cologne Water Quality Control Act, discharges to all waters of the State, including all wetlands and other waters of the State including, but not limited to, isolated wetlands, are subject to State regulation. For more information on the Waste Discharges to Surface Water NPDES Program and WDR processes, visit the Central Valley Water Board website at:
https://www.waterboards.ca.gov/centralvalley/water_issues/waste_to_surface_water/

Dewatering Permit

If the proposed project includes construction or groundwater dewatering to be discharged to land, the proponent may apply for coverage under State Water Board General Water Quality Order (Low Risk General Order) 2003-0003 or the Central Valley Water Board's Waiver of Report of Waste Discharge and Waste Discharge Requirements (Low Risk Waiver) R5-2013-0145. Small temporary construction dewatering projects are projects that discharge groundwater to land from excavation activities or dewatering of underground utility vaults. Dischargers seeking coverage under the General Order or Waiver must file a Notice of Intent with the Central Valley Water Board prior to beginning discharge.

For more information regarding the Low Risk General Order and the application process, visit the Central Valley Water Board website at: www.waterboards.ca.gov/board_decisions/adopted_orders/water_quality/2003/wqo/wqo2003-0003.pdf

For more information regarding the Low Risk Waiver and the application process, visit the Central Valley Water Board website at: www.waterboards.ca.gov/centralvalley/board_decisions/adopted_orders/waivers/r5-2013-0145_res.pdf

Limited Threat General NPDES Permit
If the proposed project includes construction dewatering and it is necessary to discharge the groundwater to waters of the United States, the proposed project will require coverage under a National Pollutant Discharge Elimination System (NPDES) permit. Dewatering discharges are typically considered a low or limited threat to water quality and may be covered under the General Order for *Limited Threat Discharges to Surface Water* (Limited Threat General Order). A complete Notice of Intent must be submitted to the Central Valley Water Board to obtain coverage under the Limited Threat General Order. For more information regarding the Limited Threat General Order and the application process, visit the Central Valley Water Board website at: www.waterboards.ca.gov/centralvalley/board_decisions/adopted_orders/general_orders/r5-2016-0076-01.pdf

NPDES Permit
If the proposed project discharges pollutants to waters of the United States and the discharge is not eligible for coverage under the Limited Threat General NPDES Permit, the proposed project will require coverage under an individual National Pollutant Discharge Elimination System (NPDES) permit. A complete Report of Waste Discharge must be submitted with the Central Valley Water Board to obtain a NPDES Permit. For more information regarding the NPDES Permit and the application process, visit the Central Valley Water Board website at:
www.waterboards.ca.gov/centralvalley/help/permit/

Tribal Resources
For projects that may involve tribal resources, the Water Boards are committed to having meaningful involvement and consultation with California Native American Tribes on actions that may have an impact to tribal lands, tribal interest, and/or tribal cultural resources consistent with the mission of the Water Boards:
www.waterboards.ca.gov/about_us/public_participation/tribal_affairs/docs/california_water_board_tribal_consultation_policy.pdf

Equity Resolution
The State Water Board adopted Resolution No. 2021-0050, Condemning Racism, Xenophobia, Bigotry, and Racial Injustice and Strengthening Commitment to Racial Equality, Diversity, Inclusion, Access, and Anti-Racism (https://www.waterboards.ca.gov/board_decisions/adopted_orders/resolutions/2021/rs2021_0050.pdf). Any action by the State Water Board related to the Project will take this resolution into consideration ensuring there is no conflict with the resolution.

Closing
We appreciate the opportunity to participate in the environmental review process. If you have any questions regarding these comments please contact the appropriate staff identified above.

Sincerely,

Erik Ekdahl, Deputy Director
State Water Board, Division of Water Rights

Patrick Pulupa, Executive Officer
Central Valley Regional Water Quality Control Board

Attachment: Comment Table for Sites Reservoir Project's Draft REIR/SEIS

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COMMENT TABLE FOR SITES RESERVOIR PROJECT'S DRAFT REIR/SEIS

Commenters: Permitting and Section (Perm); Water Quality Certifications & Public Trust Section (WQ); Bay-Delta Section (Bay-Delta)

Executive Summary

Comment No.	Page No.	Comment	Commenter
1	ES-7	For the No Project Alternative, the Executive Summary identifies that most water users would use their total contract amounts and most senior water right users would also fully use or divert pursuant to their water rights. However, many contractors and water right holders do not use their full contract amounts or water rights even when those supplies are available. This should be clarified. A summary of historical uses for the different groups of water users should be provided.	Bay-Delta
2	ES-7	The alternatives evaluated in the draft REIR/SEIS appear to be minor variations of one alternative and do not appear to provide a reasonable range of alternatives pursuant to CEQA requirements or meet the State Water Board's informational needs. It does not appear that the action alternatives incorporate reasonably foreseeable changes to regulatory instream flow requirements as described in the Board's scientific basis report in support of potential update and implementation of the Bay-Delta Plan. Potential changes include new and modified Sacramento River inflow, Delta outflow, and cold water habitat objectives, as well as other requirements to ensure the reasonable protection of fish and wildlife beneficial uses. The Board released a final report identifying the science upon which changes to the Bay-Delta Plan will be based. The draft REIR/REIS should analyze a range of bypass flows, diversion rates and amounts, that are consistent with the scientific basis report regarding potential modification to flow requirements and cold water habitat objectives for the protection of fish and wildlife. This information is needed to evaluate water availability for permitting purposes and potential to meet state approved water quality objectives and standards for certification purposes. https://www.waterboards.ca.gov/water_issues/programs/peer_review/docs/scientific_basis_phase_ii/201710_bdphaseII_sciencereport.pdf.	Bay-Delta

Chapter 1: Introduction

Comment No.	Page No.	Comment	Commenter
3	1-7	The environmental document should identify and evaluate alternative operational criteria for the project that avoid additional modification of baseline flows in most water years to protect the aquatic ecosystem and fish populations in the Bay-Delta Watershed and to demonstrate proposed project feasibility taking into consideration possible updates to flow-dependent water quality objectives in the Bay-Delta Plan. Water diversions through infrastructure such as dams, reservoirs, and distribution facilities (canals, pumps, pipelines) have substantially modified the volume, timing, frequency, rate, and duration of river flows and these modifications are primary contributors to the decline, persistent low abundance, and high extinction risk for multiple native fish species and other aquatic organisms in the Bay-Delta watershed. A significant amount of scientific information indicates that existing river flows, Delta outflows, and interior Delta flows (baseline flows) are not sufficient for halting and reversing declines of multiple fish populations in the Bay-Delta watershed. Additional surface storage, conveyance, and operational flexibility in the Proposed Project allows for greater impairment of baseline flows (volume, timing, frequency, rate, and duration) in the Bay-Delta watershed and allows for increases in adverse impacts on depleted fish populations and other aquatic organisms. Modifications to the baseline hydrograph (volume, timing, frequency, rate, and duration) in the riverine and tidal portions of the Bay-Delta watershed and subsequent impacts to ecological resources including fish populations should be estimated and disclosed in the context of changes from baseline and unimpaired flow conditions. Given the potential for additional degradation of baseline flows associated with the Proposed Project, and the relationship between flows and fish population viability, operational alternatives that avoid loss of baseline flows in most water years are needed to assess the feasibility of mitigating ecological and fishery impacts in the context of anticipated updates to the Bay-Delta Plan and to produce a record in support of multiple Board decisions.	Bay-Delta

Chapter 2: Project Description and Alternatives

Comment No.	Page No.	Comment	Commenter
4	-	Chapter 2 indicates that a benefit of the Sites Project is exchanges in releases from Shasta and Folsom for cold water pool maintenance and other environmental needs. However, the CalSim and HEC5Q modeling does not show noticeable benefits of such exchanges. Any assertions of cold water pool benefits should be supported with quantitative results that demonstrate such benefits.	Bay-Delta
5	2-29	The Project proposes to divert water during times that Shasta Reservoir should be minimizing loss of storage or gaining storage for temperature management during the summer and fall. The environmental document should include proposed operating constraints specifically designed to avoid impacts to Shasta and Trinity River storage, temperature management, and impacts to salmonid redd dewatering and stranding associated with these operations.	Bay-Delta
6	2-29	More details should be provided about the timing and magnitude of releases for specific Storage Partners and the route that water would be conveyed to ensure that possible impacts associated with these issues can be fully evaluated and disclosed. In addition, the total quantity of diversions, including losses, should be identified and evaluated.	Bay-Delta
7	2-29	The environmental document states that the Authority intends to apply for and obtain a water right permit from the State Water Board for operations of the Project and that actual operations will depend upon the terms and conditions of the water right permit. As discussed above, in order to inform the State Water Board's decision making on appropriate operational constraints for the project, a reasonable range of operational constraints should be evaluated in the environmental document and the public should be given the opportunity to review and comment on those analyses before the environmental document is finalized. Specifically, a range of operations that include criteria that provide additional protection for fish and wildlife should be evaluated, including Sacramento River and Delta outflow bypass flows.	Bay-Delta
8	2-30	The proposed Project states that "Sites Reservoir would be filled through the diversion of Sacramento River water that generally originates from unregulated tributaries to the Sacramento River downstream from Keswick Dam. A limited volume of the diversions to Sites Reservoir would come from flood releases from Shasta Lake." The draft	Perm

		REIR/SEIS should be revised to include discussion as to how water targeted for diversion by the Project will generally be limited to water generated in the watershed below Keswick Dam. In the limited circumstances where flood releases from Shasta Lake of water originating above Keswick Dam will be relied upon, the draft REIR/SEIS should be revised to clearly define what constitutes “flood releases” and should explain how flood releases will be tracked to ensure the Project is diverting only “flood releases” to the extent it diverts water that originates above Keswick Dam. Additionally, even if a limited volume of water comes from flood releases, please note that the entire watershed from the lowest proposed point of diversion (Hamilton City) upstream should be considered when evaluating water availability, as well as downstream instream flow needs.	
9	2-31, 32	The Bend Bridge Pulse Protection specifies criteria for qualified pulse flow events that would occur during October through May for the protection of migrating juvenile salmonids. For these criteria, the fish pulse protection is flow-based to simulate the effect of pulse flows on fish migration. The draft REIR/SEIS should identify fish pulse protection criteria and associated modeling rules to simulate implementation. If fish pulse protection criteria are based solely on real-time fish monitoring, flow-based modeling may overestimate actual river flows, which may be lower due to real-time decision making by water resource managers and advice from technical working groups. Pulse protection criteria should incorporate options for flow-based pulses to trigger migration and pulse flows in response to real-time fish monitoring information. Identifying these criteria will allow modeling to more accurately reflect flow conditions resulting from pulse protection. The pulse flow event is defined as 3-day trailing averages at the Sacramento River at Bend Bridge and tributary flows. A 3-day “trailing” average has the potential to miss the initial “pulse”, i.e., within the first three days of a precipitation event, of flow and fish migration. Alternative methods should be considered to protect the initial pulses of flow and migrating fish, such as using the California Nevada River Forecasting Center daily river forecast and/or fish monitoring data. The second bullet item describes a qualified pulse event as the 3-day trailing average flows at Bend Bridge (Sacramento River) flow greater than 8,000 cfs “and” tributary flow upstream exceeding 2,500 cfs. The inclusion of the conjunction “and” indicates that the pulse flow criteria for both the Sacramento River and tributaries must be met for a pulse protection to be initiated. In order to protect migrating fish from both the mainstem Sacramento River and the tributaries, however,	Bay-Delta

		pulse flow criteria should be established separately for the mainstem Sacramento River and the tributaries. In addition, the draft REIR/SEIS should explicitly state whether the tributary flow of 2,500 cfs criteria represents the combined flows for the three tributaries (Cow, Cottonwood, and Battle creeks) or for an individual tributary.	
10	2-33	The minimum bypass flow in the Sacramento River at RBPP is proposed to be 3,250 cfs. The draft REIR/SEIS states that when the Sacramento River flows exceed 3,250 cfs at RBPP that diversions would occur "until the full 2,100 cfs diversion could be achieved at flows of approximately 7,860 cfs." Diversion at this rate represents about 27% of Sacramento River flows. Further, Figure 2-26 shows that any, and all, flows above the minimum bypass flows (3,250 cfs) will be diverted until the diversion rate reaches 1,801 cfs at the Sacramento River flow of 5,050 cfs, which represents a diversion of approximately 36%. A full analysis should be provided of the potential impacts of diverting over a third of the flow of the Sacramento River, including an analysis for all months and water year types, as well as possible shorter term impacts on rearing and migration of salmon and other native fishes.	Bay-Delta
11	2-33	The proposed minimum bypass flow in the Sacramento River at Hamilton City Pumping Station is 4,000 cfs. The draft REIR/SEIS states that when the Sacramento River flows exceed 4,000 cfs at Hamilton City Pumping Station that diversions would occur "until the full 1,800 cfs diversion could be achieved at flows of about 5,800 cfs." The diversion at this rate represents about 31% of Sacramento River flows. Further, Figure 2-27 shows that any, and all, flows higher than the minimum bypass flows (4,000 cfs) will be diverted until the diversion rate reaches 1,800 cfs. An analysis of the impact of these high rates of diversion compared to the Sacramento River flow at Hamilton City Pumping Station has not been provided in the draft REIR/SEIS. Table 11-7 only provides the percentages of diversion at Hamilton City Pumping Station up to 24% or 25%. (June of Wet years, May and June of Below Normal, Dry, and Critical years). This issue needs further clarification.	Bay-Delta
12	2-33	The Hamilton City Pump Station is located at an oxbow channel away from the mainstem Sacramento River, thus experiences different hydraulic conditions. Diversion criteria at	Bay-Delta

		the Hamilton City Pump Station should take into account additional bypass flow needs for an oxbow channel needed to protect fish species.	
13	2-33	The operational criteria should identify ramping rates for diversions appropriate to protect native fish species that may be residing near or migrating past diversion facilities.	Bay-Delta
14	2-36	The environmental document states that the critical months for cold water pool management are August through September. Cold water pool protection is important year-round and most important from April through November to protect winter-run, spring-run, and fall-run Chinook salmon. High releases throughout this period reduce cold water supplies available later in the year. Cold water is needed throughout this period until ambient temperatures cool in the fall.	Bay-Delta
15	2-36	The Project is proposing the use of “exchanges” of Sites water in-lieu of releases from Central Valley Project (CVP) and State Water Project (SWP) reservoirs. The draft REIR/SEIS is unclear as to how these “exchanges” are coordinated between the proposed project and the CVP and SWP operators, and it does not specify how water being “exchanged” will be adequately tracked to ensure that these “exchanges” are reported adequately under a valid basis of right. Additional information should be added to better describe the “exchanges” that would occur with entities downstream from Sites Reservoir. Specifically, coordinated operations between the Proposed Project, CVP, and SWP should be identified in order to accurately simulate changes to river flows and water supplies throughout the watershed.	Perm
16	2-38	The Authority has yet to complete the field studies to determine baseline conditions and other environmental parameters for Funks Creek and Stone Corral Creek. The Authority states that the field studies cannot be completed until land access is obtained. The information and analysis that would be collected as part of the field studies may be needed for analysis as part of the water right application process and may need to be completed prior to any final action of any water right application filed for the Project.	Perm
17	2-60	Section 2.6.4.1 Water Operations: Although the draft REIR/SEIS states that Alternative 1 is the preferred alternative (page 2-5), the impact analysis in Chapter 11 Aquatic Resources presents two alternatives under Alternative 1 (1A and 1B). Alternative 1A includes no Reclamation investment and Alternative 1B includes up to 7% Reclamation investment, which equates to about 91,000 AF of storage dedicated to Reclamation in Sites Reservoir. The DEIR/DEIS should	Bay-Delta

		clarify which alternative is the “preferred alternative” as the modeled impacts under Alternatives 1A and 1B were different. Specifically, conditions for salmonid juvenile rearing and migration would increasingly worsen under alternatives with higher Reclamation participation, i.e., 0% (Alternative 1A), 7% (Alternative 1B), and 25% (Alternative 3).	

Chapter 4: Regulatory and Environmental Compliance: Project Permits, Approvals, and Consultation Requirements

Comment No.	Page No.	Comment	Commenter
18	4A-16	The draft REIR/SEIS states, “The following <u>three</u> basin plans.” Please correct <u>three</u> to <u>two.</u>	WQ

Chapter 5: Surface Water Resources

Comment No.	Page No.	Comment	Commenter
19	5-30	Average estimated decreases to Sacramento River flows (11%, Table 5-16) in May of critically dry years and associated adverse impacts to fish survival and fish populations may not be sufficiently mitigated or offset by the minimal average estimated increases to Shasta Lake storage in May of critically dry years (2-4%, Table 5-11). Minimal storage increases in the month of May are not necessarily likely to provide temperature benefits in later, warmer, summer and fall months when temperature benefits are most needed, especially in critically dry conditions. The net effect of these changes may be a significant adverse effect to fish species present in the Sacramento River in spring of critically dry years.	Bay-Delta
20	5-33	Reductions in flow due to Proposed Project operations and diversions on the Sacramento River during the October – June period in critically dry years for Alternatives 1 – 3, result in potentially significant adverse impacts to aquatic biological resources. Increased bypass flow requirements should be evaluated that would avoid reducing baseline flows and reduce potentially adverse impacts to fish species to less than significant.	Bay-Delta
21	5-36 and 37	The draft REIR/SEIS shows that changes to baseline flows as a result of water exchanges made possible by the Proposed Project may result in adverse impacts to fish	Bay-Delta

		species. For example, flow increases of 5 – 25 percent in fall months may dewater fall-run Chinook and steelhead redds when flows recede. Flow reductions in June and July of critically dry years (3 – 14 percent, Table 5-23) on the Feather River may adversely impact migrating spring-run Chinook salmon and green sturgeon. Similar flow changes on the American River due to Folsom Lake exchanges are estimated to occur with the same concerns for adverse impacts to salmon and steelhead. Operational criteria should be developed to avoid changes to baseline flows that may cause adverse impacts to fish species on the Feather and American Rivers.	
22	5-49	Hydrologic modeling results in the main body chapters and appendices should be presented using methods that demonstrate the full range of outcomes in modeling results. Hydrologic modeling results are currently summarized as averages by water year type and results are presented for wet years and critically dry years only. To capture the full range of potential impacts, modeling results should include the full range of outcomes and be presented without averaging and without the filter of water year type (which is a proportional sum of monthly unimpaired flow plus a proportion of last year's water year index volume). Narrative descriptions of outcomes should present median, maximum, minimum, 90^{th} and 10^{th} percent quartile outcomes. Presenting results as averages by water year type narrows the range of results presented and can mask potential adverse effects of the proposed project. Modeling data should be displayed with exceedance tables, exceedance charts, and box and whisker plots to show the full continuum of modeling results in an efficient format. Displaying modeling data using these methods efficiently discloses project impacts for all water years and does not obscure or skew potential impacts.	Bay-Delta
23	5-49	Chapter 5 should include an analysis of the impact of Proposed Project alternatives (including an alternative that sufficiently anticipates updates to flow-dependent water quality objectives in the Bay-Delta watershed) on the Sacramento River and Delta hydrograph. This analysis should include an evaluation of monthly changes in the volume of river flows for all project alternatives. Results should be compared to the no action alternative and to unimpaired flows to estimate the contribution of Proposed Project operations to changes in the hydrograph. Results should be presented to show the full range of simulated changes to monthly river flows with in the CalSim II spatial domain and for the 82-year simulation period. This hydrologic analysis should then be	Bay-Delta

		used to support the aquatic biology analyses in Chapter 11. Substantial modification to the unimpaired hydrograph is a primary driver of reductions of native fish populations that should be evaluated in the environmental document from a project specific and cumulative perspective.	
24	5-49	Chapter 5 should also include impact categories for changes to monthly reservoir storage for Sites and non-Sites storage partners, changes to Delta exports, and changes to interior flows (Old and Middle River reverse flow patterns) associated with Proposed Project alternatives. The additional storage and water exchange flexibility provided by Proposed Project alternatives may have impacts on storage volumes in storage partner and non-storage partner reservoirs that subsequently affect availability and quality of water releases and river flows for fish and wildlife management. Similarly, Delta export patterns and the duration, frequency, and magnitude of reverse interior Delta flows may change in response to increased storage and water exchange potential provided by the Proposed Project. Modifications to Delta exports and interior river flow patterns are surface water modifications important for estimating impacts associated with Proposed Project alternatives on fish and wildlife resources and on water quality for Delta water rights holders.	Bay-Delta
25	-	The environmental document should evaluate the potential hydrologic effects of the project that are not captured by monthly modeling evaluations, including sub-monthly effects and effects of real time operations that could occur under the proposed operating rules for the project.	Bay-Delta
26	-	The draft REIR/SEIS indicates that Funks Creek and Stone Corral Creek will be managed for flood purposes only and no water from any local drainages that will be inundated by Sites Reservoir will be collected in Sites Reservoir for diversion and use. The draft REIR/SEIS should include discussion as to how water entering Sites Reservoir from the local drainages will be monitored, recorded, and timely released through Sites Reservoir.	Perm
27	5-27	Additional hydrologic analyses may be required during the water right permitting process to inform and support the State Water Board's water availability findings. These additional analyses may ultimately lead to water availability findings and associated restrictions on the proposed diversions that differ from those presented in the draft REIR/SEIS. As such, staff recommends that the Authority consider including additional	Perm

		project alternatives and/or hydrologic analyses that contemplate greater restrictions on diversions to support fish and maintain water quality.	
28	5-49	The table lists expected water use and water sources for construction activities. Surface water is listed as a source water for all three project components. However, the immediate section after the table states that "As identified in Chapter 8, there is sufficient groundwater supply to provide this water during the construction period without affected yield from other wells." The draft REIR/SEIS should be revised to clarify whether surface water will be used for construction purposes. If surface water will be used during construction activities, the draft REIR/SEIS should indicate under what valid basis of right the surface water will be used. Please note that any existing water right that may be selected to use for construction activities must be used in a manner that does not violate the terms and conditions of that basis of right. A water right permit, temporary permit, petition for change, or other applicable water right might need to be obtained if surface water needed for construction cannot be used under an existing valid basis of right.	Perm
29	-	A more detailed description of the proposed bypass flows is needed, including how these bypass flows affect diversions, which is not clear in the modeling.	Bay-Delta
30	-	A detailed discussion about the accounting of water diverted and released is needed. Ideally this accounting would be publicly available in real-time.	Bay-Delta

Chapter 6: Surface Water Quality

Comment No.	Page No.	Comment	Commenter
31	-	The environmental document should include an analysis of potential sub-monthly water quality impacts, including temperature and other impacts that could have sub-monthly significant impacts.	Bay-Delta
32	-	The draft REIR/SEIS states "The analysis in this chapter focuses on the Central Valley Basin Plan objective for waterbodies designated with the WARM or COLD beneficial use that at no time or place shall the temperature of intrastate waters be increased more than 5°F above natural receiving water temperature." In addition to this objective, the Basin Plan also includes a narrative WQO, and provides as follows: "The natural receiving water temperature of intrastate waters shall not be altered unless it can be	Bay-Delta

		demonstrated to the satisfaction of the Regional Water Board that such alteration in temperature does not adversely affect beneficial uses." Temperature objectives for COLD interstate waters, WARM interstate waters, and Enclosed Bays and Estuaries are as specified in the *Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays of California* including any revisions. There are also temperature objectives for the Delta in the State Water Board's *2006 Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary*. At no time or place shall the temperature of COLD or WARM intrastate waters be increased more than 5°F above natural receiving water temperature. Temperature changes due to controllable factors shall be limited for the water bodies specified as described in Table 3-7. To the extent of any conflict with the above, the more stringent objective applies. In determining compliance with the water quality objectives for temperature, appropriate averaging periods may be applied provided that beneficial uses will be fully protected." The 5 degree requirement is the maximum allowable change in temperature. Per the narrative WQO, no change in temperature can be made without first demonstrating to the Regional Board that the alteration would not adversely affect beneficial uses. The analysis lacks any evaluation of potential impacts to beneficial uses, e.g., aquatic life, in terms of the WQO. The significance of a potential impact should be evaluated in terms of impacts to beneficial uses, not the 5 degree threshold.	
33	-	The analysis evaluates temperature impacts to the Sacramento River from the discharge of water from Sites Reservoir; however, it appears that the analysis lacks an evaluation of temperature impacts in the Sacramento River that may be caused by the additional diversions from the river and coordinated operations with Shasta Reservoir.	Bay-Delta
34	6-29	State Water Board staff note that the issuance of a Clean Water Act section 401 water quality certification could serve as Waste Discharge Requirements pursuant to the Porter-Cologne Water Quality Control Act (Water Code sections 13000 et seq.) as authorized by State Water Board Water Quality Order No. 2003-0017-DWQ, Statewide	WQ

		General Waste Discharge Requirements for Dredged or Fill Discharges that have Received State Water Quality Certification.	
35	6-31	The environmental document states that while the Delta is impaired by elevated selenium, “selenium is not included in the evaluation because the Project would not affect the major sources of Delta selenium: natural sources, San Joaquin River flow, and industries in the San Francisco Bay Area. Selenium concentrations in the Sacramento River are low, with most measurements below detection limits and measured values for total selenium all being less than 1 μg/L (WDL values for Sacramento River below Red Bluff, Sacramento River at Hamilton City, and Sacramento River above CBD measured from 2000 through 2020). Selenium concentrations in Stone Corral Creek are somewhat higher (average measured total selenium of 6.74 μg/L; Appendix 6E), but the Project would not affect the selenium load from Stone Corral Creek, and Stone Corral Creek is expected to contribute only a small percent of the water in Sites Reservoir.” USEPA 2016 criterion for Se is 1.5 ug/L in lentic systems and 3.1 ug/L in lotic systems. Stone Corral Creek concentrations appear to be elevated. The document includes USEPA 2016 in the references but does not mention the criterion and does not include a Se cycling discussion in the text, which may be warranted considering the concentrations in the creek. Stone Corral Creek concentrations are 4 times the criterion for lentic systems. An evaluation of loading to the reservoir may be warranted, as continued loading may result in localized elevated bioaccumulation rates due to the change from a lotic system to a lentic environment.	Bay-Delta
36	6-31	The environmental document states that “Contaminants associated with sediments were also dismissed from detailed evaluation. Contaminated sediments could move into Sites Reservoir as suspended sediments during high flows, but the main supplies of contaminated sediments and their potential effects would remain in the Sacramento River channel because the amount of sediment contained in the diversions to Sites Reservoir would be small compared to what is contained in the Sacramento River channel.” Reservoirs can create conditions, e.g., anoxia and hypolimnetic enrichment, that convert insoluble oxidized precipitates into reduced soluble forms, and as a result these soluble chemicals can be released from the sediment. Contaminant levels that may not pose a	Bay-Delta

		threat in the riverine setting may react differently and cause toxicological impacts in the reservoir or in discharges from the reservoir. Such potential impacts from metals, phosphates, HS, and other contaminants that may be caused by the reservoir conditions require analyses.	
37	6-31	According to the draft REIR/SEIS, “Contaminants associated with sediments were also dismissed from detailed evaluation. Contaminated sediments could move into Sites Reservoir as suspended sediments during high flows, but the main supplies of contaminated sediments and their potential effects would remain in the Sacramento River channel because the amount of sediment contained in the diversions to Sites Reservoir would be small compared to what is contained in the Sacramento River channel.” The draft REIR/SEIS should include a quantitative estimate of the amount of sediment contained in the diversions to the Terminal Regulating Reservoir, Funks Reservoir, and Sites Reservoir. Additionally, the draft REIR/SEIS should include a discussion regarding the need and frequency of dredging activities at the Terminal Regulating Reservoir, Funks Reservoir, and Sites Reservoir and the likelihood that the sediment would contain contaminants and the associated impacts related to dredging contaminated sediment.	WQ
38	6-39, 6-54, 6-58	The environmental document includes a qualitative assessment of the primary factors that could increase or decrease mercury and methylmercury concentrations at the four geographies that could be affected by Project. Aqueous methylmercury concentration is the single most important factor influencing fish tissue Hg concentrations. The predicted aqueous MeHg concentration in the reservoir is 22 to 33-fold (short-term) and 11-17-fold (long-term) higher than the proposed aqueous MeHg allocation (<0.009 ng/L) in the Statewide Reservoir Methylmercury TMDL (SWRCB 2017b, as referenced in the draft REIS/SEIS). This suggests that Sites Reservoir will create conditions that result in elevated fish tissue mercury levels that will persist indefinitely. Reservoirs create new conditions that enhance the production of MeHg and bioaccumulation and biomagnification of Hg. The creation of the reservoir has a high risk of resulting in elevated fish Hg levels that pose a risk to human recreators and consumers of fish from the reservoir as well as wildlife that consume fish. The analysis lacks an evaluation of the significance of creating a waterbody with elevated fish tissue	Bay-Delta

		Hg concentrations. Instead the analysis compares inorganic Hg concentrations against the California Toxics Rule, which is inadequate for this kind of environmental assessment, as stated in the early sections of the chapter. Elevated MeHg discharged to the Colusa Basin Drain (CBD), which already has one of the highest average concentrations of aqueous MeHg in the Central Valley (CVRWQCB 2010) will exacerbate bioaccumulation conditions in the canal. The fish Hg levels are near 0.2 ppm and increasing aqueous MeHg concentrations will likely increase their concentrations to levels that pose risk to consumers. The environmental document states, "Because Funks Creek, Stone Corral Creek, and the CBD do not support sport fish, it is unlikely that anglers would be fishing these waterbodies; accordingly, any potential exceedances of the sport fish objective at these locations would not be expected to affect the public." The CVRWQCB staff have observed many people fishing in CBD on many occasions. This statement should be revised accordingly.	
39	6-50	Please note that CVRWQCB Order R5-2016-0076-01 expires in January 2022, according to the following: https://www.waterboards.ca.gov/rwqcb5/board_decisions/adopted_orders/general_orders/r5-2016-0076-01.pdf. State Water Board staff recommend the final draft REIR/SEIS reference any update to the Order.	WQ
40	6-50	Since Stone Corral Creek is listed on the Clean Water Act Section 303(d) list for dissolved oxygen, the construction, dewatering, and diversion activities will need to comply with Basin Plan objectives and the anticipated TMDL in development for dissolved oxygen.	WQ
41	6-54 6-88	While the draft REIR/SEIS states studies of Funks and Stone Corral Creek have not yet been conducted, a general discussion should be included of how Funks and Stone Corral Creeks will be protected from any harmful algae blooms or low-quality water from the reservoir over the long-term operation of the reservoir. The draft REIR/SEIS appears to lack an evaluation that includes the complexities of cyanobacteria and may understate the true impacts of cyanobacteria or other harmful algal blooms (e.g., pelagic and benthic states, bioaccumulation of cyanotoxins by benthic invertebrates, sediment accumulation of cyanotoxins, multiple species, reservoir discharges of cyanobacteria	Perm

		and toxins, and impacts to recreational users and wildlife) in water years where the reservoir levels are primarily stagnant. The draft REIR/SEIS should be revised to include additional information and analysis to address these issues.	
42	6-56	It is not clear that the proposed mitigation measures to address water quality impacts that rely on plans that have not yet been developed will be adequate to mitigate potential water quality impacts, including impacts associated with harmful algal blooms. Further, analysis should be included on impacts from algal blooms in general due to odor, aesthetic impairment, and recreational impacts at the project site, within the Sacramento River, and in the Delta, including an analysis of cumulative impacts.	Bay-Delta
43	6-60	According to the draft REIR/SEIS, "Ongoing monitoring of aqueous and fish tissue methylmercury in Sites Reservoir will be implemented per permit conditions, to assess the effectiveness of fisheries management actions over the long term." The final REIR/SEIS should identify the specific permit(s) referenced.	WQ
44	6-72	The environmental document indicates that providing water to the Yolo Bypass is not expected to impact dissolved oxygen conditions. Additional analyses should be provided to support this conclusion, particularly given recent results from the North Delta Food Subsidy Study.	Bay-Delta
45	6-88	The environmental document should discuss the effects of the project on HABs in pelagic, benthic, and organic systems.	Bay-Delta
46	6-81, 6-100	The environmental document states that "Alternatives 1, 2, and 3 would increase the aqueous methylmercury concentration at Freeport during summer and fall months of Dry and Critically Dry Water Years. These increases would range from approximately 3% above existing conditions when Sites Reservoir releases are at the long-term expected methylmercury concentration of 0.1 ng/L, to 28% above existing conditions when releases are at the short-term reasonable worst-case methylmercury concentration of 0.3 ng/L. Fish tissue methylmercury concentrations would increase by at least 5% above existing conditions when the aqueous methylmercury concentration in Sites Reservoir releases is 0.1 ng/L (estimated long-term expected concentration), and up to 50% above existing conditions when Sites Reservoir releases have the short-term reasonable worst-case methylmercury concentration of 0.3 ng/L."	Bay-Delta

		This would conflict with the Delta MeHg TMDL and BPA. New projects should not result in an increase in aqueous MeHg concentrations or elevated fish Hg concentrations. Even the long-term MeHg concentration is 1.7 to 2.5-fold higher than the adopted aqueous MeHg goal in the TMDL and BPA.	
47	6-91	The draft REIR/SEIS states, "There are several reasons why the effect of moving Sites Reservoir releases through the Yolo Bypass could have a limited effect on pesticides in the Delta. • The pesticide load from the CBD to the Delta would not change; only the discharge location would change. • Pesticides are already present in the Yolo Bypass and are already being discharged to the Cache Slough Complex." This greatly oversimplifies pesticide use and interactions. Pesticides are registered for specific uses, and pesticides are applied according to crop types and time of year. The environmental document lacks any analysis of the different types of pesticides used, concentrations of pesticides present in the Yolo Bypass, Cache Slough, or the Colusa Basin Drain, the interactions of currently observed pesticides in the Yolo Bypass and Cache Slough and the addition of CBD pesticides (e.g., additive or synergistic interactions). For example, the CBD will contain, at a minimum, pesticides associated with rice farming, whereas monitoring in the Cache Slough has observed high levels of pesticides associated with urban land uses from Ulatis Creek. The environmental document should address these issues.	Bay-Delta
48	6-92	The environmental document states that "operation would not increase water temperature more than 5°F at discharge locations, in compliance with the Central Valley Basin Plan." This is not a correct metric for evaluating impacts to beneficial uses, as discussed above.	Bay-Delta
49	6-92	The environmental document states that "operation would not reduce drinking water quality downstream due to nutrients and organic carbon or cause low DO because nutrients and organic carbon in Sites Reservoir releases would be diluted and water	Bay-Delta

		would be aerated upon release. Any increases in reservoir nutrient concentrations may benefit fish." An evaluation against drinking water standards does not address the environmental impacts of the discharge of biostimulatory constituents. The evaluation should include an evaluation of the cumulative impacts of the discharge of biostimulatory constituents and resulting changes in productivity downstream combined with the discharge of reservoir produced HABs and cyanotoxins.	
50	6-93	The environmental document states that operation would not cause mercury concentrations to exceed the CTR criterion in Sites Reservoir. Sites Reservoir releases with estimated expected long-term aqueous methylmercury concentrations would be lower than that in the CBD under existing conditions and therefore would not be expected to increase bioaccumulation of methylmercury in CBD fish. Sites Reservoir releases could increase aqueous and fish tissue methylmercury concentrations in the CBD, particularly during Dry and Critically Dry water years at estimated long-term worst-case methylmercury concentrations in releases. However, fish tissue methylmercury levels in the CBD would likely return to baseline levels within months following the May–November release period." As stated earlier, the production of elevated fish Hg levels in the reservoir where human and wildlife fish consumers will be exposed to toxic levels would be a significant impact.	Bay-Delta
51	6-100	The environmental document states that "Construction, operation, and maintenance of Alternative 1, 2, or 3 would increase overall beneficial use of water in the Sacramento River watershed. The Project would not conflict or obstruct a water quality control plan and this impact would be less than significant." This statement is overly broad. As discussed above, the project could have significant impacts on water quality constituents or beneficial uses, and it is not clear that the proposed mitigation measures will be adequate to address these impacts given their level of detail and feasibility questions.	Bay-Delta

Chapter 7: Fluvial Geomorphology

Comment No.	Page No.	Comment	Commenter
52	7-9	The permits mentioned under BMP-14 will expire in January 2022. BMP-14 must require compliance with the existing permits and any amendments thereto.	WQ
53	7-9	BMP-12 should include the following information regarding the Construction General Permit: Water Quality Order No. 2009-0009-DWQ and NPDES No. CAS000002, as amended by Order No. 2010-0014-DWQ, Order No. 2012-0006-DWQ, and any amendments thereto.	WQ

Chapter 9: Vegetation and Wetland Resources

Comment No.	Page No.	Comment	Commenter
54	9-8	The extent of wetland and water quality and flow related impacts is not project-level. Accordingly, additional project level information will likely be needed for 401 Water Quality Certification purposes. The extent of wetland areas and waters on the Project site and subsequent estimates of project impacts may change, potentially significantly, once project-level information is developed. Section 9.3.1 states that the wetland resources in the study area are based on results of high-resolution aerial imagery and prior surveys of approximately 75% of the study area conducted between 1998 and 2003, which is approximately two decades ago. This section also states that the estimates of wetland and non-wetland waters are subject to revision based on pedestrian surveys once access has been granted to the study area and pending field verification by US Army Corps of Engineers, State Water Board, and CDFW. Tables 9-2a and 9-2b note that acreage of impacts to wetlands and waters are based on preliminary engineering designs instead of project-level information needed to support decision making under section 401 of the CWA, specifically relevant to meeting state approved water quality standards and future updates to water quality standards that are currently in process. A verified delineation and jurisdictional determination of state and federally regulated waters will be needed before the Clean Water Act Section 401 certification process can proceed. A scientifically defensible estimate of jurisdictional waters and assessment of	Bay-Delta

		conditions is needed to fully evaluate potential impacts of the project and potential opportunities to mitigate any unavoidable impacts.	
55	9-19 through 9-21	Alternatives 1-3 are described as potentially eliminating more than 375 acres of wetland resources and more than 200 miles of stream resources. This would be a substantial impact and removal of resources that are important for natural communities and ecological functions. The CEQA determination is less than significant after mitigation, however mitigation is proposed as preservation and does not include replacement at a 1:1 ratio or higher of wetland and non-wetland resources through construction and/or restoration of wetland and non-wetland aquatic habitats. This does not appear to be consistent with the finding of “not significant after mitigation.”	Bay-Delta

Chapter 11: Aquatic Biological Resources

Comment No.	Page No.	Comment	Commenter
56	-	As described in comments on Chapters 2 and 5, reductions in flows and survival of juvenile fish with a demonstrated flow survival relationship are likely to be negatively impacted by Proposed Project operations that reduce baseline flows. Anticipated negative impacts on native fish species that have documented positive flow: abundance relationships reinforce the previously stated need for a project alternative that concentrates diversions during high flow periods when there is excess flow in the system and avoids diversions during lower flow periods when those flows provide for protection of fish and wildlife.	Bay-Delta
57	11-2	Lake Berryessa appears to be incorrectly labeled Stone Corral Creek in Figure 11-1.	WQ
58	11-104 11-140	The draft REIR/SEIS states that “At all locations, mean monthly water temperatures for all months in all water year types under Alternatives 1A and B were within 0.5 °F of the NAA water temperature modeling results for Alternatives 2 and 3 were similar to those of Alternative 1 at all locations.” This statement is unclear and should be modified.	Bay-Delta
59	11-107	This paragraph addresses the Tiered water temperature management for winter-run Chinook salmon; however, it only provides results in Tier 1 and Tier 2 management years. Further analysis and results for Tier 3 and Tier 4 years would be needed for comparison. In addition, “Table 11D-19” in Chapter 11, page 107, should be changed to “11D-18.”	Bay-Delta

60	11-111	The draft REIR/SEIS concludes that the project alternatives would have “no” adverse effect on the rearing habitat for winter-run fry in the Sacramento River (page 11-111, last paragraph), however, several month-water combinations would have considerable negative impacts according to the analyses. Table 11k-23 evaluating winter-run fry rearing WUA in the Sacramento River, Segment 6, identifies that rearing habitat will be mostly reduced under the project alternatives compared to NAA; the greatest reduction will occur in October, by 3.3% in AN, 2.6% in BN, and 4.8% in CD years under Alternative 1A compared to NAA. In addition, many factors influence survival through the rearing life stages in addition to WUA. Factors such as temperature and the relationship between WUA and water temperature on the probability of survival should be discussed as part of supporting findings.	Bay-Delta
61	11-112	These tables (11N-28, 29, 30) show potential for large-scale increases (over 30%) and decreases (over 55%) of juvenile salmonid stranding under different project alternatives compared to the NAA. The draft REIR/SEIS, however, does not address any potential mitigation measures for such changes in juvenile stranding. Instead, the draft REIR/SEIS concludes that the project alternatives would not be expected to affect winter-run juvenile stranding based on the varying levels of juvenile stranding stating “some large reductions and increases in juvenile stranding occur, but large reductions in juvenile stranding are more frequent than large increases.” Mitigation for increases to juvenile stranding should be identified instead of relying on potential decreases at other times to offset increases in stranding and losses to juvenile survival.	Bay-Delta
62	11-152; 11-185	Spring-run (Table 11K-18) and fall-run Chinook salmon (Table 11K-19) spawning habitat WUA downstream of the Thermalito Afterbay Outlet will be reduced under Alternatives 1A (6.8%), 1B (5.6%), and 2 (6.7%) in October of Below Normal water years. Despite these reductions of spawning habitat in the Feather River, the draft REIR/SEIS concludes the Alternatives would have “mostly minor effects.” Further analyses of the impacts of the reduced spawning habitat and justification for the conclusion of “minor effects” should be provided. Given the status of these fish populations, a finding of “minor effects” does not appear to be supported by the estimated losses to spawning habitat that result from the proposed project.	Bay-Delta
63	11-166	In table 11-29, numbers presented for “All Fish Abundance Upstream of Red Bluff” and “All Fish Abundance Upstream of Hamilton City” are the same. Please clarify.	Bay-Delta

64	11-174	The project would result in reduced spawning habitat WUA for fall-run, especially in river segments 4 and 6 in the Sacramento River under Alternatives 1A, 1B, and 3 (Tables 11K-8, 9, 10, and 11). The draft REIR/SEIS also concludes that "Alternatives 1, 2, and 3 would result in frequent minor reductions in spawning habitat WUA for fall-run, and occasional somewhat greater reductions, primarily for Alternative 3." The mitigation measure FISH-2.1 is designed to enhance migration survival of juvenile salmonids, and its impacts on spawning habitat WUA is uncertain. This should be clarified.	Bay-Delta
65	11-207	The following sentence is unclear and should be revised: "These results indicate that steelhead in the Feather River would be negligible."	Bay-Delta
66	11-258	An analysis of the impact of changes to Delta outflow on dispersal of larval Delta smelt should be included in the environmental document to improve understanding of the potential impacts of the Proposed Project on Delta smelt. Reduced outflow is expected to reduce the distribution of Delta smelt larvae downstream to areas of higher quality habitat for larval and post-larval Delta smelt. Results should be discussed by month and not averaged across season or multiple months.	Bay-Delta
67	11-260	For tables 11-58 and 11-59, the results of abundance of the Delta smelt copepod food source (*Eurytemora affinis*) should be presented on a monthly basis to avoid underestimating the potential effects of reduced food sources as a result of reduced Delta outflow. Delta smelt are food limited and large reductions within a month may have a more significant biological impact than would appear based on average reductions over several months. The draft REIR/SEIS averages the results over several months (March – May, Table 11-58; March – June Table 11-59) and concludes that changes are minimal. This summary approach to presenting the data and making conclusions may significantly underestimate impacts of changes to Delta outflow on food sources for Delta smelt.	Bay-Delta

Chapter 17: Energy

Comment No.	**Page No.**	**Comment**	**Commenter**
68	17-12	The Federal Energy Regulatory Commission (FERC) exempts from licensing certain hydropower facilities located on non-federally owned conduits with installed capacities up	WQ

		to 40 megawatts. The applicant must file a Notice of Intent to Construct a Qualifying Conduit Hydropower Facility with FERC. It is unclear if FERC has approved an exemption for the proposed generation.	

Chapter 28: Climate Change

Comment No.	Page No.	Comment	Commenter
69	-	The basis of the analysis for Section 28.4 is the near-term average climate hydrology. The average change in 2035 is not sufficient to describe the range of conditions expected by the end of the century. Having at least a qualitative analysis of climate change impact on water supply, and other changes that might affect the Project through its useful life (or over the century) would be better suited for analyzing the long-term feasibility of the Project. The draft REIR/SEIS should evaluate what conditions could be expected by the end of the useful life of the Project.	Perm
70	28-8	The assessment of performance with extreme change should accompany analyses, such as a drier and extreme warming scenario, and a wetter with moderate warming scenario. Analyses in Chapter 28 are based on the average amount of change in 2035 (central tendency, CT). On page 28-4 the text indicates "While average precipitation may not change significantly, there will be a change in precipitation patterns and extremes." It seems that relying only on central tendency is not adequate for describing a full range of effects.	Perm
71	28-11	Analyses are for Critically Dry and Wet Water Years with average climate change (CT 2035). While Critically Dry and Wet are the bookends for water year types, the analysis under average change does not reflect the extremes and does not reflect "the full extent of future climate scenarios." The draft RDEIR/SEIS should address how the frequency of Critically Dry and Wet water year types change with extreme change and how different Critically Dry Water Year hydrology is under extreme change compared to CT 2035.	Perm
72	28-12	If the Sites Reservoir operations are most sensitive to Wet Water Year changes under climate change, the analysis should show the extent of impacts on relevant variables during Wet Water Years with extreme climate change, not just with average change.	Perm

Chapter 31: Cumulative Impacts

Comment No.	Page No.	Comment	Commenter
73	31-35	The cumulative analysis should include a CalSim study that evaluates possible updates to the Bay-Delta Water Quality Control Plan as identified in the 2018 Framework Document:https://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/docs/sed/sac_delta_framework_070618%20.pdf . The update of the Bay-Delta Plan has the potential to affect bypass/diversion amounts, as well as storage in Shasta, which could also affect the ability to divert from the Sacramento River by the Sites Project.	Bay-Delta

Appendix 2D: Best Management Practices, Management Plans, and Technical Studies

Comment No.	Page No.	Comment	Commenter
74	2D-2 to 2D-30	For table 2D-1, State Water Board staff request the Sites Authority to consult with State Water Board - Water Quality Certification Program staff when developing best management practices (BMPs) or plans that address water quality. For example, the Spill Prevention and Hazardous Materials Management/Accidental Spill Prevention, Containment, and Countermeasure Plans should be developed in consultation with State Water Board staff prior to construction. Additionally, State Water Board staff request the Sites Authority to consult with State Water Board staff regarding BMP-6, BMP-7, BMP-8, BMP-9, BMP-10, BMP-13, BMP-30, and the Initial Sites Reservoir Fill Plan.	WQ

Appendix 5A6: Modeling Limitations

Comment No.	Page No.	Comment	Commenter
75	5A6-2	Appendix A6 states that the Reclamation Temperature Model was used to simulate temperatures on the Feather River and a reference to Appendix H of 2008 OCAP BA is provided. In Appendix H of the 2008 OCAP BA there is no mention of a temperature model for the Feather River. The model used to simulate temperatures on the Feather River should be correctly identified and documented.	Bay-Delta

Appendix 6A: California State Water Resources Control Board Constituents of Concern

Comment No.	Page No.	Comment	Commenter
76	6A-11 to 6A-14	For table 6A-4, the table should reference the most recent California Integrated Report (Clean Water Act Section 303(d) List and 305(b) Report). State Water Board staff anticipate the 2020-2022 California Integrated Report will be submitted to the USEPA in March 2022. Additional information can be found here: https://www.waterboards.ca.gov/water_issues/programs/water_quality_assessment/2020_2022_integrated_report.html.	WQ

Appendix 6F: Mercury and Methylmercury

Comment No.	Page No.	Comment	Commenter
77	6F-18	The environmental document states that "Since no reservoir exists under the No Project Alternative, these fluctuations cannot be compared to a baseline. However, comparison to other reservoirs indicates that expected fluctuations are greater than median fluctuations of other reservoirs in California, indicating that reservoir fluctuations will likely contribute to conditions favorable to mercury methylation." The baseline is no reservoir producing MeHg, so the analysis should encompass all of the new MeHg being produced by the new reservoir and subsequent exposure to fish, humans, and wildlife.	Bay-Delta

EXHIBIT D

February 8, 2023

State Water Resources Control Board
1001 I Street
Sacramento, CA 95814

Transmitted via email to: Bay-Delta@waterboards.ca.gov

RE: Comment Letter – Draft Scientific Basis Report Supplement

Dear Staff:

On behalf of the Natural Resources Defense Council, San Francisco Baykeeper, California Sportfishing Protection Alliance, The Bay Institute, Defenders of Wildlife, and Golden State Salmon Association, we are writing to provide written comments regarding the Draft Scientific Basis Report Supplement in Support of Proposed Voluntary Agreement for the Sacramento River, Delta, and Tributaries Update to the San Francisco Bay/Sacramento-San Joaquin Delta Water Quality Control Plan ("Draft Report"). As discussed in detail below, the Draft Report fails to use the best available science, makes assertions that are inconsistent with the lack of scientific evidence that physical habitat restoration in the Bay-Delta is likely to improve survival or abundance of key fish species, fails to adequately consider the effects of water temperatures, ignores key flow thresholds (including those previously established by Board), and fails to use scientifically credible modeling assumptions. The State Water Resources Control Board ("Board") should significantly revise the Draft Report to correct these flaws, and we request that the Board share these comments with the independent scientific peer review of the Draft Report.

I. The Draft Report Fails to Adequately Acknowledge the Lack of Scientific Evidence that Physical Habitat (Tidal Marsh, Riparian, Floodplain, Spawning) is Currently Limiting Viability of Fish Populations or Abundance of Chinook Salmon and Fails to Use the Best Available Science Regarding Limiting Factors:

The Draft Report's identification of limiting factors affecting key fish species in the Bay-Delta (Chapter 2) lacks scientific rigor. In particular, it fails to adequately cite to and summarize the existing peer-reviewed studies that have not found evidence that physical habitats are currently limiting the viability of key fish species identified in the report. Equally important, the salmon habitat metrics used in the Draft Report are logically flawed and demonstrate that habitat restoration is not likely to improve salmon survival or abundance. This is unsurprising because the current water management and flow regime currently limits salmon abundance, rather than the extent of physical habitat.

A. The Draft Report's Discussion of Limiting Factors Must be Revised

Chapter 2 of the Draft Report provides vague and general statements regarding the potential effects of different stressors on fish populations, but it fails to cite scientific studies that support the assertion that these stressors are currently limiting the viability of fish populations in the Bay-Delta or attainment of the existing Chinook Salmon doubling objective. Equally important, the Draft Report fails to cite or consider existing scientific studies that have concluded these stressors are not limiting factors.

1. Chinook Salmon

The Draft Report's claims regarding physical habitat for Chinook salmon fails to use the best available science. For example, the Draft Report claims that the loss of rearing habitat (which it states affects the food supply for salmon and other fish species) is a limiting factor for salmon in the Sacramento River, yet only a few lines later the Draft Report contradicts this statement, admitting that there is not evidence that food supply is currently limiting salmon populations in the Sacramento River. Draft Report at 2-4; *see id*. at 2-6 (similar language regarding Feather River); *id*. at 2-8 (similar language regarding Yuba River); *id*. at 2-10 (similar language regarding American River); *id*. at 2-11 (similar language regarding Mokelumne River). More importantly, the Draft Report does not cite existing studies, such as Henderson et al. 2017, which found no evidence that survival of migrating juvenile salmon in the Sacramento River was affected by the amount of riparian habitat. Henderson et al. 2017 concludes that flow significantly affects survival of migrating salmon in the Sacramento River, across both reaches and years; however, neither the percentage of off-channel habitat within 50 feet of the river nor adjacent cover (defined as "the percent of non-armored river bank with adjacent natural woody vegetation") were statistically significant covariates of juvenile salmon survival. Henderson et al. 2017. The Draft Report should be revised to include a clear statement that current availability of off-channel habitat or riparian habitat has not been shown to limit survival of migrating juvenile salmon in the Sacramento River, citing Henderson et al. 2017.

Similarly, the Draft Report claims that a lack of shallow-water habitat in the Delta is a major stressor on salmon and other fish species. Draft Report at 2-19. While the Draft Report discusses studies from other regions, it fails to cite existing peer-reviewed studies and agency findings which conclude that the extent of shallow-water environments in the Delta does not currently limit Central Valley salmon populations, given the low abundance of salmon and existing river flows into and through the Delta. Most notably, Munsch et al. 2020 found that juvenile salmon were absent from restored shallow environments in the Delta and upper San Francisco Bay estuary when spawner abundance and/or river flow levels were low and that "…the efficacy of [physical habitat] restoration efforts depends on sufficient spawners and flow to promote juvenile abundances and distributions that translate to occupied restored habitats." Munsch et al. 2020. In other words, the extent of shallow-water environments in the Delta is not a limiting factor for salmon at current population levels or under the current flow regime. This suggests that without higher abundance and increased flows, restoration of shallow water environments in the Delta is unlikely to improve productivity or provide substantial population level benefits. This is particularly true in dry and critically dry years when much existing habitat is unoccupied currently and during which flow augmentation under the proposed Voluntary Agreement is negligible. Similarly, in its 2017 biological opinion regarding WaterFix, NMFS found that for winter-run Chinook salmon, "The proposed Delta habitat restoration did not improve the cohort replacement rate under this scenario because the current low abundance of the winter-run population is not limited by Delta rearing habitat." NMFS 2017 at 810.

Furthermore, any beneficial effects of tidal marsh restoration on salmon do not substitute for adequate river flows, but instead depend on adequate flows and temperatures. Recent studies have found that in years with adequate flows, juvenile salmon growth in the Delta is higher than it is in the American River, but this is not the case in drought years. Coleman et al. 2022 (concluding that "variation in water flow and temperature (Figure 1) were likely the primary abiotic factors that generated differences in growth opportunities in each habitat within and among years."). The Draft Report should be revised to include a clear statement that rearing habitat in the Delta is not currently limiting salmon populations, citing these studies.

The Draft Report also claims, erroneously and without evidence, that habitat connectivity onto and off floodplains is the "primary limiting factor" for Chinook salmon and other native migratory fish. Draft Report at 2-17. This statement is contradicted by numerous studies, some of which are cited in the Draft Report, which emphasize the importance of flow, temperature, and other factors affecting the survival and viability of salmon populations. Equally important, while there are numerous scientific studies finding that salmon that rear on floodplains are larger in size, the Draft Report never acknowledges that despite decades of research, existing studies have not demonstrated higher survival in either the freshwater or ocean environment for salmon that rear on floodplains (particularly in the Yolo Bypass). For instance, Takata et al. 2017 evaluated the results of years of paired releases of salmon to evaluate whether salmon reared on the floodplain had a survival advantage compared to those that reared in the Sacramento River, and the study concluded that,

> Despite the known growth advantages of floodplain rearing, we did not detect significant differences in survival to the ocean fishery between our paired [juvenile salmon] releases in the Yolo Bypass and Sacramento River.

Takata et al. 2017.

While the Takata et al. 2017 study appropriately caveated this conclusion by noting the small sample sizes from the ocean fishery, and although floodplain rearing can provide important benefits in terms of life history diversity, we are unaware of any studies from the Bay-Delta watershed which demonstrate increased ocean survival or abundance/production from rearing in the Yolo Bypass. Similarly, several studies have documented that salmon that rear in the Yolo Bypass do not have higher freshwater survival than salmon that rear in the Sacramento River under the same river flow conditions. *See* Pope et al. 2018; Johnston et al. 2018. The Draft

Report should be revised to clearly state that existing studies have not documented improved survival of salmon, in either freshwater or ocean life stages, nor increased production and escapement, as a result of rearing on floodplain habitats, citing these studies.

2. *Longfin Smelt*

Equally important, there is little to no evidence that the extent of shallow tidal marsh environments in the Delta is a limiting factor for Longfin Smelt. There is no empirical evidence that increasing shallow tidal marsh acreage will lead to increased abundance or productivity of SF Longfin Smelt. Despite the restoration over the past few decades of several thousand acres of shallow tidal habitat in the SFE (e.g., as a result of the CalFed program, previous biological opinions, the South Bay Salt Pond Restoration Program, and other programs), SF Longfin Smelt abundance and productivity have not increased beyond that predicted by the flow-abundance relationships; in fact, despite this restoration, the SF Longfin Smelt population has continued to decline in abundance and productivity (e.g., Rosenfield and Baxter 2007; Kimmerer et al. 2009; Thomson et al. 2010; Nobriga and Rosenfield 2016).

Nevertheless, the Draft Report erroneously concludes that improved access to spawning habitat explains the relationship between flow and Longfin Smelt abundance.[1] Draft Report at 6-29. The Draft report acknowledges that there is no known relationship between flow and larval Longfin Smelt abundance as would be expected if increases in freshwater flow increased spawning success at a population scale; production of larval Longfin Smelt is relatively consistent from year to year, showing no correlation with Delta outflow. *See, e.g.*, Dege and Brown 2004; Eakin 2021. On the other hand, juvenile abundance is strongly correlated with Delta Outflow across orders of magnitude for both variables. *See, e.g.*, Rosenfield and Baxter 2007; Nobriga and Rosenfield 2016. These findings contradict the Draft Report's assertion that creation of additional shallow tidal environments will increase abundance and productivity of the SF Longfin Smelt population by increasing larval production. Rather, they are evidence that the well-documented Longfin Smelt flow-abundance relationship is driven by the effect of flow on larval survival, not by increased production of larvae.

The Draft Report also erroneously assumes that the mere presence of Longfin Smelt larvae in or near restored tidal marsh environments is evidence that the extent of these environments limits the species' abundance or survival. Whereas Longfin Smelt larvae are observed in shallow marsh environments, they are also observed in open water habitats, and it is not clear what percentage of the population makes use of shallow marsh environments and the duration of residence in these areas appears to be very short (<1 month).

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[1] The Draft Report erroneously suggests that Rosenfield and Baxter (2007) found that Longfin Smelt spawn in tidal wetlands; that paper did not study Longfin Smelt spawning habitat preferences. In fact, Rosenfield and Baxter documented a decade-long near failure to detect spawning age Longfin Smelt in Suisun Marsh, despite year-round intensive sampling.

There is little evidence for any mechanism connecting the extent of shallow sub-tidal marsh environments to viability of the estuary's Longfin Smelt population. In fact, efforts to document contribution of larval Longfin Smelt rearing in restored wetlands in the South Bay to the estuary-wide juvenile and adult population have failed to detect such evidence. *See* Lewis et al. 2019. Furthermore, even the presence of Longfin Smelt larvae in recently restored tidal marshes is not evidence that restoration improved habitat occupancy; the study that the Draft Report relies on (Lewis et al. 2020) reports findings from "…*previously undescribed aggregations* of Longfin Smelt that were attempting to spawn in restored and *underexplored* tidal wetlands of South San Francisco Bay" (emphasis added); Rosenfield 2010 indicates that the South Bay historically supported juvenile Longfin Smelt, prior to major restoration efforts.

Juvenile Longfin Smelt are not common in shallow, sub-tidal marsh (Rosenfield and Baxter 2007) and so would not be expected to benefit from restoration of such habitats. There is also little evidence for a substantial positive effect on SF Longfin Smelt of prey subsidies exported from shallow sub-tidal habitats (see below). Furthermore, there is little evidence that Longfin Smelt juvenile abundance or productivity is limited by prey abundance. Whereas Kimmerer 2002 suggested an association between a decline in Longfin Smelt abundance and the invasion of the estuary by the filter feeding clam, *Corbula amurensis*, in 1987, subsequent analyses that looked at multiple years around this period failed to detect a step-decline in Longfin Smelt abundance that is neatly coincident with the clam invasion. Thomson et al. 2010; Mac Nally et al. 2010; Nobriga and Rosenfield 2016. Nor is there evidence that Longfin Smelt abundance is strongly correlated with prey availability (Thomson et al.2010); Mac Nally et al. 2010 (Fig 3a,b at 1425) found weak, but significant, ***negative*** associations between Longfin Smelt abundance and their main prey, as compared to a very strong association with spring X_2.

The Draft Report should be revised to strike the speculative claims on page 6-29 and elsewhere regarding the purported benefits of tidal marsh restoration on Longfin Smelt.

Furthermore, the Draft Report's analysis of the Voluntary Agreement's effects on pelagic habitat area for Longfin Smelt (described in section 5.5.5 of the Draft Report and reported in Section 6.2.2) is contrary to the best available science indicating that area or volume (measured as the overlap of a few "habitat suitability" metrics) is not limiting to the Delta's native or naturalized fishes or certain zooplankton. Kimmerer et al. 2009 analyzed the effect of flow on "habitat" for several Delta fish species, including Longfin Smelt, using an approach very similar to that described in the Draft Report. They found that the change in Longfin Smelt "habitat" volume for a given change in flow was insufficient to explain the (much larger) change in Longfin Smelt abundance over the same range of flows; they concluded that variation in habitat volume did not explain most of the variation in Longfin Smelt abundance through time.[2] The Draft Report

[2] Kimmerer et al. 2009 reached the same conclusion – that changes in habitat volume did not explain changes in abundance – for the suite of Delta fish and zooplankton species they studied, including Delta Smelt. They concluded: "Therefore, other mechanisms must underlie responses of abundance to flow for most species."

should clearly state that there is no evidence that abundance or survival of Longfin Smelt or other pelagic species in the Delta are limited by variations in the volume or area of pelagic habitat.

3. Delta Smelt

Similarly, the Draft report wrongly assumes that the extent of tidal marsh in the Delta currently limits Delta Smelt abundance and survival and that restoration on the scale proposed by the Voluntary Agreement would alleviate such an effect. This assumption is not supported by the empirical evidence, as Delta Smelt have continued to decline to nearly indetectable levels despite the restoration of shallow water environments, including more than 4,000 acres of restoration required under the US Fish and Wildlife Service's 2008 biological opinion that was specifically intended to support this species. Given that various fish assemblage sampling programs indicate that Delta Smelt numbers are far below those observed even two decades ago, it is extremely unlikely that the population is limited by the current extent of physically suitable habitat. It is also unlikely that habitat area will become a key constraint on the population in the near future, especially given that an additional several thousand acres of shallow tidal habitat restoration is already required under the Delta Smelt biological opinion.

4. Food Subsidy from Restored Environments

The Draft Report at times erroneously claims that tidal marsh restoration "may" export phytoplankton and zooplankton to other areas of the Delta, and assumes this would lead to Delta-wide increases in food supply for Delta Smelt and other species. *See, e.g.,* Draft Report at 6-24. Yet existing studies have largely rejected the hypothesis that tidal marsh restoration will subsidize other areas of the Delta with exported food. For example, whereas Hammock et al. 2019 found potential support for the hypothesis that tidal marshes can improve Delta Smelt foraging success on the margins of marsh habitats, Hammock et al. 2019 did not find evidence to support the hypothesis that tidal marshes export zooplankton to other parts of the estuary. In addition, Herbold et al. 2014 concluded that tidal marshes are unlikely to export significant amounts of plankton throughout the estuary, in part due to invasive clams. More recently, Yelton et al. 2022 concluded that "…there is little evidence of persistent subsidies of zooplankton from tidal wetlands to open water," and Hartman et al. 2022, who observed lower abundance of zooplankton in shallow water than in deep water environments, concluded "This runs … counter to the conceptual model which suggests that restoring shallow tidal wetlands will provide an increased supply of food for at-risk fishes."

One recent study supports the hypothesis that fish prey items are exported from large floodplain bypasses to adjacent river environments (Sturrock et al. 2022); however, this effect is ephemeral, and both the magnitude and spatial extent of prey subsidy are directly correlated with river flow. In addition, the most abundant prey items exported from the floodplain do not tolerate brackish water. Sturrock et al.2022. Thus, the ability of the inundated floodplain to subsidize the food web of brackish environments is highly constrained. This demonstrates a recuring theme in research on restored shallow-water environments: any benefits to native fishes are usually still highly dependent on maintenance of an adequate flow regime – ultimately, flow creates, maintains, and activates habitat for native fishes.

The Draft Report's assumptions about broad scale export of plankton throughout the estuary are inconsistent with the best available science. Meanwhile, it ignores peer-reviewed studies that point to other stressors on the prey base of native fishes. For example, Section 6.2.3 of the report completely ignores the effects of clam grazing on plankton production. In addition, the Draft Report's discussion of Delta food webs fails to reference the 2019 peer-reviewed study which found that SWP/CVP South Delta pumping reduces phytoplankton abundance in the Delta by 74 percent. *See* Hammock et al. 2019. The Draft Report should be revised to eliminate claims that tidal marsh restoration will increase regional productivity, citing these and other papers that have rejected this hypothesis and it should include references to studies implicating anthropogenic stressors and the effect of river flow regimes in its discussion of food-web limitation for pelagic fish in the Delta.

B. The Draft Report's Salmon Habitat Metrics are Logically Flawed and Demonstrate that Habitat Restoration is Not Likely to Improve Natural Salmon Production and Abundance

The Draft Report quantifies salmon spawning and rearing habitat that it asserts are needed to achieve salmon natural production targets, identifying acreage needed to achieve the Draft Report's proposed definition of salmon doubling[3] and 25% of that target. *See* Draft Report at Figure ES-1, ES-2. However, the results from the Mokelumne River demonstrate that these habitat targets for spawning and rearing habitat are illogical and are not likely to improve natural survival and abundance of salmon in the Central Valley.

The Draft Report indicates that the Mokelumne River provides more than 100% of the spawning and rearing habitat necessary to achieve salmon doubling. Draft Report at Figure ES-1, ES-2. However, natural salmon production on the Mokelumne River is woefully short of the salmon doubling objective, largely because of unsustainably low survival in the spawning life stage (due to inadequate water temperatures) and juvenile life stage (due to inadequate instream flows in the winter and spring). The East Bay Municipal Water District runs a very successful salmon hatchery program on the Mokelumne River, which supports relatively high returns of salmon to the Mokelumne; however, returns of hatchery-origin fish are not relevant to the existing or modified/proposed salmon doubling objective or natural production of viable fish populations. Based on the Department of Fish and Wildlife's reports from Constant Fractional Marking Program, in recent years the vast majority of salmon escapement on the Mokelumne River are hatchery salmon that did not incubate or rear in the Mokelumne River:

Year	Percentage Hatchery Fish (Mokelumne Hatchery)	Percentage Hatchery Fish (Mokelumne Spawners)
2019	89%	73%

[3] As discussed *infra*, the Draft Report's calculation of salmon doubling is arbitrary and inconsistent with the existing Bay-Delta Water Quality Control Plan and the Central Valley Project Improvement Act's Anadromous Fish Restoration Program.

2018	99%	87%
2017	94%	86%
2016	90%	81%
2015	96%	94%

As a result, the escapement of naturally produced salmon to the Mokelumne River appears to fall far short of achieving the salmon doubling objective identified in state and federal law, including the Bay-Delta Water Quality Control Plan. For instance, based on Grandtab's reported 2019 Mokelumne River escapement of 4,361 total salmon to natural areas and returns of 8,509 salmon to the Mokelumne hatchery, the Department's data from the Constant Fractional Marking Program indicates that escapement of naturally produced salmon was only 1,180 salmon to natural areas with an additional 936 naturally produced salmon returning to the hatchery.

In contrast to the East Bay Municipal Water District's successful hatchery production, egg-to-fry survival and natural production of salmon on the Mokelumne River is generally extremely low in most years, well below levels that are typical for Chinook salmon in other managed river systems. *See* Quinn 2005.

Year	**Egg-to-Fry Survival (to Downstream Monitoring Location at River Kilometer 62)**
2007	1%
2008	8%
2009	5%
2010	18%
2011	2%
2012	2%

See East Bay Municipal Water District, December 2013. Emigration of Juvenile Chinook Salmon (*Oncorhynchus tschawytscha*) and Steelhead (*Oncorhynchus mykiss*) in the Lower Mokelumne River, December 2012 - July 2013.[4]

Despite exceeding the spawning and rearing habitat metrics identified in the Draft Report, natural salmon production on the Mokelumne River appears to be woefully short of the salmon doubling objective. This mismatch demonstrates that the spawning and rearing habitat metrics utilized in the Draft Report are not logically related to the factors that actually limit the natural production of salmon in the Central Valley.

[4] This report, which is the most recent such report publicly available from the District's webpage, is available online at: https://www.ebmud.com/download_file/force/1900/568?emigration-of-juvenile-chinook-salmon-and-steelhead-in-the-lower-mokelumne-river-dec.-2012-july-2013.pdf. This report, and all other scientific studies and documents cited herein which are available for download from a specific webpage, are hereby incorporated by reference.

II. **The Draft Report's Suggestions that Restoring Physical Habitat will Provide Unquantified "Expected Benefits" is Inconsistent with the Available Scientific Evidence:**

The Draft Report acknowledges that it does not quantitatively model the effects of non-flow measures on species abundance. This is because, unlike the numerous documented relationships between flow and abundance or productivity of fish populations in this ecosystem, research quantifying the presumed relationship of non-flow actions to fish population viability is either lacking or has failed to detect any relationship at all. Nevertheless, the Draft Report repeatedly suggests that physical habitat restoration will provide unquantified "expected benefits." *See* Draft Report at 7-2 ("The quantitative connection between restored non-flow habitat and species abundance was not modeled, only evaluated qualitatively, so benefits are expected but unquantified with respect to species abundance."). However, the best available science from the Bay-Delta watershed has failed to show that restored physical habitat will increase species abundance and survival, which the Draft Report fails to cite.

a. Floodplain Habitat Restoration

As discussed above, the best available science has not found that salmon that rear in the Yolo Bypass have higher survival in freshwater or ocean environments, and has not found that floodplain rearing results in higher abundance. Takata et al. 2017; Pope et al. 2018; Johnston et al. 2018. As a result, the best available scientific information from the Bay-Delta does not demonstrate that restoring floodplain habitat (including connectivity to floodplain habitat) will increase abundance and survival of salmon. While the *duration* of floodplain habitat inundation is linked to other benefits to cohorts of migrating juvenile salmon (e.g., through its correlation with the life history diversity of juvenile salmon exiting the floodplain (Takata et al. 2017; Pope et al. 2018; Johnston et al. 2018), or via food export to the river environment (Sturrock et al. 2022)), the Draft Report should be revised to clearly state that there is no scientific evidence in the Bay-Delta to conclude that there are "expected benefits" to survival and abundance of salmon from restoration of additional floodplain acreage, and that any benefits to native fish species associated with floodplains require adequate magnitude, frequency and duration of river flows that inundate the floodplain. Similarly, the existing scientific literature in the Bay-Delta has not found that riparian habitat limits survival or abundance of juvenile salmon migrating down the Sacramento River, Henderson et al.2017, and the Draft Report should be revised to clearly state that "expected benefits" to salmon survival and abundance from riparian habitat restoration in the Sacramento River are unsupported and speculative, at best.

b. Tidal Marsh Habitat Restoration

As discussed above, the best available science has found that tidal marsh habitat in the Delta is not currently limiting salmon abundance, given existing flows and salmon abundance levels. Munsch et al.2020. Because there is not evidence that tidal marsh habitats in the Delta currently limit salmon population abundance, there is not evidence that tidal marsh restoration will provide "expected benefits" to salmon abundance; this is particularly true given the findings, described above, that tidal marsh habitats in the Delta do not generally export food to open water environments. As a result, the Draft Report should be revised to clearly state that there is not scientific evidence that tidal marsh restoration in the Delta will provide "expected benefits" to salmon survival and abundance, particularly given current depressed population levels and the VAs failure to provide adequate river flows during dry and critical years.

There is similarly little to no scientific evidence that tidal marsh habitat restoration would provide "expected benefits" to the abundance and viability of Longfin Smelt and Delta Smelt. As discussed above, the mere observation of Delta Smelt or Longfin Smelt near restoration sites does not demonstrate that restoration is improving survival or abundance. With respect to Longfin Smelt, Lewis et al. 2019 states clearly that the value of restored shallow subtidal environments "remains unknown." There is no evidence that restoration activities in these areas of South San Francisco Bay generated any positive effect for Longfin Smelt. In fact, Longfin Smelt occupancy of and recruitment in these restored shallow marsh habitats in South San Francisco Bay appears to be dependent on freshwater flow. Lewis et al. 2019 observed successful recruitment of Longfin Smelt larvae to marshes in South San Francisco Bay only in years of locally high freshwater flow into the Bay; during other years, adult Longfin Smelt returning to and spawning in the vicinity of the South Bay Salt Ponds may have represented an ecological sink. There is also no evidence that Longfin Smelt benefited from the existence of the restored shallow sub-tidal habitat in years that were not wet. Regarding their detections of substantial numbers of Longfin Smelt west of Suisun Bay, which occurred primarily during the wet years 2017 and 2019 (and, for restored South Bay salt ponds, only during those two years), they state: "... it is valuable to consider whether, with high Delta outflows, it is feasible and probable that larval and juvenile Longfin Smelt found in high numbers in San Pablo Bay, and even Lower South San Francisco Bay, could have been transported from Delta and Suisun Bay spawning sites by currents, tides, and winds." *Id*.

As discussed above, there is little evidence that tidal marsh habitats limit the survival and abundance of Longfin Smelt. Similarly, in proposing to list Longfin Smelt as endangered under the federal Endangered Species Act, the U.S. Fish and Wildlife Service concluded that,

> We consider reduced and altered freshwater flows resulting from human activities and impacts associated from current climate change conditions (increased magnitude and duration of drought and associated increased temperatures) as the main threat facing the Bay-Delta longfin smelt due to the importance of freshwater flows to maintaining the life-history functions and species needs of the DPS. However, because the Bay-Delta longfin smelt is an aquatic species and the needs of the species are closely tied to freshwater input into the estuary, the impact of many of the other threats identified above are influenced by the amount of freshwater inflow into the system (i.e., reduced freshwater inflows reduce food availability, increase water temperatures, and increase entrainment potential).

87 Fed. Reg. at 60963. In its species status assessment, the Fish and Wildlife Service also concluded that,

> The loss of tidal marsh habitats may have hampered [Longfin Smelt] productivity, but to date, there are no indications that restoration has been sufficient to stem the

> decline. Therefore, we cannot conclude whether or not the species has lost resilience due to landscape changes that occurred in the 19th and 20th centuries.

U.S. Fish and Wildlife Service, Species Status Assessment for the San Francisco Bay-Delta Distinct Population Segment of the Longfin Smelt, available online at: https://www.regulations.gov/document/FWS-R8-ES-2022-0082-0003/content.pdf, at 56. The Draft Report should be revised to include these references regarding the lack of scientific evidence that tidal marsh restoration is likely to have "expected benefits" to Longfin Smelt.

c. Spawning Habitat Restoration

The Draft Report fails to demonstrate that creation of physical habitat suitable for salmon spawning is likely to improve the productivity or abundance of salmon. Most importantly, as discussed below, the Draft Report ignores the effects of water temperatures as a key and limiting characteristic of spawning habitat for Central Valley Salmon, despite the well documented effects of water temperature on spawning and egg incubation success. *See infra*. In addition, the Draft Report indicates that spawning habitat on each of these rivers already exceeds what the Draft Report speculates is necessary to achieve 25% of the salmon doubling goal, which is the Voluntary Agreement's purported target, and in some cases already exceeds the spawning area estimated to be necessary to achieve 100% of the salmon doubling goal. *See* Draft Report at ES-1. The Draft Report should be revised to clearly state that there are not "expected benefits" from spawning habitat restoration, particularly without ensuring adequate river flows and water temperatures to support spawning and incubation.

III. <u>The Draft Report Fails to Adequately Consider Whether Habitat Restoration is Reasonably Certain to Occur</u>

The Draft Report admits that outcomes from implementation of the proposed VA are not certain, and identifies a number of "uncertainties in VA outcomes," which are in addition to the uncertainties inherent in quantitative modeling of complex ecosystems. Draft Report at ES-7. One of those uncertainties is when habitat restoration projects would be completed. Any benefits associated with non-flow actions cannot be realized until those actions are implemented. Regrettably, in recent decades the implementation of habitat restoration projects in the Delta has repeatedly missed deadlines for completion; for instance, most of the restoration projects included as part of EcoRestore were required to be fully implemented by 2018, yet the majority of acreage is still incomplete.[5] Even assuming for the sake of argument that there are no delays in permitting, funding, or execution, many non-flow actions will require years to complete, even if they are implemented with the utmost efficiency – it is extraordinarily unlikely that most non-flow actions will be implemented as quickly as flow actions. Therefore, modeling in the forthcoming Staff Report/SED that compares outcomes of the Voluntary Agreement's mix of flow and non-flow actions must reflect the inherent asynchrony in implementation between flow and most non-flow actions – the analysis should be careful not to compare expected outcomes

[5] In addition, one of the larger recent restoration projects (Lower Yolo Ranch) is apparently obtaining credits towards these existing mitigation requirements despite the fact that the vast majority of its restored "habitat" is at elevations above tidal influence.

from the first day of implementation for a flow alternative with outcomes expected only after the final non-flow action is fully implemented years later.

IV. **The Draft Report Fails to Adequately Consider the Effects of Water Temperature on Habitat, Survival and Abundance:**

The Draft Report's assessment of the Voluntary Agreement's proposed "habitat" restoration fails to use the best available science because it ignores the role of water temperatures in the formation and maintenance of suitable habitat. The 2017 Scientific Basis Report correctly concludes that "High summer and fall water temperatures is recognized as a major limiting factor for Chinook salmon and steelhead populations." 2017 Scientific Basis Report at 3-35. Despite this recognition that water temperature is a major limiting factor for salmon spawning success, the Draft Report states that water temperature is "not included in the suitability criteria for VA habitat." *See* Draft Report at 5-6 ("While water quality parameters such as dissolved oxygen and water temperature are key attributes of suitable habitat, they were not included in the suitability criteria for VA habitat."); *id*. at 7-2 (VA spawning and rearing habitat "was not informed by water temperature."). Temperature thresholds are known for most or all life stages of many native fish species and temperatures are known to limit the viability and abundance of these populations. Also, the effect on water temperatures of flow rates, reservoir management, and climate change can all be estimated by existing models. The Draft Report's assessment of spawning habitat plainly fails to use the best available science.

In addition, the Draft Report inaccurately states that, "Higher flows decrease temperatures below dams." *Id*. at 2-2. At least for dams with temperature control devices like Shasta Dam, peer-reviewed research confirms that the temperature of water released from the dam, not the volume of water that is released, is the primary factor affecting downstream water temperatures in spawning reaches. *See, e.g.*, Daniels and Danner 2021.[6] The effect of flow volume on water temperature becomes increasingly important with distance from the dam, in areas were migrating and rearing juvenile salmon are the primary life-stages. The Draft Report should be revised to clarify this important point.

The 2017 Scientific Basis Report emphasizes the importance of managing water temperatures below upstream dams and the current problems in maintaining adequate water temperatures for salmon at existing dams on the Sacramento River, Feather River, American River, and other rivers, and it proposes a new narrative objective regarding cold water habitat, which would be implemented by updating outdated temperature standards and establishing new temperature standards at existing dams. *See, e.g.*, 2017 Scientific Basis Report at 1-12, 1-22, 4-18 to 4-19, 5-34 to 5-43.[7] In contrast, the proposed Voluntary Agreement does not include a narrative

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[6] Miles Daniels and Eric Danner (2020). The Drivers of Water Temperatures Below a Large Dam. Water Resources Research, 56, e2019WR026751. https://doi.org/10.1029/2019WR026751, available online at: https://agupubs.onlinelibrary.wiley.com/doi/pdfdirect/10.1029/2019WR026751.

[7] Excessive temperature dependent mortality that resulted from the failure to adequately manage water temperatures below major dams has significantly contributed to the unsustainable egg to fry survival rates discussed *infra*.

objective regarding cold water habitat and does not propose specific measures to improve temperature management at upstream reservoirs, and the Draft Report fails to analyze or discuss the effects of the proposed Voluntary Agreement on upstream temperature management. The Draft Report should be revised to clearly state that the Voluntary Agreement would not address management of upstream water temperatures as proposed in the 2017 Scientific Basis Report.

By failing to address temperature issues, the Draft Report dramatically overstates the potential benefits of the modest habitat restoration propose in the Voluntary Agreement. Simply put, unless regulatory requirements force improved in-river temperature conditions, particularly regarding pre-spawning adult survival, spawning success and egg to fry survival, it is very likely that a high percentage of pre-spawn adults, eggs and fry will continue to be killed before they could even conceivably benefit from proposed habitat restoration downstream. In addition, these severe water temperature impacts on salmon are greatest during critically dry years and droughts, when salmon also face very low juvenile outmigration survival because of inadequate instream flows. The Draft Report should be revised to acknowledge these compounding problems of water temperatures and low flows adversely affecting salmon in droughts and critically dry years. The evaluation of the frequency of meeting flow thresholds for juvenile salmon survival during outmigration (*see infra*) will help to evaluate the effects of the Voluntary Agreement or other flow regimes on salmon survival, including during critically dry years and droughts.

Finally, recent research has also highlighted the important effects of river flow on water temperature in the Delta and the subsequent effect on predation of juvenile salmon and their survival through the Delta. *See, e.g.*, Nobriga et al.2021.[8] Similarly, other studies indicate an effect of river inflow on the distribution of estuarine temperatures, which may affect abundance, survival, and distribution of native fish in the Delta and Suisun Bay (Vroom et al. 2017[9]; Bashevkin and Mahardja 2022[10]). The failure to consider water temperature in regard to quantifying rearing habitat fails to use the best available science.

V. <u>The Draft Report Fails to Use the Best Available Science Regarding the Effects of Flow on Fish Populations:</u>

As discussed below, the Draft Report fails to adequately disclose to the public and reviewers the effects of the shifting regulatory baseline, fails to consider that modeled flows are not likely to occur, and fails to analyze whether the Voluntary Agreement would achieve key flow metrics.

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[8] Matthew L. Nobriga, Cyril J. Michel, Rachel C. Johnson, John D. Wikert, 2021. Coldwater fish in a warm water world: implications for predation of salmon smolts during estuary transit. Ecology and Evolution. 2021;11:10381–10395, available online at: https://onlinelibrary.wiley.com/doi/full/10.1002/ece3.7840.

[9] Vroom, J., van der Wegen, M., Martyr-Koller, R. C., & Lucas, L. V. 2017. What determines water temperature dynamics in the San Francisco Bay-Delta system? Water Resources Research, 53, 9901–9921. https://doi.org/10.1002/2016WR020062.

[10] Bashevkin, S.M. and B. Mahardja. 2022. Seasonally variable relationships between surface water temperature and inflow in the upper San Francisco Estuary. Limnology and Oceanography 67(3) DOI: 10.1002/lno.12027.

a. The Draft Report Fails to Adequately Account for the Shifting Baseline

The Draft Report appropriately attempts to account for the shift in the environmental baseline from the baseline used in the 2017 Scientific Basis Report to the Voluntary Agreement's proposal to use the requirements of the Trump Administration's unlawful biological opinions as the environmental baseline. However, in several key respects the Draft Report fails to provide the reader with clear and accurate information regarding the effects of the shifting baseline.

First, the Draft Report fails to explain that its estimate of changes in abundance of certain fish species is not comparable to the estimated changes in abundance of certain fish species in the 2017 Scientific Basis Report. The Draft Report estimates changes in abundance using modeled/expected flows, whereas the 2017 Scientific Basis Report estimated changes in abundance using only flows that would be required under the alternatives it evaluates (rather than modeled or expected flows), *see* 2017 Scientific Basis Report at 5-30 to 5-31. However, modeled flows under the alternatives described in the 2017 Scientific Basis Report are significantly higher than the flows required under those same alternatives. *See* 2017 Scientific Basis Report at 5-25 to 5-31. Therefore, given the linear nature of the flow-abundance and flow-survival relationships, modeled/expected flows in the 2017 Scientific Basis Report would result in substantially greater increases in abundance of these fish species than described in that report. The Draft Report should be revised to make clear that anticipated changes in abundance estimated by the two reports are not directly comparable, and abundance increases in the 2017 Scientific Basis Report would be substantially higher if the methodology used in the Draft Report had been used in the 2017 Scientific Basis Report.

Second, the shifting baseline obscures the fact that the proposed Voluntary Agreement results in smaller increases in expected Delta outflow than its proponents contend, and in certain water years the VA results in decreased Delta outflow relative to the baseline used in the 2017 Scientific Basis Report. *See* Draft Report at Table 4-11. However, Table 4-11 does not summarize the *changes* in outflow by water year type in terms of thousands of acre feet ("TAF") or percentage change, as the table below shows:

Season	Water Year Type	CalSim 3 Baseline (TAF)	Postprocessed Baseline (TAF)	VA without lower San Joaquin (TAF)	VA with lower San Joaquin (TAF)	**Difference in Outflow: VA vs 2017 Baseline (w/o lower SJR) (TAF)**	**Percent Difference in Outflow: VA vs 2017 Baseline (w/o lower SJR)**
Jan–Jun	W	23,331	23,593	23,460	23,513	**-133**	**-0.56%**
Jan–Jun	AN	12,796	12,919	13,376	13,500	**457**	**3.54%**
Jan–Jun	BN	6,085	6,135	6,601	6,707	**466**	**7.60%**
Jan–Jun	D	5,273	5,398	5,823	5,928	**425**	**7.87%**

Jan–Jun	C	3,601	3,673	3,735	3,788	**62**	**1.69%**

Table 4-11 should be revised to include information summarizing the changes in expected Delta outflow proposed under the Voluntary Agreement in both thousands of acre feet and percentage changes, similar to the table above. The amounts of flow proposed by the Voluntary Agreement (shown on Table ES-1) are misleading to the public in light of the changes to the baseline, and this information is necessary for the public to understand the volume of water proposed under the Voluntary Agreement in light of the shifting baseline and in order for those volumes to be compared with the baseline used in the 2017 Scientific Basis Report.

Finally, the Draft Report's estimate of flow-related biological benefits is inflated by the choice of baselines because it includes flow contributions from the San Joaquin Basin, whereas the 2017 Scientific Basis Report did not include additional flows from the San Joaquin Basin in its analysis of changes in flows and abundance. Furthermore, the Draft Report treats VA flows from the San Joaquin as increases, when they actually represent decreases in San Joaquin flows relative to those required under the existing Water Quality Control Plan. In 2018 the Board adopted instream flow requirements for the Stanislaus, Tuolumne, Merced, and lower San Joaquin rivers as amendments to the Bay-Delta Plan, which requires far more water than what is proposed in the Voluntary Agreement for the San Joaquin Basin. The Draft Report should be revised to include a reference to the expected increase in Delta inflows and outflows required by the 2018 Bay-Delta Plan amendments in order to make the flows proposed under the Voluntary Agreement comparable with the analysis in the 2017 Scientific Basis Report.

b. The Draft Report Fails to Adequately Explain that Modeled Flows under the Voluntary Agreement Flows are Not Likely to Occur

The Draft Report also fails to adequately consider that the modeled flows under the Voluntary Agreement are almost certain not to occur. While the Draft Report acknowledges some uncertainty about deviations from the modeled results as a result of flexibility in when flow assets are provided, Draft Report at 7-2, the Draft Report fails to recognize several other important uncertainties that make the modeled flows unlikely to occur, which should be discussed and documented in the Draft Report.

First, the 2017 Scientific Basis Report discusses the need to establish new flow requirements in order to ensure that flow conditions are not degraded in the future as a result of new water diversion and storage projects or increased diversions under existing water rights. *See, e.g.*, 2017 Scientific Basis Report at 1-5, 5-10, 5-24. For example, the 2017 Scientific Basis Report explains that "Existing flows generally exceed minimum D-1641 Delta outflow objectives for February through June, which means that over time with increasing water development, existing outflows will likely diminish with additional diversions." *Id.* at 5-24. Similarly, it explains that,

> As previously discussed, the percent of unimpaired flow scenarios do not yet account for other regulated and unregulated flows that would also contribute to Delta outflows above the inflow-based Delta outflow requirement, and predicted flows would be higher at times. The relative magnitude of this difference can be discerned by comparing current conditions with MRDO. The Staff Report will

> include modeling analyses that include these additional expected flows. While a complete analysis of this issue will include predicted flows under the scenarios that accounts for other flows, the analysis is still useful for several reasons. First, the analysis indicates that MRDO is inadequate to ensure the current level of Delta outflow protection. **While MRDO requirements do not control operations much of the time, with increasing water diversions, adequate minimum requirements will be critical as is demonstrated in Chapter 2.**

Id. (emphasis added). The State Water Resources Control Board's 2018 Framework discussed this problem in further detail, explaining that,

> In addition to existing water right claims, new water rights may also be requested. The volume of water in active or pending water right applications, in addition to water that was set aside and reserved by the state (referred to as 'state filed water rights'), far exceeds the average annual unimpaired runoff from the Bay-Delta watershed. Further, state filings maintain the water right priority of the date they were established, which for many date back about a hundred years ago, making water rights under these filings senior to many existing water rights. Given these potential future demands and limited existing flow requirements in the Bay-Delta watershed, it is imperative that updated flow requirements be established in order to protect fish and wildlife beneficial uses in the Bay-Delta watershed.

2018 Framework at 7.

In contrast, the Voluntary Agreement does not identify specific flow requirements or guarantee that the modeled flows will occur, nor does it propose to prohibit new water diversions, new water storage projects, or increased water diversions by existing water rights holders, all of which would reduce flows compared to the modeled results. Delta outflows are therefore almost certain to be less than the modeled results.[11] The Draft Report fails to explain the basis for assuming that modeled flows actually will occur, and what limits on new or increased water diversions would be imposed to ensure these modeled flows actually occur.

Moreover, a significant portion of the water proposed in the Voluntary Agreement is supposed to be purchased, including purchases at market rates. *See id*. at Table ES-1. However, the Draft Report does not acknowledge the numerous examples of similar water purchase programs that failed to provide the promised environmental flows, including the CVPIA Level 4 refuge water supply program, and the Voluntary Agreement does not require that these flows will be provided regardless of the cost.

Equally important, during every year identified as critically dry since 2012, the parties to the Voluntary Agreement have failed to meet the minimum Delta outflow requirements of D-1641.

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[11] Indeed, several new water storage and diversion projects are currently proposed (e.g., Sites Reservoir and Delta Conveyance Project) that would substantially reduce flows into and through the Delta compared to the environmental baseline over the longer term, according to their environmental documentation.

See also 2017 Scientific Basis Report at 1-6 ("As evidenced in the recent drought, the Projects' ability to maintain responsibility for meeting all Bay-Delta Plan flow and water quality requirements in the watershed while preserving water for cold water purposes is not realistic in the face of climate change and increasing water demands."). However, the Voluntary Agreement does not provide any assurance that the minimum requirements of D-1641 (the foundation of the Voluntary Agreement) would be met during multi-year droughts. This includes reductions in Delta outflow during the summer months, which is currently not considered in the Draft Report despite the scientific information demonstrating the importance of summer and fall flows to Delta Smelt and other native fish species. *See also* 2017 Scientific Basis Report at 3-75 to 3-77, 5-32.

Therefore, Draft Report should be revised to clearly state that modeled flows under the Voluntary Agreement are not required and are not likely to occur in the future, that water assumed to be purchased by the Voluntary Agreement is highly uncertain and not required, and that flows during droughts are likely to be much lower than modeled flows under the Voluntary Agreement.

c. The Draft Report Should be Revised to Consider Frequency of Achieving Key Flow Thresholds

The Draft Report fails to evaluate the frequency with which the proposed Voluntary Agreement would likely achieve key flow thresholds identified in the 2017 Scientific Basis Report (notwithstanding the flawed assumption that modeled flows are likely to occur). *See, e.g.,* 2017 Scientific Basis Report at 3-100, 5-25 to 5-31. The Draft Report should be revised to include this analysis, and appropriate caveats regarding the use of modeled flow results described above. In addition, the Draft Report fails to consider several flow thresholds identified in more recent scientific studies, which should be identified and referenced in the Draft Report:

- Flows of approximately 24,720 cfs at Bend Bridge were identified as a key flow threshold for survival of outmigrating juvenile winter-run Chinook salmon, with survival reduced when flows drop below this level and increased at flow levels above this threshold. Hassrick et al. 2022.[12]

[12] *Factors Affecting Spatiotemporal Variation in Survival of Endangered Winter-Run Chinook Salmon Out-migrating from the Sacramento River.* N. Amer. Journal of Fish. Mgmt., DOI: 10.1002/nafm.10748. This paper was published after Michel et al. 2021 and includes flow thresholds specific to winter-run Chinook salmon, whereas Michel et al. 2021 examined flow thresholds for spring-run and fall-run Chinook salmon. In addition, the Draft Report should be revised to clarify that Michel 2021 recommends "implementation of spring pulse flows above the 10,712 cfs flow threshold," that the 22,872 cfs flow threshold is the minimum for overtopping Tisdale Weir and that the paper's estimate of lower survival rates above this threshold may be "an artifact of lower detection efficiencies associated with fish utilizing additional high flow migration routes with less receiver coverage," and that the available data was not sufficient to distinguish the effects of flows on survival between the thresholds of 10,712 cfs and 22,872 cfs.

- Flows of approximately 35,000 cfs (1,000 m^3/second) at Freeport were identified as a key flow threshold for survival of salmon migrating through the Delta, with survival reduced when flows drop below this level. Perry et al. 2018.[13]

VI. **The Draft Report Fails to Consider the Effects of the Voluntary Agreement on the Extent and Duration of Harmful Algal Blooms:**

The Draft Report fails to consider the adverse effects of implementing even the modeled Voluntary Agreement flow regimes on the magnitude, duration, and intensity of harmful algal blooms ("HABs"). The best available scientific evidence uniformly indicates that baseline conditions during drier years, which results in very low Delta outflow and associated upstream shifts in X2 location during the summer, increase the likelihood of HABs, whereas substantial increases in Delta outflow reduces the likelihood of HABs.

Lehman et al. 2020 found a "strong correlation of *Microcystis* abundance with the X2 index and water temperature," with outflow and water temperatures explaining 58-78% of the variation in bloom surface. Most notably, the paper concludes that,

> Importantly, relatively small changes in the location of the X2 index may be important. A shift of the X2 index by only 3 km was associated with a factor of 3 increase in the percent abundance of subsurface Microcystis cells in the cyanobacterial community between the extreme drought years 2014 and 2015 (Lehman et al., 2018). Similarly, the increase in the X2 index from 71 km in July to between 75 and 76 km in August and September may have facilitated retention of cells in the central Delta during the peak of the bloom in 2017.

Lehman et al. 2020. This finding is consistent with other research from the Bay-Delta, which has found that the frequency of these blooms is closely linked to water residence time (i.e., flow rates). Berg M and Sutula M. 2015. Factors affecting the growth of cyanobacteria with special emphasis on the Sacramento-San Joaquin Delta. Southern California Coastal Water Research Project, Technical Report 869 August. More recently, Lehman et al.2022 concluded that X2 (Delta outflow) and water temperature predict much of the variation in *Microcystis* surface biovolume, that it was "not unexpected that the X2 index would account for most of the variation in the *Microcystis* bloom abundance" in the Delta, and that the *Microcystis* bloom in 2014 peaked when X2 was above 85 km. *See also* Kudela, R. M, Howard, M. D, Monismith, S., & Paerl, H. W. (2023). Status, Trends, and Drivers of Harmful Algal Blooms Along the Freshwater-to-Marine Gradient in the San Francisco Bay–Delta System. San Francisco Estuary and Watershed Science, 20(4). http://dx.doi.org/10.15447/sfews.2023v20iss4art6, available online at https://escholarship.org/uc/item/1dz769db.

Inexplicably, the Draft Report completely overlooks the connection between Delta flow regimes and HABs, and the effects of implementing modeled Voluntary Agreement flow regimes on this

[13] *Flow-mediated effects on travel time, routing, and survival of juvenile Chinook salmon in a spatially complex, tidally forced river delta.* Can. Journ. of Fish. & Aquatic Sci. 75:11, DOI/10.1139/cjfas-2017-0310.

relationship. Ironically, the sole mention of HABs in the Draft Report is to acknowledge that, "increases to flow may alleviate the impacts of cyanoHABs" and then to caveat this statement with reference to potential temperature impacts in hotter years that may counteract flow benefits. *See* Draft Report at 2-23.

The Draft Report should be revised to consider the effects of the modeled Voluntary Agreement flow regime on the formation and extent of HABs, including whether these flows are adequate to ameliorate the increasingly adverse effects of HABs under baseline conditions.

VII. The Draft Report's Modeling Assumptions for Salmon Doubling Fail to Use the Best Available Science:

Finally, the Draft Report's modeling of the habitat area necessary to achieve the salmon doubling objective fails to provide a reasoned explanation for the selected salmon escapement values and uses estimates of egg-to-fry survival that are inconsistent with the best available science. As a result, this modeling must be substantially revised.

The first major flaw in the calculation is that the Draft Report's salmon escapement targets are inconsistent with, and much lower than, the salmon doubling objective, and the Draft Report fails to provide a reasoned explanation for the selected values. The U.S. Fish and Wildlife Service's Final Restoration Plan for the Anadromous Fish Restoration Program (2001) ("AFRP") identifies a natural production target of 990,000 salmon of all runs, including 439,000 salmon in the mainstem Sacramento River, in Appendix B-1. Even accounting for the difference between production and escapement, the Draft Report's escapement targets do not appear to be consistent with the AFRP's salmon doubling natural production targets on any of the selected river systems:

	Final AFRP 2001 Production Target	**Draft Report Escapement Target**	**Percentage of AFRP Salmon Doubling Natural Production Target**
Total	990,000 salmon (all runs combined) Fall-run: 750,000 Late-fall-run: 68,000 Winter-run: 110,000 Spring-run: 68,000	366,600	37%
Sacramento River	443,000 (all runs combined): Fall-run: 230,000 Late-fall-run: 44,000 Winter-run: 110,000 Spring-run: 59,000	154,000	35%
Feather River	170,000	98,000	58%
Yuba River	66,000	26,000	39%
American River	160,000	82,000	51%

Mokelumne River	9,300	6,600	71%

The Draft Report fails to explain why its escapement targets range from a high of 71 percent of the AFRP's natural production target on the Mokelumne River to a low of 35 percent of the AFRP's production target for the Sacramento River. The Draft Report states that these escapement numbers were taken from Table 3-Xa-1 of the 1995 U.S. Fish and Wildlife Service Working Paper on Restoration Needs Volume 3. *See* Draft Report at 5-3. However, these escapement numbers are not consistent with the escapement numbers in that table (Table 3-Xa-1 of the 1995 Working Paper). Equally important, Table 3-Xa-1 of the 1995 Working Paper only provides average historical escapement values, and this table does not identify escapement targets necessary to achieve the AFRP's salmon doubling production targets. *See* U.S. Fish and Wildlife Service 1995 at 3-Xa-1 ("In general, escapement estimates were taken from Mills and Fisher (1994)."). The Draft Report and modeling used in the proposed VA must be revised to be consistent with the salmon doubling objective, and provide a reasoned explanation for the selected numbers.

Second, the modeling used in the Voluntary Agreement and Draft Report to calculate habitat area needed to achieve salmon doubling uses an assumption of egg-to-fry survival that is substantially higher than observed values in the Central Valley over the past 20 years, making the model results unreliable. The Draft Report assumes egg-to-fry survival of 38 percent. *See* Draft Report at Table 5-1. However, over the past 20 years, egg to fry survival rates in the Central Valley have been less far less than this assumed value. For the Sacramento River, the U.S. Fish and Wildlife Service has estimated that egg to fry survival for the 2002-2020 period has averaged 13.4 percent for fall-run Chinook salmon (only achieving 38 percent in 2016) and averaged 14.1 percent for winter-run Chinook salmon (achieving 38 percent only in 2011 and 2017). *See* Voss and Poytress 2022. Similarly, the 2019 final report of the Scientific Evaluation Process for the Stanislaus River estimated that egg survival was 33 percent, which would necessarily result in egg to fry survival rates lower than 38 percent. SEP 2019 at 164. Egg-to-fry survival rates on the Mokelumne River are also far lower than these assumed values for wild spawned salmon in recent years. The Draft Report fails to provide a reasoned explanation to support this assumed value, which is more than double the observed average egg-to-fry survival over the past 20 years on the Sacramento River.

Finally, the modeling includes several assumptions and omissions that further undermine its reliability. As discussed *supra*, the modeling of habitat ignores the effects of water quality or water temperatures on habitat suitability, even though the Draft Report acknowledges that these are "key attributes of suitable habitat." *See* Draft Report at 5-6. In addition, the Draft Report assumes that all spawning and floodplain environments created under the Voluntary Agreement are suitable habitat. *See id*. at 5-7 to 5-10; *id*. at 5-11 ("… assumes all VA floodplain habitat is suitable habitat when inundated."). However, the SEP 2019 report, relying on on-the-ground assessments of habitat suitability, estimates that only 7 to 30 percent of floodplain habitat is actually suitable habitat for salmon, requiring greater inundated acreage to achieve habitat targets. SEP 2019 at 165. The Draft Report fails to justify the assumption that all inundated floodplain is suitable habitat, and it should be revised to use a habitat suitability assumption of 7 to 30 percent.

VIII. <u>Conclusion:</u>

Thank you for consideration of our views. We hope and expect that staff can quickly revise the Draft Report to address these concerns, removing the unfounded claims of unquantified "expected benefits" resulting from habitat restoration and including more accurate information regarding the likely flows under the proposed Voluntary Agreement.

Sincerely,

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EXHIBIT E

Credit: Rene Reyes

Species Status Assessment for the San Francisco Bay-Delta Distinct Population Segment of the Longfin Smelt

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Contents

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Chapter 3 – Current Condition

For the Bay-Delta DPS to maintain viability, a significant portion of its population must be resilient to the variable environmental conditions. In this chapter, we start with describing the stressors that the species has historically faced to date, and how the species has responded to these stressors over time. We then show the estimates of species relative abundance based on long-term monitoring program data to document the current condition of the species. Then, we present the results of our quantitative modeling estimating probability of extinction on the current trajectory, and close with a discussion of the 3R's relative to the ecological viability of the DPS.

3.1. Stressors

Here we discuss the most probable stressors and environmental variables that have likely led to the Bay-Delta DPS's current condition, which include the following: habitat loss and degradation via reduced freshwater flow, food web effects from reduced flows and invasive species, increasing temperatures. Additionally, we discuss other potential stressors that are less certain to be influencing abundance patterns or are thought to be influencing population dynamics to a lesser degree. These include: conversion of tidal marsh and environmental contaminants; and more so historically than presently, entrainment via water diversions. Based on our knowledge of the life history of the Bay-Delta DPS, we assess how changes in the system may have affected recruitment and subsequent survival among life stages, resulting in the observed decline in abundance through time, which is presented following this treatment of historical and extant stressors.

3.1.1. Reduced freshwater flow

A significant stressor to the Bay-Delta longfin smelt is reduced flows and alteration of the natural hydrograph—reduction in the magnitude and duration of freshwater flows into and through the Delta and to a lesser extent from the various Bay Area tributaries. In the Bay-Delta, the natural hydrologic cycles of drought and flood would yield a different outflow regime (i.e., "unimpaired flow") if upstream dams and diversions were not in existence, as water project management has decreased springtime flows resulting from upstream storage, and increased summer inflows that are subsequently diverted for urban and agricultural beneficial uses (Kimmerer 2004, p. 15).

Demand for water supplies and flood protection have substantially increased over time. In response, local, State and Federal agencies have built dams and canals, and captured water in reservoirs, to increase water storage during the wet season and convey water to farms and cities during the dry season, resulting in one of the largest man-made water systems in the world (Nichols *et al.* 1986, p. 569). Operation of this system has thus altered the timing, magnitude, and duration of freshwater flows into the Bay-Delta (Andrews *et al.* 2017, p. 72; Gross *et al.* 2018, p. 8). Storage in the upper watershed of peak runoff, and release of the captured water for irrigation and urban needs during subsequent low flow periods, resulted in a broader, flatter hydrograph with less seasonal variability (Kimmerer 2004, p. 15).

In addition to the system of dams and canals built throughout the Sacramento and San Joaquin River basins, the Bay-Delta is unique in having the largest water diversion system on the west coast. The State Water Project (SWP) and Central Valley Project (CVP) each operate water export facilities in the south Delta (Kimmerer and Nobriga 2008, p. 2). Project operation is dependent upon upstream water supply and export area demands, both of which are strongly affected by the interannual variability in precipitation within the broader hydrologic basin draining the Sacramento and upper San Joaquin Valleys. From 1956 to the 1990s, water exports increased, rising from approximately five percent of the Delta inflow to approximately 30 percent of the Delta inflow (Cloern and Jassby 2012, p. 7). By 2012, an estimated 39 percent of the estuary's unimpaired flow in total was either consumed upstream or diverted from the estuary (Cloern and Jassby 2012, p. 8).

Although alterations in the Delta and California's water diversions/storage have dated back to the latter 1800s, the most substantial parts of California's water infrastructure were constructed during the 1940s-1970s (see Section 2.3). It is noted that water year type classifications should not necessarily be conflated with realized estuarine hydrological conditions, as water operations modify these parameters based on supply considerations and extant regulatory requirements. For example, Reis *et al.* (2019, Table 5, p. 12) quantified a statistically-significant reduction in the frequency of realized delta outflow as a proportion of unimpaired flow reaching the Bay. Hutton *et al*. (2017, p. 2500) confirmed statistically-significant decreases in outflow during four months (February, April, May, and November), and increases in July and August—with follow-up analysis indicating primary attribution for these changes associated with the State and Federal water projects (Hutton *et al.* 2017b, Table 3, p. 2523). Further, the magnitude of impairment has changed over time (Hutton *et al.* 2017a, Fig. 4, pp. 2507–2508; Reis *et al*. 2019, Fig. 3, p. 12). It is probable that the magnitude (along with frequency) of realized delta outflow conditions are critical to this underlying relationship between flow variables, ecological conditions, and historical abundance trends, but only more detailed analyses and modeling will help characterize this risk quantitatively *and* mechanistically.

Numerous studies have shown the positive correlation between longfin smelt juvenile abundance and freshwater flow (Stevens and Miller 1983, pp. 431–432; Jassby *et al.* 1995, p. 285; Sommer *et al.* 2007, p. 274; Thomson *et al.* 2010, pp. 1439–1440; Kimmerer 2002a, p. 47; Rosenfield and Baxter 2007, p. 1585; Kimmerer *et al.* 2009, p. 381; Mac Nally *et al.* 2010, p. 1422; Maunder *et al.* 2015, p. 108; Nobriga and Rosenfield 2016, p. 53). Longfin smelt indices have exhibited a persistent correlation with freshwater flow. The survival of longfin smelt through their early life-stages is lower during dry conditions and higher during wet conditions--the evidence for this is that longfin smelt abundance indices nearly always decline sharply during dry periods then rebound when wet weather returns (Mahardja *et al.* 2021, pp. 9–10). In addition, recent multiple and consecutive dry conditions or prolonged drought have been and are expected to continue as significant pinch points putting downward pressure on the Bay-Delta DPS' trajectory, and the population may no longer possess the resilience to be able to recover from a string of consecutive dry years, or years in which water operations are unfavorable during important intervals within their lifestage. Prolonged drought conditions have already occurred and the trend in frequency and duration has increased (Swain *et al*.

2018, pp. 427–433). These drought conditions have exacerbated the impact of reduced flows from human activities.

Biologically speaking, one of the most important aspects of the various estuarine circulation mechanisms is that they can help animals avoid being transported seaward even though the net flow averaged over the entire water column is flowing toward the ocean. The same mixing currents that can aggregate sinking particles can assist in aggregating motile plankton. However, swimming organisms like young longfin smelt (Bennett *et al*. 2002, p. 1502) and their prey (Kimmerer *et al.* 2002, Fig. 9, p. 365; 2014, Fig. 6, p. 911) combine changes in their vertical and lateral position with these variable mixing currents to help maintain themselves in spatial association with particular salinity ranges and other habitat attributes.

Changes in Delta outflow affect both the location and the function of the low-salinity zone. When Delta outflow is low, X2 encroaches into the legal Delta (i.e., east of Chipps Island; Jassby *et al.* 1995, Fig. 2a, p. 274). When this occurs in the winter and spring, it affects where longfin smelt spawn and their larvae and young juveniles rear. Upstream of X2, surface and bottom salinities are always about the same (Jassby *et al.* 1995, Fig. 2c, p. 274). This means that, upstream of X2, there is little if any stratification of the water column and therefore the behaviors that planktonic organisms employ to stay associated with particular salinity ranges become ineffective. As a result, landward (upstream) of X2, these animals are less likely to avoid movement with net flows because the net flow direction is uniform across the water column. This can be beneficial if they occupy water in which the net flow direction is seaward (toward the low-salinity zone), but detrimental if they occupy water in which the net flow direction is moving toward the CVP and SWP water diversions in the southern Delta (Kimmerer 2008, Fig. 16, p. 23). In contrast, fish and invertebrates that are strongly affiliated with in-water structures and vegetation, as well as benthic fish and invertebrates, can resist the net flows in the Delta. However, these are not behaviors that have been attributed to the early life stages of longfin smelt (Bennett *et al.* 2002, Fig. 4, p. 1502; Grimaldo *et al.* 2020, Fig. 6, p. 10).

In terms of flow changes within the legal Delta, the CVP and SWP have a more outsized influence on hydrodynamics than non-project diverters (Hutton *et al.* 2019, Fig. 7, p. 11). Water exports from the Delta increased from the 1950s into the late 1980s (Cloern and Jassby 2012, Fig 7a, p. 7; Service 2019, Fig 5.7). Thereafter, the increasing trend began to level off, but the year-to-year variability increased. The export of water from the southern Delta tends to draw a ‘net’ flow of water from north to south (Kimmerer and Nobriga 2008, Fig. 7, p. 12). This flow is referred to as ‘net’ because it expresses a tidally-filtered flow, meaning that the tidal flows that routinely cycle negative (toward the SWP and CVP diversions) and positive (seaward) over hourly time scales have been mathematically removed to characterize the portion influenced by exports as net flow direction. Nonetheless, the transport of water toward the SWP and CVP diversions is fundamentally an instantaneous to tidal time-scale process.
The CVP pumping plant diverts water from Old River during all phases of the tide. In contrast, the SWP includes Clifton Court Forebay (CCF) in front of its diversions. The CCF is a gated, regulating reservoir that helps manage the highly variable water levels in Old River for the CVP pumps and local irrigators. During flood tides, the CCF intake gates are opened to allow the tide (and gravity) to bring water into the forebay. The water that is being exported at the CVP, and the water flowing into CCF, are backfilled by the tide and gravity flow of water from elsewhere in the Delta. Over time scales of weeks to months, this backfilling, which is the hydraulic mechanism for the net flow, dominates the transport of river water in the Delta (Kimmerer and Nobriga 2008, Fig 3, p. 10).

It has long been recognized that abundance indices for age-0 longfin smelt tend to increase in wet years that have followed dry years (Stevens and Miller 1983, Table 8, p. 433; Jassby *et al.* 1995, Fig. 5, p. 280; Rosenfield and Baxter 2007, Table 3, p. 1585); but longfin smelt abundance indices have also declined over time in a range of water year types (Thomson *et al.* 2010, Fig. 6, p. 1442). Freshwater flows entering the estuary change a wide variety of physical, chemical and biological parameters that can influence the distribution and abundance of aquatic species (see Section 2.3). Thus, it is unlikely that a single mechanism associated with or co-varying with wet and dry years is responsible for generating observed patterns in longfin smelt recruitment. Recent analyses that have attempted to consider the influence of wet and dry years in the context of longfin smelt's life cycle have found evidence that the freshwater flow-, or flow-associated mechanisms, influence the number of juvenile recruits produced per spawner (Maunder *et al*. 2015, pp. 105–106; Nobriga and Rosenfield 2016, Fig. 2, p. 53).

Population dynamics of longfin smelt surviving a sufficient duration into the juvenile life stage to begin migrating seaward do not appear to be influenced by freshwater flow variation (Nobriga and Rosenfield 2016, p. 55). These two pieces of evidence imply that the reproductive success of the adult spawners, the survival of eggs and early life stages, or both of these factors, are the endpoints being affected by the freshwater flow- or flow-associated mechanisms. Figure 3.1 shows hypothesized, staggered, but overlapping, timing of flow- or flow-associated mechanisms that might have an important quantitative influence on longfin smelt spawning success, on egg survival, or survival from the larval to the juvenile life stage. Each of these mechanisms is known to covary with flow, or to have done so historically (citations provided below). It is not the existence of these mechanisms, but their *quantitative influence* on the viable egg production and survival of longfin smelt's early life stages that remains a clear science priority in support of longfin smelt conservation.

While the overall pattern relating freshwater flows to abundance indices for the Bay-Delta DPS is widely accepted, the mechanisms driving this correlation are not fully quantified or resolved. Following are the enumerated summaries of mechanistic drivers of Bay-Delta DPS abundance dynamics as related to freshwater flow, or flow-associated physical or biological parameters.

<u>Mechanism 1, spawning locations</u>: High flows during the spawning season likely led to more total spawning effort seaward of the legal Delta (Grimaldo *et al*. 2020, Fig. 6, p. 10) and higher spawning success in Bay Area tributaries (Lewis *et al*. 2019, p. 3). If egg survival tends to be higher seaward of the Delta, then variation in spawning locations may be a recruitment mechanism that covaries with freshwater flow. This is speculation that warrants focused research efforts to better inform longfin smelt conservation.

<u>Mechanism 2, spawning season duration:</u> The duration of the longfin smelt spawning season each year is fundamentally driven by climatic influences on the estuary's water temperatures. Water temperature is greatly influenced by freshwater inflow and ambient air temperatures (Vroom *et al*. 2017, pp. 9918–9920). Wet weather increases tributary outflows from Bay Area streams where overlying air temperatures remain cool longer into the season than is typical in the Delta. This might lead to longer spawning seasons in these smaller systems. Wet weather also increases Delta

outflow, which likely leads to more total spawning effort seaward of the legal Delta (Grimaldo *et al.* 2020, Fig. 6, p. 10). If elevated outflow is maintained into the spring, one expected result would be successful spawning opportunities not available in warmer, lower outflow years when the low-salinity zone is encroaching on the Delta and overlying air temperatures during May typically begin to exceed Bay Area air temperatures (Conomos *et al*. 1985, Fig. 4, p. 5).

<u>Mechanism 3, low-salinity zone location and retention for larvae and young juveniles:</u> The hydrodynamic phenomena reviewed in section 2.3 may create bioenergetically-favorable transport and retention opportunities for larval and juvenile longfin smelt. For instance, the Delta does not have as much shoal habitat as seaward parts of the estuary. When outflow is high enough to place the low-salinity zone over larger shoal and marsh habitats, the lower water velocities and estuarine mixing currents may enhance opportunities for early life stage longfin smelt to maintain position and find food in higher quality habitat (Hobbs *et al.* 2006, p. 916; Grimaldo *et al.* 2017, p. 7).

<u>Mechanism 4, entrainment of larvae and young juveniles:</u> High flows during the spawning season likely lead to more total spawning effort seaward of the legal Delta (Grimaldo *et al.* 2020, Fig. 6, p. 10). This leads to smaller fractions of larvae vulnerable to entrainment in exported water. Higher net flows out of the Delta also better facilitate the seaward transport of larvae that are spawned in the Delta and lessen their risk of entrainment in water diversions (Kimmerer and Nobriga 2008, Fig 7, p. 12; Rosenfield 2010, Fig. 9, p. 40; Grimaldo *et al.* 2009, Table 2, p. 1261).

<u>Mechanism 5, prey availability for larvae (*Eurytemora affinis*)</u>: If food limits the survival of longfin smelt during their larval stage, it would logically be associated with declines in *E. affinis*—the predominant component of larval longfin smelt diet (Barros *et al*. 2022, Fig. 6a). The influence of Delta outflow on *E. affinis* production has changed over time, due in large part to the strong influence of overbite clam grazing (Table 2.1). The abundance of *E. affinis* has declined over time (Winder and Jassby 2011, Fig. 6, p. 682), but as of 2011, longfin smelt recruits per spawner had not (Nobriga and Rosenfield 2016, Fig. 2, p. 53). This dissociation of trends makes it unlikely that the decline of *E. affinis* had a major quantitative impact on the survival of larval longfin smelt (Nobriga and Rosenfield 2016, pp. 54–55), but a comparable analysis for the last decade is lacking.

<u>Mechanism 6, prey availability for young juveniles (mysids)</u>: If food limits the survival of longfin smelt exceeding about an inch in length, it would logically be associated with mysids—the predominant component of the diet at this lifestage (Barros *et al*. 2022, Fig 6b, pdf p. 10). If mysid abundance was important to longfin smelt recruitment, then the expectation following the overbite clam invasion would be a substantial decline, even after accounting for the influence of outflow (or X2). This is what was observed (Kimmerer 2002a, Fig. 5, p. 46 and Fig. 8, p. 48; Thomson *et al*. 2010, Fig. 6b, p. 1442), which lends support to a juvenile longfin smelt food limitation hypothesis. We recognize that direct statistical support for a bottom-up longfin smelt-mysid link has not been reported in several recent statistical evaluations (Mac Nally *et al*. 2010, Fig. 3, p. 1425; Thomson *et al*. 2010, Fig. 6c, p. 1442; Maunder *et al.* 2015, Tables 2-3, p. 108). However, longfin smelt may continue to rely on mysids as prey until they leave the estuary, and

the survival of these older fish may have declined over time (Nobriga and Rosenfield 2016, Table 5, p. 54). Therefore, it remains possible that changes in mysid abundance have been an important contributor to the observed decline. This is speculation that warrants focused research efforts to better inform longfin smelt conservation.

<u>Mechanism 7, prey delivery from the Yolo Bypass:</u> As outflow from the Delta increases, the proportion of the total flow entering from the Yolo Bypass increases as well (Kimmerer 2004, Fig. 5, p. 16). As the bypass drains, its relatively shallow depth, long residence times, and warmer temperatures can help deliver phytoplankton and invertebrates into the Delta (Sommer *et al*. 2004, Fig. 3 p. 254). However, in the wetter years when Yolo Bypass floods and drains, many, if not most, longfin smelt are rearing in fairly distant locations. Therefore, it is uncertain whether these winter-spring floodplain food subsidies are substantial contributions to larval longfin smelt at the population scale.

<u>Mechanism 8, turbidity of the low-salinity zone:</u> The potential importance of turbidity as a moderator of feeding success and predation risk for young longfin smelt was reviewed in section 2.6.3. Turbidity has declined in the estuary for a combination of reasons. However, the high winds that accompany wet weather can resuspend sediment and increase low-salinity zone turbidity, especially when the low-salinity zone is flowing back and forth over major shoal areas like Suisun Bay (Bever *et al*. 2018, Fig. 11, p. 1957). Further, high winter-spring flows deliver new sediment and particulate matter that can increase turbidity (Kimmerer 2004, Fig. 27, p. 41; Cloern and Jassby 2012, Fig. 10, p. 10).

In summary, during high outflow years, longfin smelt are believed to benefit from a suite of mechanisms that can extend the spawning season and increase the cumulative survival of the early life stages. Conversely, during low outflow years, fewer of these benefits are accrued and survival is reduced. For these reasons, the interannual variation in Delta outflow and to lesser extent, flows in Bay Area tributaries (which can also be represented by correlates like X2) mechanistically represent a primary population need from December through May or June each year.

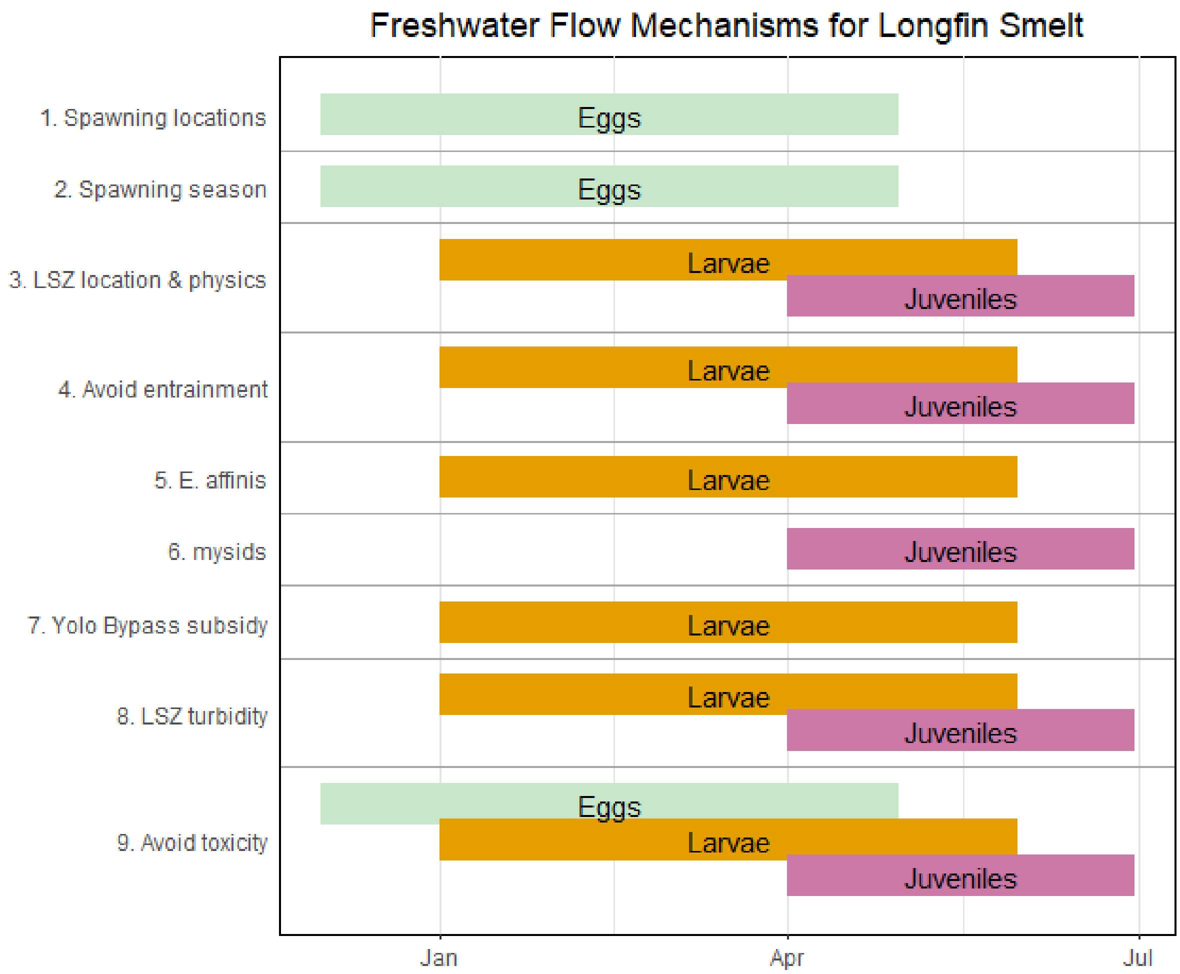

Figure 3.1: Conceptual timeline representing the multiple potential mechanisms by which interannual variation in Delta outflow may mechanistically contribute to recruitment of Age-0 longfin smelt. The life stage durations are approximate in that they start and end on the first and last day of particular months. The reader should recognize that exact stage durations will vary from year to year.

The extended durations of elevated freshwater flow out of the Delta and other estuary tributaries during wetter water years increases the number of beneficial environmental conditions that spawning longfin smelt and their progeny experience. Contrasting this to the pattern in dry years, as X2 and, by extension, the low-salinity zone, moves upstream, longfin smelt migrate farther upstream to reach their spawning habitats (CDFG 2009a, p. 17). Spawning further upstream in the Bay-Delta makes longfin smelt more susceptible to entrainment at the State and Federal water diversions in the south Delta, particularly during late-winter and early spring when larvae are present (Rosenfield 2010, p 13). Studies of hydrodynamics and fish entrainment have found that predicted losses increased with reverse flows in the southern Delta, which are a function of export rates and Delta inflows (Grimaldo *et al.* 2009, p. 1266; Rosenfield 2010, p. 13). In addition, as X2 moves upstream (landward) in the estuary, likely consequences are less spawning habitat available, weakening or absent gravitational circulation (which may have energetic, physiological, and predator avoidance consequences for young longfin smelt) and decreased water turbidity (which also has survival implications for young longfin smelt based on their role as both predator and prey) (Kimmerer 2002b, p. 1279).

Finally, as the spawning range of the species is significantly concentrated in the west Delta and Suisun Bay during dry years instead of the entire San Francisco Estuary, the Bay-Delta DPS is especially vulnerable to local catastrophic events. For example, if a large oil spill occurred in the Delta during a dry year, the entire spawning class and its progeny could be wiped out. But during wet years where spawning can occur in San Pablo Bay, the South San Francisco Bay, and their tributaries (during exceptionally wet years), a large oil spill in the Delta may not affect spawning occurring in San Pablo Bay and the South San Francisco Bay. Since 1971, large petroleum spills that have demonstrable impacts in the San Francisco Estuary have occurred approximately once every 8 years (CDFW 2021b).

3.1.2. Food limitation

The available information indicates that the Bay-Delta DPS rely on a relatively small number of crustacean meso- and macrozooplankton taxa. Longfin smelt larvae have diets dominated by a copepod, *Eurytemora affinis,* that is common in the low-salinity zone during the spring (CDFW, unpublished data; see Figure 3.2A) indicates that *Limnoithona traspina* are more dominant in January and February larval diets, while other inverts are important at times in the Napa River and San Pablo Bay (Bouley and Kimmerer 2006, p. 221). Like most carnivorous fishes, as longfin smelt larvae increase in body size and mouth gape, they begin taking larger prey that provide more calories per unit of effort expended catching them (i.e., optimal foraging theory). The two most common prey taxa of these larger longfin smelt are epibenthic mysids and amphipods (Burdi 2022, pers. comm.; CDFW unpub Diet Study Data). The copepod *Eurytemora affinis* was also at one time an important prey item for a now much depleted mysid species, *Neomysis mercedis* (Knutson and Orsi 1983, p. 478).

The *Eurytemora affinis* population has been in decline since the 1970s, but beginning in the late 1980s, the zooplankton community started undergoing about a decade of rapid change in species composition, trophic structure, and utility for fish production (Winder and Jassby 2011, pp. 683–685; Kratina *et al.* 2014, p. 1070; Brown *et al.* 2016a, p. 8). As these food web changes were beginning to take place, the production of longfin smelt per unit of outflow or X2 began to decline (Kimmerer 2002a, p. 47; Thomson *et al.* 2010, p. 1442c); coincidental with the invasion of the estuary by the overbite clam (*Potamocorbula amurensis*) (Carlton *et al.* 1990, pp. 81 and Figure 3) and with extended drought in the Central Valley (Rosenfield and Baxter 2007, p. 1589). The filter feeding overbite clam's rapid establishment and growth in the estuary is thought to have diverted resources from the primary food sources of the Bay-Delta longfin smelt (Carlton *et al*. 1990, pp. 90–91; Feyrer *et al*. 2003, pp. 284–286; Rosenfield and Baxter 2007, p. 1589). This decline in the abundance indices was sharp and substantial (generally recognized as a "step decline"). The decline of longfin smelt's historical prey has not been accompanied by a large change in prey use (Feyrer *et al.* 2003, p. 285; Barros *et al.* 2019, p. 15). This suggests that longfin smelt had formed strong predator-prey interactions with their primary prey, a hypothesis supported by empirical data (Mac Nally *et al.* 2010, p. 1426).

As described under Life History, approximately 90% of juvenile and, when they return to the estuary, adult longfin smelt diets are comprised of predominantly mysids and, to a lesser extent, amphipods (Burdi 2022, pers. comm.; CDFW unpub Diet Study Data). *Neomysis mercedis*, which was once a dominant contributor to the low-salinity zone food web, has dropped in numbers by over tenfold and accounted for <4% of total zooplankton biomass after 1994 (Winder and Jassby 2011, p. 684). In addition to lower abundance, CDFW's Zooplankton Study has shown that the average individual sizes of mysids in the San Francisco Estuary have decreased over time (Hennessey 2011, unpublished data), with a species composition shift towards *Hyperacanthomysis longirostris*, an invasive species that reaches maturity at a smaller mass than *Neomysis* (Hennessy 2011, entire). Despite these changes, longfin smelt are one of the few species that continue to rely heavily on *Neomysis* and other mysids as their primary prey (see Figure 3.2B). As longfin smelt exhibit very little variation in prey use, they are considered more susceptible to food web changes than some other fishes (Feyrer *et al.* 2003, p. 281).

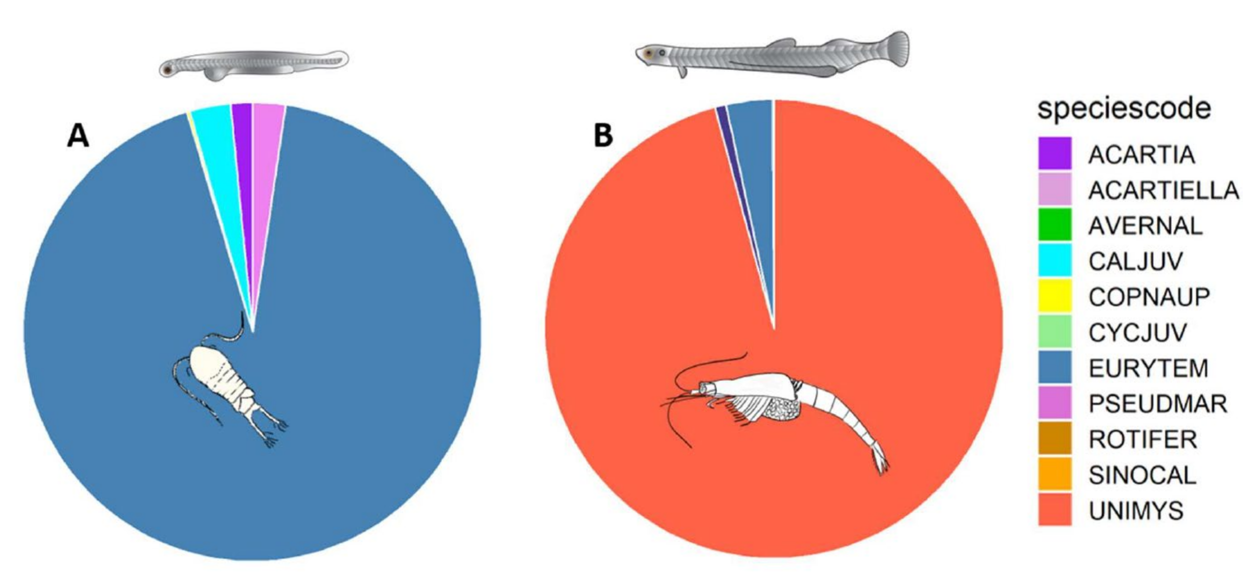

Figure 3.2: Proportion of diet biomass for all longfin smelt broken up between A) larval (<25mm TL) and B) juvenile fish (>25mm TL). Copepod and mysid art by Arthur Barros. Larval and juvenile fish art by Adi Khen. Source: Barros *et al.* 2019, p. 17.

The general decline in diatom phytoplankton and zooplankton is likely affecting juvenile and adult longfin smelt by decreasing food supply for historically important prey species, such as *Neomysis mercedis* (Kimmerer and Orsi 1996, pp. 418–419; Feyrer *et al.* 2003 p. 281). In addition to phytoplankton suppression, laboratory and field experiments have shown that overbite clams feed directly on the nauplii of common calanoid copepods (Kimmerer *et al.* 1994, p. 87), which are the primary prey source for larval longfin smelt.

The Pelagic Organism Decline (POD)

Around 2002–2004, abundance indices for multiple species declined in what was known at the time as the Pelagic Organism Decline or POD. The POD referred to a coincident drop in the FMWT catches of four species (delta smelt, longfin smelt, striped bass, and threadfin shad) (Sommer *et al.* 2007, p. 273), and the event is generally recognized as another step decline. The coincident declines of multiple species suggested a possible common cause, but a mechanism for decline that applied to all four fish was not forthcoming (Mac Nally *et al.* 2010, p. 1426; Thomson *et al.* 2010, pp. 1442–1443). Latour (2016, Fig. 7, p. 244 and p. 245) later hypothesized that changes to fish catchability due to increasing estuary water clarity might be an explanation for the POD.

Fish population dynamics theory is important to interpreting analyses of longfin smelt data from the literature because most of the trend analyses cited above have ignored it. The Bay-Delta DPS has plausibly been declining for over 50 years and that decline is presently at circa 3–4 orders of magnitude below initial observations. The FMWT index is the most commonly used metric of longfin smelt recruitment in the scientific literature. It is generally an index of age-0 fish but the adult longfin smelt population is also declining (Rosenfield and Baxter 2007, Table 3, p. 1585; Nobriga and Rosenfield 2016, Table 2, p. 49, which in turn is limiting how many eggs can be produced. The reason the longfin smelt population keeps appearing to have a 'step decline' or 'change in intercept' of its outflow relationship is at least in part because analyses that do not account for the declining abundances of the parental generations are based on an improper population model that ignores the influence of adult egg supply on how many recruits can be produced (see Figure 3.3).

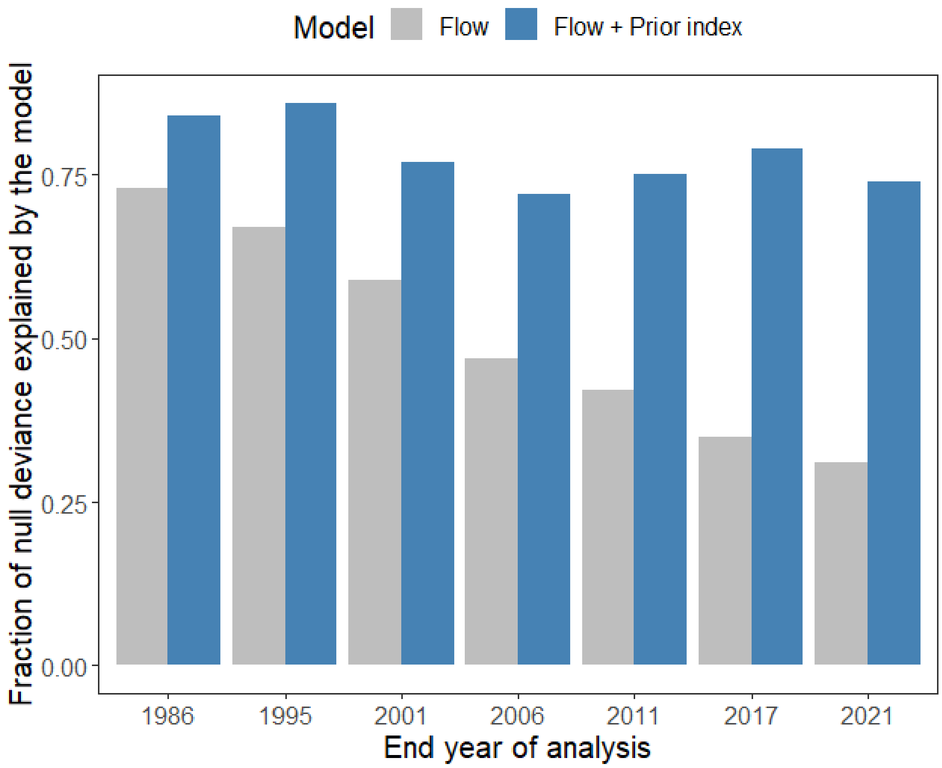

Figure 3.3. Summary of linear regression models predicting the longfin smelt Fall Midwater Trawl (FMWT) indices over time, 1967 through the year listed along the x-axis, i.e., moving from left to right along the x-axis, the length of the data time series is increasing. The gray bars show the fraction of null deviance (akin to an r-squared) explained by generalized linear models of log (Delta outflow) averaged for February-June versus log (FMWT index). The ability of this model to explain trends in the indices has declined substantially over time (see also Tamburello *et al.* 2018). The blue bars depict the explanatory power of models that also include the FMWT index from two years prior as a predictor of the current year index (following Mac Nally *et al*. 2010). This latter model is at least coarsely accounting for the potential of declining adult abundance to limit egg supply which in turn limits how many juveniles can be produced. The predictive capability of this model formulation has not trended downward like the flow-only models have.

3.1.3. Temperature

As described in the Life History and Biology section, longfin smelt are most abundantly detected within a narrow temperature range relative to the range that occurs in the upper estuary. Subadult longfin smelt habitation in the San Francisco Estuary is limited to when water temperatures are below 22°C (Baxter *et al.* 2010, p. 68), and, based on field surveys of ripe and post-spawning females (Wang *et al.* 1986, p. 9; Tempel and Burns 2021, slide 12), successful spawning may require water temperatures below 14°C, while larvae and young juveniles show a preference for temperatures below 12°C and 20°C, respectively, for successful rearing--particularly in food-limiting environments like the San Francisco Estuary, where bioenergetic metabolic demands for caloric intake increase with increasing water temperatures. As the southern-most population, the Bay-Delta DPS likely already experiences the warmest temperatures in the full species range. Water temperature in the Delta commonly exceeds 22°C during the summer (Vroom *et al.* 2017, p. 9904; data from CDEC, CENCOOS, and USGS), and has been predicted to exceed this threshold for longer periods due to climate change, which would limit habitat occupancy across affected areas, and stress life-stages with limited adaptive motility (i.e., in early spring for young juveniles). It remains unknown to what extent the ocean acts as a thermal refugium for the DPS; however, recent otolith data has shown that adults do exhibit anadromy that had been hypothesized previously by Rosenfield and Baxter (2007, p. 1590). Bay Study Otter trawl age-0 captures in July exhibited mean salinity conditions of 24 ppt, so some juveniles in July (perhaps sooner) can withstand marine salinities (Baxter, 1999, p. 189). Summaries of City of San Francisco outfalls catches also confirm age-0 and age-1 individuals present in the Gulf of Farallones (CDFG, 2009, page 6). The potential effects of climate change are described in detail under the Future Condition chapter.

3.1.4. Loss of suitable spawning habitat

The only fairly well demonstrated aspect of longfin smelt spawning behavior is that the fish appear to find spawning locations in and near the low-salinity zone (Grimaldo *et al*. 2020, Fig. 6, p. 10) and other smaller low salinity habitats in Bay Area tributaries (Lewis *et al*. 2019, p. 3). Just-hatched longfin smelt larvae have been found in pelagic waters and adjacent shoals and wetland areas (Grimaldo *et al*. 2017, p. 1776; Lewis *et al.* 2019, Fig. 2, p. 3). Thus, what other attributes of spawning habitat selection are important to successful reproduction are unknown and would benefit from additional research in support of longfin smelt conservation.

3.1.5. Predation

There is no research from the San Francisco Estuary available from which to develop a complete list of important predators of longfin smelt or to estimate predation rates on longfin smelt to determine how they have trended over time. There have been two recent predator diet studies spatially limited to the legal Delta that tested for prey using DNA extracted from predator stomachs. Michel *et al.* (2018, p. 9) sampled the San Joaquin River between Head of Old River and Stockton, and they did not detect any longfin smelt in any of four species of predators' stomachs. Brandl *et al.* (2021) collected six species of predators from the North Delta. The predator with the most longfin smelt detections was Sacramento pikeminnow (Brandl *et al.* 2021, Table 4). The only other predator from which longfin smelt DNA was detected was striped bass. No longfin smelt DNA was detected from channel catfish, white catfish, largemouth bass or smallmouth bass. Because of this paucity of data, the following discussion is limited to generalities about the role of predators in fish food webs that are broadly applicable and form the basis of major, widely used modeling tools.

The early life stages of fish are often subject to high rates of predation that play important roles in modulating abundance and amplifying the consequences of food limitation (Ahrens *et al.* 2012, Fig. 2, p. 46, and throughout; Pangle *et al.* 2012, pp. 5–6). Thus, changes in vulnerability to predation of eggs, larvae, and small juvenile longfin smelt are a plausible hypothesis for why survival is higher in wetter years than drier years. If predation rates covary with the freshwater flow influence on longfin smelt recruits produced per spawner, they are likely modulated through several other mechanisms like turbidity, temperature, access to zooplankton prey, or outcomes of differences in wet versus dry year hydrodynamics (Fig. 2.8).

Chronic food limitation and predation risk are often tightly linked in fish food webs (Ahrens *et al*. 2012, pp. 47–48). The reason is that prey organisms do their best to limit potential contact with predators.

One effective way to do this is by limiting foraging times, which are often relatively risky because small fishes have to behave in ways that increase their vulnerability to predators when they are actively foraging, e.g., by leaving shelter habitats or simply moving around more actively in surface waters (Ahrens *et al*. 2012, Fig. 1, p. 43). Thus, when food densities decline, prey fishes have two choices. They can either eat less and grow more slowly or they can increase foraging times to compensate for the lower prey densities. Depending on the context of the ecosystem a fish finds itself in, there are pros and cons to either of these choices. How longfin smelt have behaviorally responded to declining prey density has not been studied and would be valuable information from a conservation perspective.

3.1.6. Contaminants

Due to the extensive range of the Bay-Delta DPS, there is potential for exposure to a variety of contaminants. Potential exposure and effects will likely vary based on location and habitat characteristics, which change drastically from fresh to salt water, as well as differing anthropogenic sources (e.g., agricultural practices, industrial and urban wastewater discharge). The Delta is largely an agricultural area with a multitude of tributaries conveying agricultural and urban discharge. The Suisun Bay watershed consists of a mixture of agriculture, managed duck ponds, urbanization, and industry. The San Francisco Bay is encircled by largely urbanized and industrial land uses, with some significant inputs from agriculture in the San Pablo Bay.

Contaminant sources include discharge from municipal wastewater treatment plants, agricultural outfalls, stormwater runoff, and direct application such as for pest control or anti-fouling agents. The types of contaminants can change throughout the year with changes in agricultural use and pest control efforts and storm loading. “Legacy” contaminants in the Bay–Delta, those from historic loading that persist in the environment, such as organochlorine chemicals from past agricultural use and mercury from past mining activity, can bioconcentrate through the food web, posing additional health risks (Connor *et al*. 2007, pp. 87–88; Marvin-DiPasquale and Cox 2007, p. 2). Human population growth has increased the urban footprint over time but there is still a significant presence of agriculture adjacent to Suisun Bay and the Delta. Regulation has reduced the use of some contaminants, only to be replaced by other more potent alternative water-soluble chemicals such as neonicotinoids, which impact non-target species such as aquatic invertebrates and fish (Buzby *et al*. 2020, pp. 15–21). In addition, there are insufficient data to know the full exposure risk of most constituents (Johnson *et al.* 2010, p. viii). Kuivila and Hladik (2008, p. 14) found that of the 163 pesticides being applied, over half were not being monitored.

The Delta and all regions of the Bay have been listed in the 2018 California Integrated Report (Clean Water Act Section 303(d) List and 305(b) Report) as an impaired water for several contaminant compounds (SWRCB June 2018, Appendix A). This list included: elemental contaminants, or ‘metals’ (mercury and selenium), toxic organics (dioxins, furans, polychlorinated biphenyls), and pesticides (chlordane dieldrin, DDT). Additional emerging contaminants of concern include: newer pesticides, flame retardants, nutrients, naturally occurring toxins, micro-plastics (e.g., from synthetic clothing), and pharmaceuticals and personal care products (Klosterhaus *et al*. 2013, pp. 97–98, Table 1; Sutton *et al*. 2017, entire). The U.S. Geological Survey’s (USGS) on-going analysis of water in the Delta suggest that on average 10 new synthetic organic pesticides chemicals are detected every year (CDPR 2020, dataset).

Moschet *et al.* (2017, p. 1558) have indicated the presence of in excess of 50 chemical compounds from a single, 1L, grab sample.

Contaminants can have a variety of direct and indirect impacts on fish and their supporting food web. Direct effects involve impacts to growth, vitality, immunocompetence and disease condition, behavior, reproductive impairment, mutagenicity and direct acute lethality. It is also possible that indirect effects from certain contaminants may manifest via changes in the estuarine community, that consequently impair growth, survival or reproduction of the consumer species.

To date, there are no data documenting the impact of contaminants to longfin smelt in the SFE. Field-based toxicity is difficult to determine, as impacted fish are not recovered in order to be examined (i.e., fish either die from direct exposure and resulting disease, or are eaten). Risk of exposure and effect, as determined by comparison to other species (e.g. delta smelt and inland silverside) potentially include: direct effects on development, growth and reproduction; impacts resulting from impairments to bioenergetic demands, impaired locomotion, reducing feeding success and leading to increased susceptibility to predation, disease, and entrainment (Brander *et al.* 2012, p. 2854; 2016; Connon *et al.* 2009, p. 12; Hasenbein *et al.* 2014, p. 696; Jeffries *et al.* 2015a, p. 17407; Jeffries *et al.* 2015b, p. 55; Cole *et al.* 2016, p. 219; DeCourten and Brander 2017, p. 2). Fong *et al.* (2016, pp. 20-21) suggested that a weight of evidence approach indicates numerous detected contaminants in the Bay-Delta have detrimentally affected the ecosystem, and these authors concluded that contaminants likely played a significant role in the POD.

3.1.7. Entrainment

When water is diverted from the estuary, the opportunity is created for fish to follow the flow of water and become "entrained" by the hydrodynamic footprint of those diversions. There are several sources of entrainment for longfin smelt. These are discussed here in turn.

<u>In-Delta Agricultural Diversions</u>: Water is diverted at numerous sites throughout the Delta for irrigation of crops, particularly during the summer months (Siegfried *et al.* 2014, Figs. 10–11, p. 11) when most longfin smelt are rearing seaward of the legal Delta. Herren and Kawasaki (2001, p. 347) reported over 2,200 such water diversions within the Delta, but CDFG (2009, p. 25) notes that number may be high because Herren and Kawasaki (2001) did not distinguish intake siphons and pumps from discharge pipes. Given the temporal mismatch between seasonal peaks in water diversions to supply farms in the Delta and use of the Delta waterways by longfin smelt, seasonal irrigation of Delta farms does not seem like a major conservation concern for longfin smelt.

<u>Other Diversions:</u> The Barker Slough pumping plant is located in the north Delta and serves as the inlet to the North Bay Aqueduct, which is a municipal diversion that serves Solano County. This diversion is owned and operated by the California Department of Water Resources (DWR) and has positive barrier fish screens that likely limit entrainment of longfin smelt spawned in the vicinity of the diversion.

Downstream in Suisun Marsh, the Roaring River and Morrow Island Distribution Systems (RRDS and MIDS) are additional DWR facilities that divert water from Montezuma and Goodyear sloughs,

respectively. The water is distributed to waterfowl management wetlands in Suisun Marsh and eventually returned to the marsh channels (minus what evaporates). The RRDS is screened while MIDS is not. Both diversions have been observed to entrain or impinge longfin smelt (CDFG 2009b, p. 41). Longfin smelt catches in Suisun Marsh declined earlier in time than they did in other surveys (Rosenfield and Baxter 2007, p. 1589). These authors recommended to evaluate that observation more carefully. The RRDS and MIDS came online in 1979–1980. A key question is whether longfin smelt decline in Suisun Marsh was already underway due to land and water management practices, or might the distribution systems have affected hydrodynamic conditions in the marsh in a way that increased entrainment of longfin smelt or otherwise inhibited their use of the marsh as a spawning habitat?
Entrainment into several power plants may have been an historically important source of longfin smelt mortality (particularly larvae), but these plants have since been decommissioned.

<u>State and Federal Water Export Facilities</u>: The CVP and SWP each include pumping plants in the south Delta. These pumping plants are used to export water to users throughout much of the State. The operation of these facilities can exert a strong influence on regional hydrodynamics (Kimmerer and Nobriga 2008, Fig. 7, p. 12; Hutton *et al.* 2019, Fig. 7, p.11). That hydrodynamic influence can result in the entrainment of fish, sometimes from considerable distances (e.g., Kimmerer 2008, p. 2, Fig. 1, p. 3). In most years, longfin smelt have been collected ("salvaged") in the fish facilities that are in front of each pumping plant. The salvage of fish is an indicator that individuals are being entrained in exported water.

Historically, the salvage of age-1 and older longfin smelt peaked in January (Grimaldo *et al.* 2009, Fig. 5, p. 1262). These fish likely represented individuals searching for spawning habitats and immature individuals comingling with adults. The salvage of age-0 fish peaked in April-May as larvae reached sizes at which they could be retained on the fish screens of the CVP and SWP fish facilities. In all likelihood, however, some larvae began to be entrained once they started hatching in December or January, but remained undetected until about March, with salvage efficiency increasing in April-May as the fish grew larger.

Age-0 longfin smelt salvage has historically been a function of larval abundance and Old and Middle River (OMR) flow (Grimaldo *et al.* 2009, Table 2, p. 1260). This pattern reflects two things: (1) the fish facilities are sampling devices so like other fishing gear, they can catch more fish when there are more to catch, and (2) OMR flow indexes the 'sampling effort' of the fish facilities by reflecting how much and how quickly water is being moved toward the pumping plants. When net OMR flow is positive, San Joaquin River water is generally moving seaward through the Delta. The more net negative OMR is flowing, the more water in the Delta is moving toward the pumping plants, the more of that water has come from the Sacramento River, and the faster that water is moving south.

OMR is a metric that represents a net direction of water flow, meaning that the tidal flow that moves in the positive and negative directions over hourly to spring-neap time scales has been mathematically removed. Nonetheless, the water transport processes OMR represents are instantaneous to tidal time scale variations in gravity flow of water interacting with river and tidal currents via spatial differences in water surface elevation (Andrews *et al*. 2016, equation 5, p. 6).

Longfin smelt can be entrained in exported water when adults and comingling age-1 individuals enter the south Delta, and as larvae and small juveniles that are either rearing or being tidally dispersed landward of X2 (CDFW 2020, Fig. 13, p. 53). During periods of high Delta outflow adult longfin smelt and their progeny are much less likely to be entrained in exported water because the low salinity zone is not encroaching on the Delta and more individuals may be cued to spawn in Bay Area tributaries if they are likewise flowing high.

It is possible that past entrainment of larval longfin smelt may have reached levels of concern (e.g., 2002 per CDFW 2020, Fig. 10, p. 47; see Figure 3.4). However, since 2009, the entrainment of longfin smelt has not been substantial enough to affect the species population dynamics. The results of two different analytical approaches to the Smelt Larval Survey (SLS) data suggest that it is not likely population-level entrainment of larvae has exceeded 3% since 2009 (Wim Kimmerer, pers. comm.). One analysis coupled particle tracking modeling with the SLS data set and found an upper 95% credible interval of proportional entrainment was 2.9% in the critically dry winter of 2013 and nearly zero in the wet winter of 2017. A second analysis similar in approach to Kimmerer (2008, entire) analyzed all of the SLS data from 2009-2020. Similarly, this approach also found proportional entrainment was unlikely to have exceeded 3% (range = 0.5% to 2.9%). We interpret these findings to indicate that the OMR management strategies in place since 2009 have been an effective conservation strategy for longfin smelt.

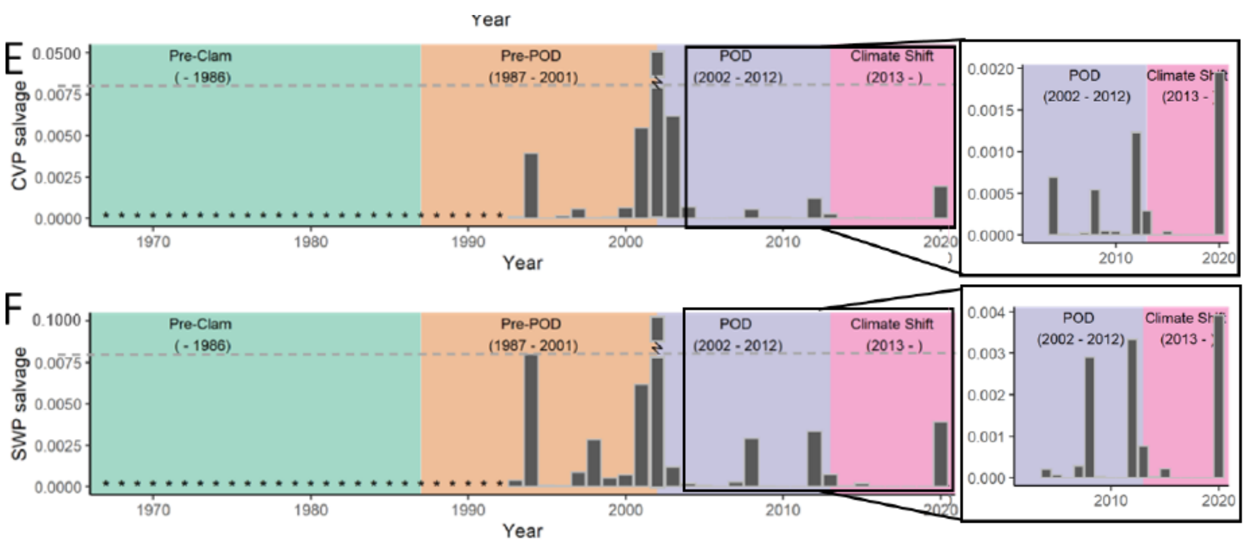

Figure 3.4: Longfin smelt salvage numbers at the SWP and CVP facilities, before and since OMR management by CDFW.

3.2. Current DPS Survey Indices

In the previous section, we detailed the stressors acting on the species. Here we summarize abundance indices showing the DPS' decline over recorded time to its current condition as a result of these stressors. These data begin with simple plots of relative abundance over time, but also include more sophisticated population modeling and viability metrics (summarized herein, and fully documented in a series of technical appendices).

3.2.1 Species relative abundance

Collectively, available survey data indicate a marked, and significant decline for the SF Bay-Delta DPS of longfin smelt throughout the estuary, and across all life stages. To show how the species' status over time to its current condition, we first utilize field survey data from three established surveys--the 20-mm Survey, Bay Study, and FMWT. As described earlier, each of these surveys routinely catches longfin smelt. SLS, although designed for longfin smelt, is not used here as it was designed to assess entrainment risk and not relative abundance, and it has a much shorter survey history (2009-present). Further information about specific surveys: purpose, timing, and geographic coverage are enumerated in Appendix B, following.

The 20-mm Survey (https://wildlife.ca.gov/Conservation/Delta/20mm-Survey) has been conducted since 1995. The CDFW does not produce an index of longfin smelt abundance from the 20-mm Survey, so we adapted the methods for the delta smelt index for longfin smelt. The code and method used to produce the 20-mm index values can be found in Appendix B. As noted in Appendix B, its sampling grid does not include San Pablo Bay, Central San Francisco Bay, or the South San Francisco Bay, and as such the survey underestimates relative abundance in wet years. However, the 20-mm Survey encompasses a significant portion of the distributions of larval and small juvenile longfin smelt, including nearly the entire range during dry years. Since 2000, 16 of 21 years have been classified by DWR as Critical, Dry, or Below-Normal (https://cdec.water.ca.gov/reportapp/javareports?name=WSIHIST). During that period, the trend in longfin smelt catches from the 20-mm Survey has been generally downward (see Figure 3.5).

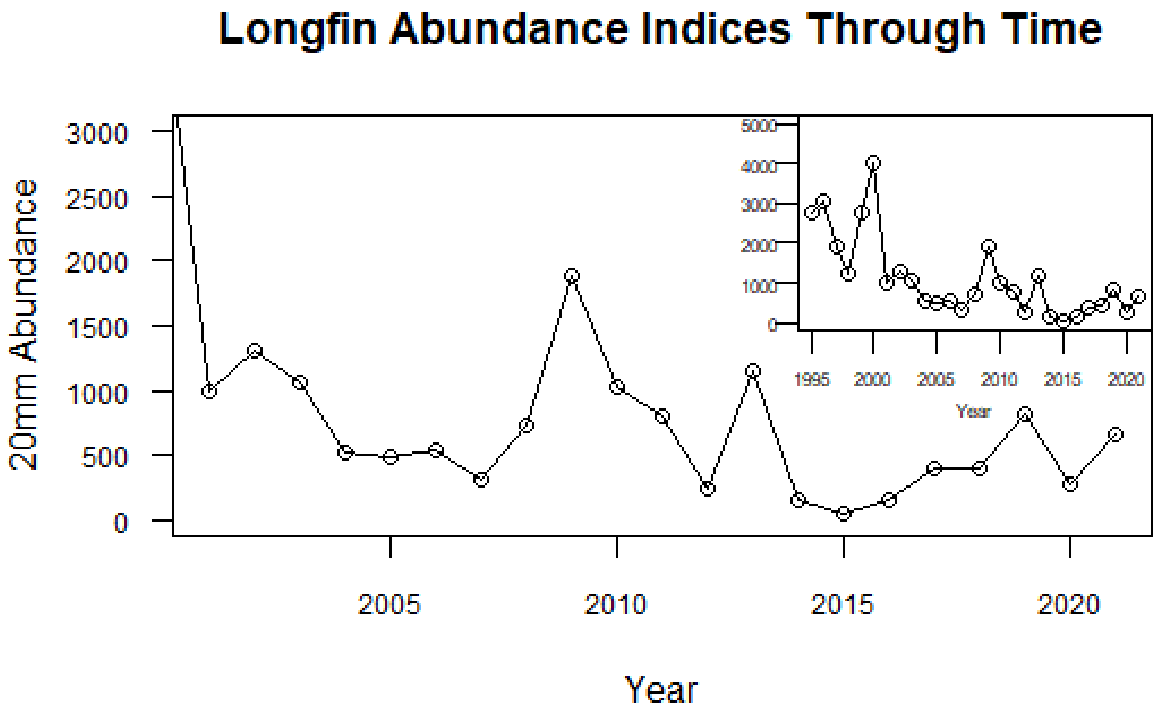

Figure 3.5: Longfin smelt abundance indices from the CDFW 20-mm Survey, 2000–2018 (Inset displays time series since 1995). Source: CDFW 2021a

The FMWT, which captures both juvenile and adult longfin smelt, has the longest history of any survey that is considered effective for the Bay-Delta DPS and has been used to determine the status of the species since the late 1970s (Stevens and Miller 1983, pp. 431–432). Since that time, its peak (unitless) index value recorded was approximately 63,000 in 1982, although the highest ever index value reported was over 80,000 in its first year of completion (1967). The FMWT abundance index for longfin smelt has not exceeded 10,000 since 1983, has not exceeded 1,000 since 2006, fell below 100 for the first time in 2007, and has registered values less than 100 eight more times since then (see Figure 3.6). The 2021 FMWT index for longfin smelt was 323, which was the highest since 2011 (https://www.dfg.ca.gov/delta/data/fmwt/indices.asp).

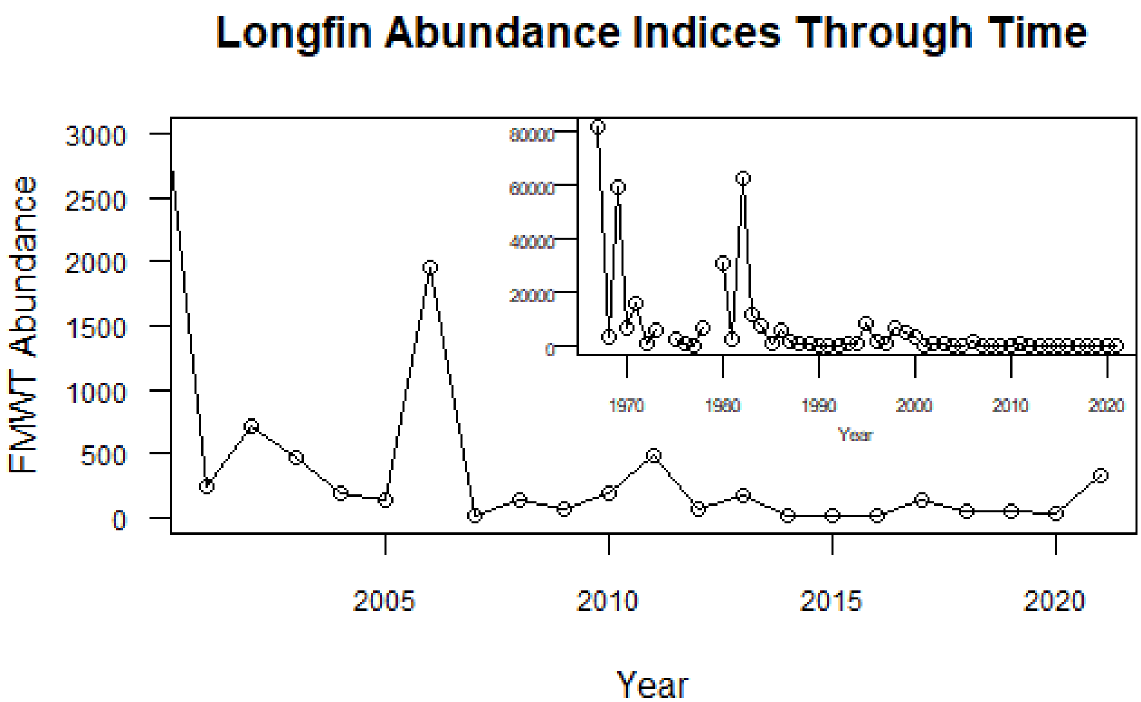

Figure 3.6: Longfin Smelt abundance indices for 2000–2020 from the FMWT (Inset displays time series since 1967). Source: CDFW 2021a

The San Francisco Bay Study (https://wildlife.ca.gov/Conservation/Delta/Bay-Study) samples low-salinity to fully marine waters of the estuary, utilizing both otter (OT) and midwater trawls (MWT); standardized sampling has occurred in most years since 1980. However, sampling was more sporadic in the 1990s and again in several recent years. By deploying two gears, the Bay Study samples near bottom as well as midwater to surface-oriented fishes (Feyrer *et al*. 2015, Fig. 5, p. 3614). Unlike the FMWT, the Bay Study provides separate abundance indices for ages 0, 1, and 2+ longfin smelt. This means there are six Bay Study longfin smelt abundance indices per year; this describes the status of the species at a finer resolution but makes it difficult to summarize the trends concisely. The Bay Study midwater trawl trends are shown in Figure 3.7 and the otter trawl trends in Figure 3.8. The age-0 indices from both surveys suggest abundance peaks occurred in the early 1980s and again in 1995. In most other years, indices for older age classes have been notably lower than age-0 indices. This is expected for the age-1 and age-2+ indices due to the greater cumulative lifetime mortality experienced by the older fish. The Bay Study index values were at or near record lows in 2014 or 2015, which were the last years in the largely continuous time series of Bay Study indices. Reports from 2017 indicated an uptick in age-0 abundance, but still at or near record lows for older age classes.

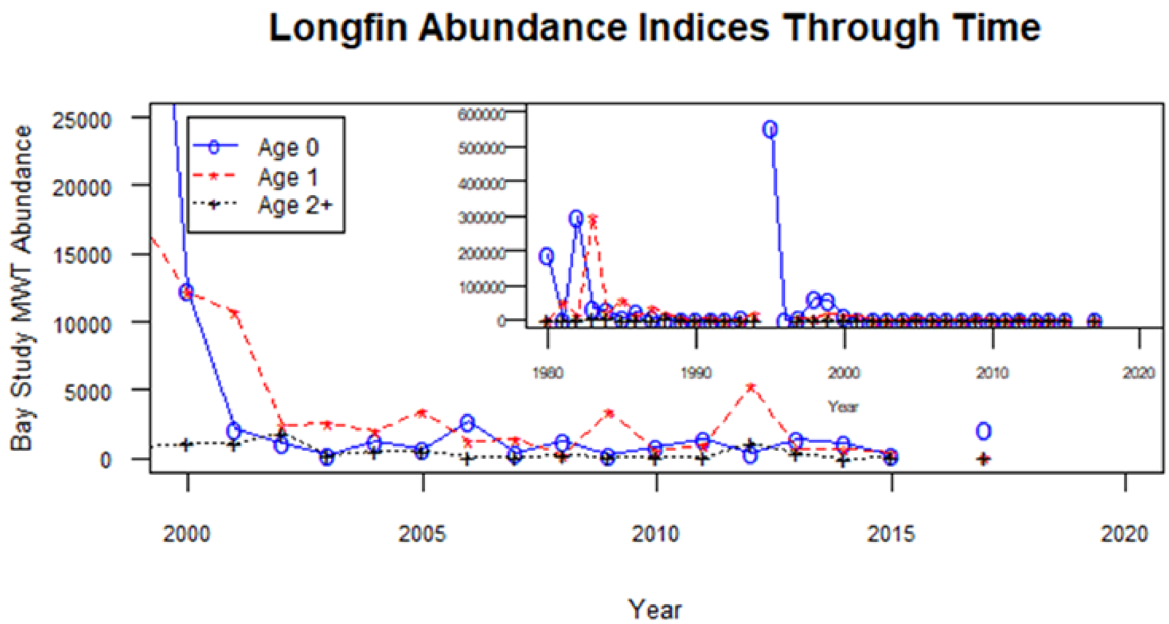

Figure 3.7: Age 0, Age 1, and Age 2+ longfin smelt abundance indices over time from the Bay Study Midwater Trawl, 1999–2017 (Inset displays time series since 1980). Source: CDFW 2021a.

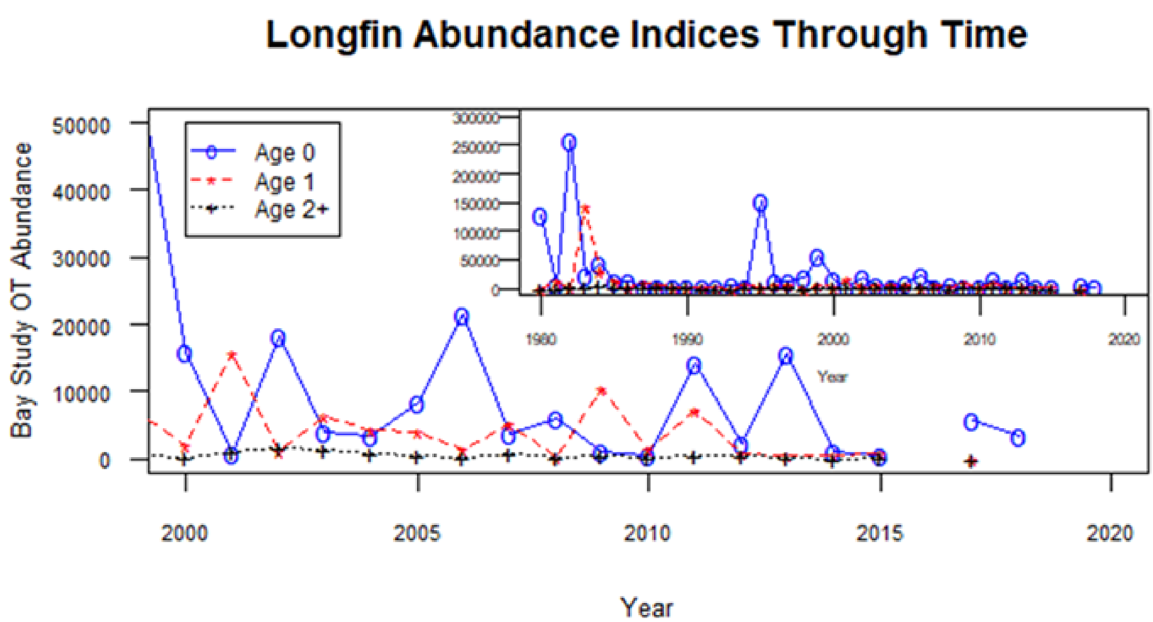

Figure 3.8: Age 0, Age 1, and Age 2+ Longfin Smelt abundance indices over time from the Bay Study Otter Trawl, 1999–2018 (Inset displays time series since 1980). Source: CDFW 2021a

Longfin smelt densities calculated from SLS monitoring data also indicate a decline in abundance. Prior to 2014, larval longfin smelt were generally detected at nearly every SLS sampling station in Suisun Bay, the confluence of the Sacramento and San Joaquin Rivers, and Northern Delta at densities numbering in the multiple hundreds of individuals per 1,000 m^3 (see Figure 3.9). After 2014, detection frequencies declined and became more variable. Extended dry years compound the negative impacts to longfin smelt as the fish have not shown an ability to quickly recover and reoccupy upstream spawning habitats following drought. Successive years with such unfavorable conditions are likely to continuously suppress longfin smelt abundance which propagates through to the next spawning generation.

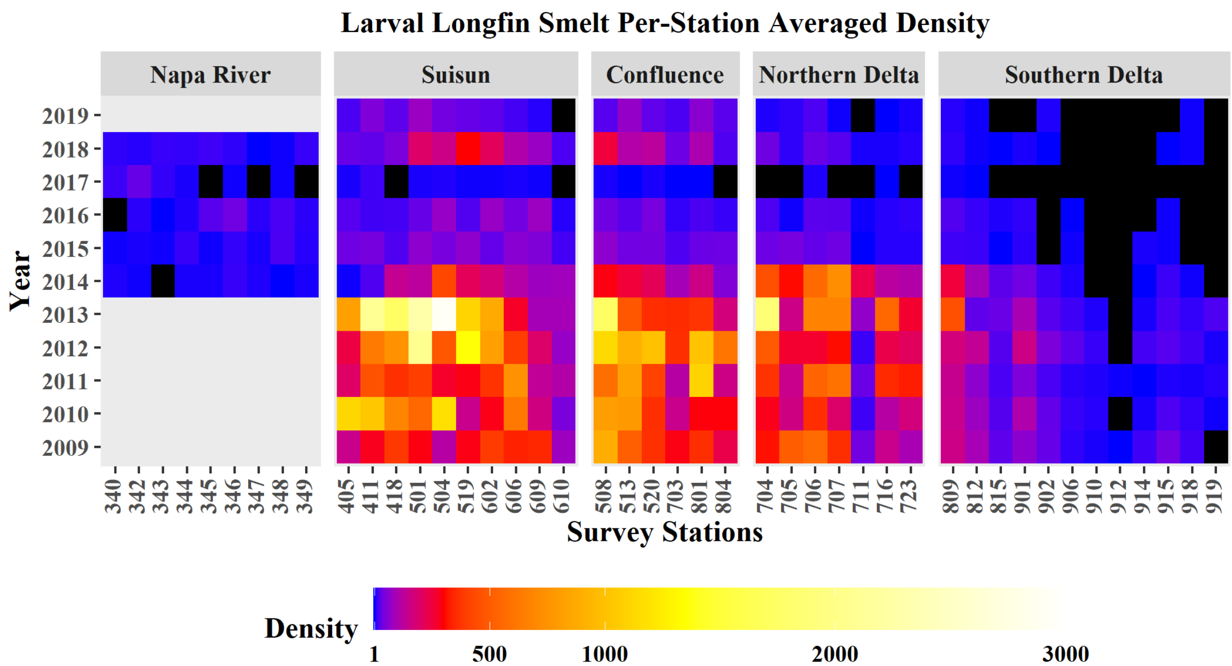

Figure 3.9: Per-station averaged densities for larval longfin smelt across four regions of the Upper Estuary. Densities were averaged at each station for each year of the Smelt Larval Survey. Legend presents average densities per 1,000 m3. Black boxes represent sampling stations that did not detect longfin smelt across all tows for that year. (Eakin 2021, p. 196).

Considering the consistently low abundance indices across all monitoring survey programs and life stages it is apparent that the DPS lacks the ability to recover to the higher abundance numbers seen in the past. All the best available field surveys for documenting long-term abundance trends suggest longfin smelt numbers have substantially declined over time, with current relative abundance reflecting small fractions of the species historical relative abundance. Even considering the small upticks in the most recent survey results, the general trend over time has been lower highs and lower lows in the indices. This supports the conclusion that abundance of all life stages has declined substantially over the course of several decades and that decline has generally continued in recent years. This decline has spanned three to four orders of magnitude in the overall abundance indices over the course of the historical record. In the next section, we summarize these trends numerically as estimates of average annual population growth and consider the consequences of such rates on the long-term viability of the population.

3.2.2. Baseline Scenario and Population Viability Analyses

While descriptive statistics summarizing the historical time series of established (and derived) official relative abundance indices can be informative, they do have limitations (as described herein and in Appendix B) when it comes to inference about population viability, and certainly for ascribing causation relative to potentially important covariates. Therefore, we have performed additional modeling efforts to frame the available information in a context relevant to the purposes of this SSA.

We present a baseline scenario analysis, where we assume that there are no additional changes in the system over time; specifically, this approach assumes that current stressors remain the same and that they have the same magnitude and intensity of impacts on the Bay-Delta DPS into the future. We describe two population viability analyses (PVA; Morris and Doak 2002, Ch. 1 pp. 1–14), which use two different population models to summarize population growth rates and use them to forecast the risk of extinction into the future. These two PVAs, termed count-based and age-structured, use two different model structures: a broad view of the weight of evidence presented by the suite of monitoring surveys and a relatively detailed view of life stage specific vital rates. Details for these modeling approaches are described in Appendix C & Appendix F.

Count-Based PVA

In the first analysis, each abundance index is treated as an independent time series describing the pattern in abundance of longfin smelt. This analysis is done using a count-based PVA framework, which is mathematically and biologically simple as it summarizes the patterns of decline in each of the abundance indices and the impact that has on the probability of quasi-extinction in the future. Quasi-extinction was defined as 1% of the mean of index values since 2008 or lower (≤ 16). Estimates of population growth rates and variability were derived from all available years for each survey. The summaries of the abundance indices and associated count-based PVA represents a quantitative summary of the information that many biologists use to form their intuition about the status of the species.

Values for each of the indices of longfin smelt abundance have decreased substantially over the available time series (Figures 3.5–3.7). Even though this pattern is consistent across each of the indices, it can be difficult to interpret what changes in the indices indicate for population viability because each is constructed differently. When expressed as year over year changes to the indices, we derive estimates of annual population growth rates (lambda) that can be summarized in terms of their central tendency and spread. When population growth rates are less than one, the abundance declines and when population growth rates are greater than one, the abundance grows. Growth rates are multiplicative, so a growth rate of 0.5 indicates that abundance dropped by half, whereas a growth rate of 2 indicates a doubling population.

Mean population growth rates for individual surveys were less than one for most of the abundance index data series, which indicates that population size is declining over time (see Figure 3.10). Only the Bay Study otter trawl index for age-0 longfin smelt produced an estimate greater than one. However, variability was high for all surveys, and confidence limits on each of the estimates included one. This indicates that even though abundance tends to decline on average, in some years abundance will be stable or increasing.

To summarize the population growth rates from multiple surveys, we performed a meta-analysis on the mean growth rates for each of the surveys. Like most of the individual surveys, the estimated mean population growth value from the meta-analysis was less than one and the error bars included one, but the variability around the mean was much lower. It is noteworthy that for some of the surveys it is not possible to calculate an abundance estimate when zero Longfin Smelt are caught. This has become an issue for some recent years and the inclusion of only index values from years with non-zero catches may bias estimates of mean population growth rates upward.

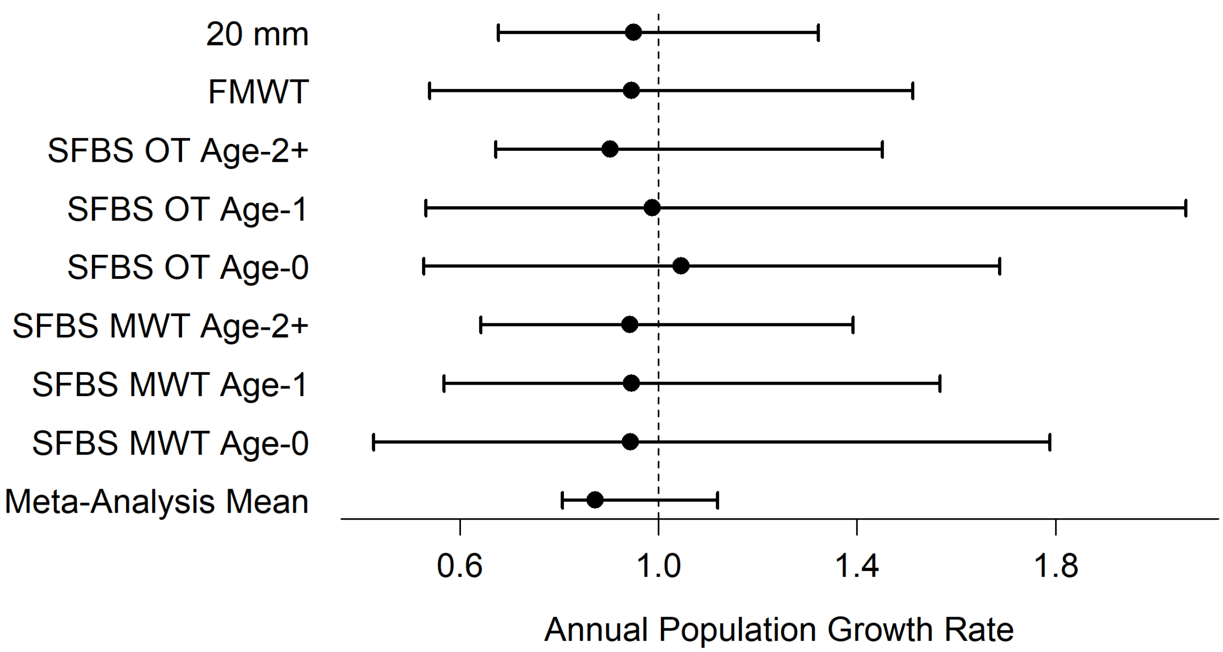

Figure 3.10: Population growth rates (λ) using all available years, based on a count PVA framework, and a mean population growth rate calculated as the mean from a random effects model meta-analysis. Error bars are 95% confidence limits. For individual studies, error bars are derived from the regression method developed by Dennis *et al.* 1991. For the meta-analysis, error bars are derived from the random effects model.

Based on the meta-analysis of mean population growth rates and applying the simplifying assumption that the rate of population growth is constant over time (i.e., applying the historically observed average rate of decline forward through time), we would expect population growth rates to decline an additional 40% over the next 10 years. Confidence limits are 88% decrease to 209% increase, but asymmetry of the confidence limits indicates that decreases are more likely and in fact sampling from the distribution of the estimate we find that abundance decreases more than half of the time (55%). The large variability in these estimates makes a sustained increase in population size unlikely, as indicated by the probability of quasi-extinction over time. Populations with highly variable growth rates tend to have low viability over time because adding variation tends to make a population grow more slowly over the long term and the population size is more likely to fall below the quasi-extinction threshold than it is for populations with less variable growth rates (Morris and Doak 2002). Without intervention, populations with negative growth rates are expected to go extinct, regardless of the initial population size or the variability in their growth rates. An important question to investigate becomes when extinction is likely to happen because this determines the timeframe for implementing management actions to increase the growth rate.

To illustrate a timeline for extinction risk, we calculated a cumulative distribution function for the time to extinction based on the mean population growth from the meta-analysis, using the mean of the most recent non-missing abundance index values as an initial abundance, and the mean of quasi-extinction thresholds that we calculated for each of the indices. Mean probability of extinction (solid line) and 95% confidence intervals (dashed lines) were calculated using the countCDFxt function from the popbio package (Stubben and Milligan 2007). The starting population size was set to the mean of the most recent non-missing index values (= 1916). Quasi-extinction was defined as 1% of the mean of index values since 2008 or lower (≤ 16). The mean population growth rate exhibits a probability of quasi-extinction exceeding 20% when carried forward for two decades (see Figure 3.11), which was proposed by Lindley *et al*. (2007, Table 1, p. 4) as a criterion ascribing high extinction risk to Central Valley salmonid populations.

The shape of the quasi-extinction curve was influenced by the choice of initial abundance, with lower values producing a steeper slope in the near-term and a higher asymptote in the long-term than was observed for quasi-extinction curves associated with higher initial abundance values. The mean growth rates for each other individual surveys produce similar levels of extinction risk (Appendix C). Predictions for all abundance indices, taken together, show that the probability of quasi-extinction exceeds 20% for all surveys over the next five years and reaches 50% by 2040 (Fig. 3.11). Applying the same assumptions over a longer time horizon (i.e., 2050-2065), the suite of surveys predicts that the probability of extinction for the Bay-Delta DPS under current conditions is roughly 50–80%. Here we present the results of a meta-analysis using values from the official abundance indices associated with various long-term monitoring surveys, but similar results were obtained using annual summaries of catch per tow as an alternative index of abundance for the surveys.

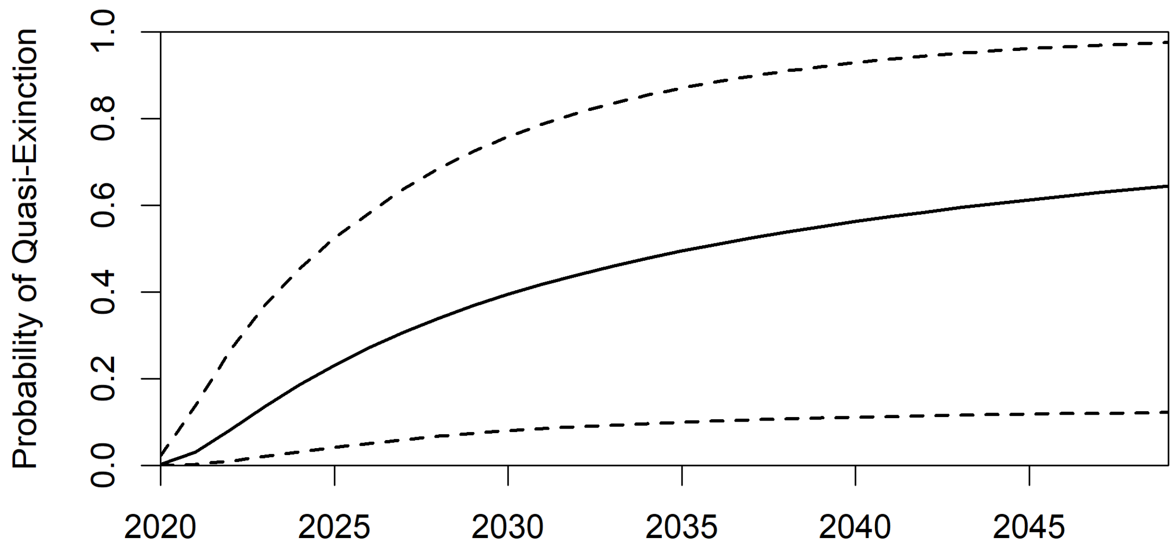

Figure 3.11: Probability of quasi-extinction estimated from a meta-analysis of several surveys that report population indices for Longfin Smelt. Mean probability of extinction (solid line) and 95% confidence intervals (dashed lines) were calculated using the countCDFxt function from the popbio package. The starting population size was set to the mean of the most recent non-missing index values (= 1916). Quasi-extinction was defined as 1% of the mean of index values since 2008 or lower (≤ 16). Estimates of population growth rates and variability were derived from all available years for each survey.

Age-Structured PVA

The second population viability analysis recognizes the need for a model that takes the age structure of the population and density dependence into account. In this analysis, we developed an age-structured state-space population dynamics model and estimated changes in vital rates for the population over time (Appendix F). The population viability analysis that is based on this model explicitly draws on estimates of vital rates (survival and reproduction) that link the age classes. In this model, survival rates from one age class to the next were structured as a proportion, while reproduction rate was structured used the Beverton-Holt equation to represent density dependence. Data on the abundance of the age classes came from Bay Study's abundance indices for both of its sampling gears (midwater trawl and otter trawl). These were incorporated into the model as two observations of each time point.

The age-structured PVA evaluated four age-specific abundance thresholds for quasi-extinction risk: the estimated abundance index associated with the lowest 1st, 5th, 10th, and 15th lower percentiles of the estimated age-specific abundance indices. Specific values associated with each percentile are given in Appendix F, but as a relative index of abundance, the values only have meaning in relation to each other. The population was considered quasi-extinct if the abundance estimate for any age class fell below the specified threshold. Populations. that reach quasi-extinction are considered unable to recover, so if the abundance falls below the quasi-extinction threshold in any year, the population remains "extinct" for all subsequent years in that run of the model.

For each simulation, the initial abundance was drawn from the distribution of estimated age-specific abundance values for 2015, which was the last year of the continuous time series of indices for Bay Study. Vital rates were drawn from the distribution of parameters for all years in the data set (1980–2015). As such, the full historical dataset informed the simulations of future abundance, and the analysis assumes that the future will follow patterns similar to the past. The simulation was run 1000 times and the probability of quasi-extinction is the proportion of times the population reached quasi-extinction at or before the year specified.

The probability of quasi-extinction was sensitive to the choice of quasi-extinction threshold and, as we might expect, setting higher thresholds results in higher probabilities that the population will become extinct (see Figure 3.12). Even with this variability, the model results show a substantial risk of extinction even at low threshold values. For example, using the 10 percent quantile of abundance estimates as the threshold, approximately 60% of simulations reached extinction by 2050. Both the 5 and 10 percent quantile line also meet Lindley *et al.*'s (2007, Table 1, p. 4) criteria for high risk of extinction (20% probability over two decades). The most conservative threshold (1 percent quantile) shown in Fig. 3.12 meets Lindley et al.'s criteria for moderate risk of extinction (>5% over 100 years).

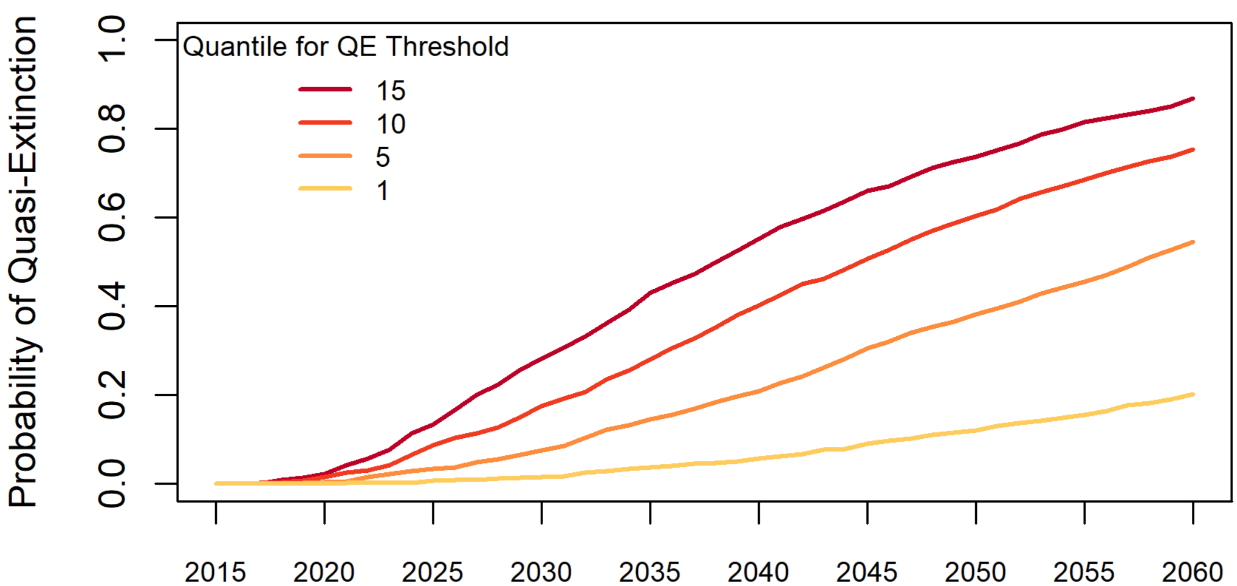

Figure 3.12: Estimated probability of quasi-extinction for four sets of age-specific abundance values, based on the percentiles at the lower end of the distributions of relative abundance estimates. Specific values associated with each percentile are given in Appendix F.

3.3. Summary of the 3 R's

Here, we conclude the current ecological viability by summarizing the species response to these stressors with an assessment of the 3 R's as they apply to the Bay-Delta DPS.

3.3.1. Redundancy

The San Francisco Bay-Delta DPS is a single, genetically-indistinguishable population with basically unidirectional gene flow to northern populations (I.e., a 'source' population), as evidenced by genetic data (Saglam *et al*. 2021, p. 1797). Age structure of the population (more than one age class extant in the system) may yield some buffer against a year with a catastrophic event. However, it is not presently known how many spawning age-classes in any given generation of the Bay-Delta DPS exist. The spawners may: 1) be all or nearly all age-2 or, 2) include meaningful numbers of age-1 and, 3) possibly even age-3 fish. If there is only one spawner age-class in each generation as is the case in Lake Washington, the Bay-Delta DPS has less inherent resilience to poor conditions than if there are multiple spawning age classes. This is one of the most important uncertainties that limits our ability to model the DPS' population dynamics and by extension, evaluate the three Rs. Nonetheless, it is apparent in the trend data that sequential dry years and droughts have strongly contributed to population decline. Inhabiting a hydrologically-connected estuarine system, with a capability of facultative anadromy, the fate of the DPS is reliant upon the ecological condition of the San Francisco Bay-Delta and, to an extent, the DPS' ability to exploit the nearshore Pacific Ocean niche.

3.3.2. Representation

We assess the species representation (adaptive capacity) within the Bay-Delta based on the observed phenotypic plasticity in its life history (to the extent we can infer it from available data) and the current and future conditions within the system that may afford some capacity for behavioral adaptations that enhance growth, survival and reproduction. To the extent that lifestages can tolerate higher salinities (a capacity that increases over developmental time), the species does possess adaptive capability to move seaward, thus seeking cooler thermal refugia and opportunities to sustain its survival, growth, and development until their return to the Delta for spawning. However, like our rationale above, as evidenced by the species relative abundance and the trends observed over time, even with plasticity in its life history, the species has not been able to withstand the cumulative changes to the Bay-Delta ecosystem and has fared poorly amidst the suite of stressors acting upon it. In short, recent and current conditions in the SFE have constrained adaptive options, impaired fitness, and reduced survival. Therefore, we do not anticipate that either genetic or environmental diversity confers sufficient adaptive capacity to the Bay-Delta DPS to overcome the detrimental environmental changes (especially into the anticipated future—see Future Condition chapter, following).

3.3.3. Resilience

Given the biology, life history, and interconnectedness of the San Francisco Estuary that the Bay-Delta DPS inhabits, its lack of population redundancy, and our estimate that it possesses limited inherent adaptive capacity (low representation) within these ecological constraints, the factor most contributing to the Bay-Delta DPS' extinction risk centers on its population resilience (I.e., the interaction of extant stressors on the current standing population). The key stressors impacting the Bay-Delta DPS are inadequate frequency and magnitude of favorable freshwater flow conditions for survival, growth, and reproduction; limited food supplies; and small population size. It is acknowledged that these factors are all ecologically interrelated.

Reduced freshwater flow

The biggest stressor impairing production of longfin smelt is decades of accumulating impairment of freshwater flow caused by the development and redistribution of water supplies in California. Freshwater flow to the estuary, especially as Delta outflow, is the most important species need. This DPS has a long-standing relationship with Delta outflow. With the exception of 2021, abundance indices during Critical, Dry, and Below-normal year types were never higher than the preceding abundance index of the immediately preceding Wet or Above-normal year type. Further, no FMWT index for longfin smelt has ever surpassed the initial 1967 index and in the overbite clam era (1987-present), only one index (1995) has even gotten within ten percent of the 1967 index. Thus, the decline of the Bay-Delta DPS, which is now in its sixth (observed) decade, has led to very low abundance indices.

Loss of food

The invasion of the overbite clam was a catastrophic event as it had an immediate and permanent impact on the pelagic food web in the San Francisco Estuary. The overbite clam both reduces the base primary producers of longfin smelt's food web and competes directly with larval longfin smelt by consuming some of the same prey. The suspected role of food limitation is a lower carrying capacity for longfin smelt, even in wet years. This stronger limit on juvenile fish production has interacted with insufficient frequency of wet years to contribute to persistent species decline. An apparent lack of trophic adaptability provides longfin smelt with little representation to withstand accumulating changes to the food web. This is further evidenced with the species inability to recover from the catastrophic overbite clam invasion.

Small population size

Though not a stressor in itself, small populations are more vulnerable to demographic, stochastic, and allele effects (Foden and Young 2016, p. 40). Based on field survey indices, the abundance of the Bay-Delta DPS has been at, or near, record lows for the past decade. The current small population size thus lowers the species resilience, and limits opportunities for higher recruitment during favorable years. Small populations also have reduced capacity to adapt to environmental changes (representation) due to limited genetic variation (Willi *et al.* 2006, p. 440). Mechanisms for this include: lower fitness owing to environmental stress (Willi *et al*. 2006, p. 447), inbreeding depression, genetic load, or nongenetic allele effects (Reed 2005, p. 556). However, we lack the information needed to quantitatively assess whether the small population size of the Bay-Delta DPS affects the species representation.

Other Potential (and/or Historical) Stressors

Temperature: Laboratory studies have suggested that longfin smelt are more physiologically sensitive to elevated water temperature than the delta smelt (Jeffries et al. 2016, p. 1714). The 20°C threshold suggested for juvenile longfin smelt is commonly exceeded over large areas of the estuary, particularly the Delta and the lower Sacramento and San Joaquin rivers during the summer months (Vroom et al. 2017, p. 9904; data from CDEC, CENCOOS, and USGS), possibly coaxing the fish to seek cooler oceanic waters. Currently, longfin smelt are able to use facultative anadromy, albeit with a strongly declining population trend in the Bay-Delta—suggesting this strategy may be insufficient to mitigate temperature stress. The Bay-Delta DPS' ability to continue to survive in the Bay-Delta given anticipated warming is discussed in the Future Condition chapter, below.

Entrainment: The best currently available information suggests that if OMR management comparable to what has occurred since 2009 continues, the entrainment of longfin smelt will not have a strong influence on the viability of the Bay-Delta DPS.

Loss of Tidal Marshes: It is unknown how important historical tidal marshes were to longfin smelt, but they currently use a mixture of tidal marsh and open-water habitats. Tidal wetlands and marshes in the San Francisco Estuary were largely converted to other uses by about 1920 and have recently begun to be restored. The loss of tidal marsh habitats may have hampered species productivity, but to date, there are no indications that restoration has been sufficient to stem the decline. Therefore, we cannot conclude whether or not the species has lost resilience due to landscape changes that occurred in the 19th and 20th centuries. The quantitative contributions of restored estuarine marshes to larval growth and rearing remains a potentially important science question in support of longfin smelt conservation.

In Table 3.1, following, we summarize how current drivers are understood to be impacting the Bay-Delta DPS under our evaluation within this SSA.

Table 3.1: Summary of Threats under Current Condition for the San Francisco Bay Delta DPS Longfin Smelt

Stressor/Threat	Life Stage(s)	Mechanism	Magnitude of Threat
Reduced freshwater flow	Larvae and juveniles	Productivity reduction leading to recruitment loss	High Risk
Loss of food	All	Productivity reduction due to food web collapse and increased competition	High Risk
Small Population Size	All	Reduced stock for reproduction, greater vulnerability to stochastic events, Allee effects	High Risk
Temperature Stress (Habitat Constriction)	Adults and late juveniles	Physiological stress: Escape to cooler environments as adults is an option	Constraining?
Increasing temperature	Larvae and younger juveniles	Lethal mortality to early lifestages: Unable to avoid as larvae	Likely Constraining
Predation	Larvae/ juveniles	Higher vulnerability to predation at early life stages	Uncertain
Entrainment	Larval and younger juveniles	Entrainment to the South Delta export facilities and other diversions	No longer considered a substantial stressor with current State protections
Contaminants	All	Direct mortality through reduced fitness or indirect through food web	Uncertain
Tidal habitat loss	Larvae and juveniles	Reduced rearing area lowering growth and recruitment	Uncertain

In summary, the Bay-Delta DPS of longfin smelt is not resilient; more than five decades of declining abundance indices have documented an inability of this fish to sustain itself in the contemporary estuary. The Bay-Delta DPS also has extremely limited redundancy, since it effectively represents a single population inhabiting the San Francisco Bay-Delta and nearshore ocean environment. The representation of the Bay-Delta DPS is thought to be limited as well, reflecting that same declining abundance trend and no discernable and quantifiable compensatory adaptation to historical ecological conditions. Based on our evaluation of the 3 Rs, we conclude the San Francisco Bay-Delta DPS of the longfin smelt is highly vulnerable in its current condition.

EXHIBIT F

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105-3901

January 28th, 2022

Ernest Conant
Regional Director
U.S. Bureau of Reclamation
California-Great Basin Office
2800 Cottage Way
Sacramento, California 95825-1898

Subject: Supplemental Draft Environmental Impact Statement/Recirculated Draft Environmental Impact Report for the Sites Reservoir Project, Glenn and Colusa Counties, CA (EIS No. 20210172)

Dear Ernest Conant:

The U.S. Environmental Protection Agency has reviewed the Sites Reservoir Project Supplemental Draft Environmental Impact Statement (SDEIS) pursuant to the National Environmental Policy Act (NEPA), Council on Environmental Quality regulations (40 CFR Parts 1500-1508), and our NEPA review authority under Section 309 of the Clean Air Act. The EPA is a cooperating agency for this SDEIS and provided comments on chapters of the Administrative SDEIS on April 21st and May 28th, 2021.

According to the SDEIS, the Sites Project Authority has modified their proposal to construct and operate a new off-stream surface storage reservoir ten miles west of Maxwell, California, and the Bureau of Reclamation continues to participate in the development of the project to consider the environmental impacts of coordinating the use of federal facilities that would be used to supply water to the reservoir. Reclamation is also examining the possibility of investing in Sites reservoir storage up to 25% to improve operational flexibility of the Central Valley Project (CVP). The EPA recognizes the need for improved water management in California and welcomes the opportunity to assist Reclamation in ensuring that federal decision making concerning new water storage facilities appropriately considers environmental impacts associated with siting, design, construction, and operation of such facilities.

The EPA has identified several topics or resource areas in the SDEIS that would benefit from additional information or analysis in the Final EIS, including project operations, scope of analysis, climate impacts and greenhouse gas emissions, impacts to streams and wetlands, sediment management, and surface water quality. We have enclosed detailed comments and recommendations on these and other resource topics, and we have included a brief summary below. Please note that because the SDEIS does not identify Reclamation's Preferred Alternative, our comments apply to all alternatives.

The EPA is concerned about the approach to project operations in the SDEIS, which have not yet been finalized but are critical to understanding the environmental impacts of Sites Reservoir. Operations are modeled using historical hydrology data that may not reflect current and future conditions, and diversion criteria are based on regulatory requirements that are currently being revised. While important components of the originally proposed project have been altered, none of these project changes explain why the Trinity River and lower Klamath basin were excluded from the scope of analysis. Finally, the

SDEIS uses a 2035 scenario for analysis of potential climate impacts; however, the project would not begin operating until at least 2030, making the 2035 scenario unhelpful to the analysis for operations.

Sufficient information on wetlands and other aquatic resources to support permitting under Section 404 of the Clean Water Act is not included in the SDEIS, and appropriate testing procedures and plans for sediment management and beneficial reuse have not been specified. The EPA has additional concerns about the effects of Sites Reservoir on water quality. The SDEIS identifies substantial adverse effects that can be expected from mercury methylation in the proposed reservoir; the EPA is concerned that this impact could disproportionately affect tribal and subsistence fishing communities. The SDEIS finds that evapoconcentration of aluminum, copper, and iron would likely contribute to exceedance of water quality objectives to protect aquatic life. The SDEIS also acknowledges that conditions in the proposed reservoir would be conducive to the formation of harmful algal blooms, but the EPA has concerns that the analysis presented may mischaracterize the likelihood and severity of blooms. Furthermore, the EPA believes that the proposed mitigation measures to manage these water quality concerns would not be effective and, in many cases, would conflict with each other. Finally, we have concerns about the modeling approach and presentation of results assessing the effects of Sites Reservoir operations and CVP exchanges on temperature-dependent mortality of listed fish species, including Chinook salmon.

EPA appreciates the opportunity to review this SDEIS. When the Final EIS is released for public review, please send one copy to the address above (mail code: TIP-2). If you have any questions, please contact me at 415-947-4167, or contact Joe Morgan, the lead reviewer for this project, at 415-972-3309 or morgan.joseph@epa.gov.

Sincerely,

Jean Prijatel
Manager, Environmental Review Branch

Enclosure: EPA's Detailed Comments

cc: Melissa Dekar, U.S. Bureau of Reclamation
Vanessa King, U.S. Bureau of Reclamation
Lisa Gibson, U.S. Army Corps of Engineers
Stephen Maurano, NOAA Fisheries
Evan Sawyer, NOAA Fisheries
Diane Riddle, State Water Resources Control Board
Erin Foresman, State Water Resources Control Board
Alicia Forsythe, Sites Project Authority

EPA's DETAILED COMMENTS ON THE SUPPLEMENTAL DRAFT ENVIRONMENTAL IMPACT STATEMENT FOR THE SITES RESERVOIR PROJECT, GLENN AND COLUSA COUNTIES, CALIFORNIA, JANUARY 28, 2022

Operations Modeling and Diversion Criteria

As noted in our 2018 comment letter on the Draft EIS, important components of the Sites Project remain undefined pending outcomes of state funding processes, such as the California Proposition 1 Water Storage Investment Program, including a final Operations Plan. While the impacts of constructing the reservoir are significant, a thorough description of project operations is critical to guiding the environmental analysis presented in the SDEIS, as well as guiding other federal and state permit decisions. The analysis presented in the SDEIS is based on modeled project operations generated by the California Department of Water Resources CalSim-II model, which is modified to include the proposed Sites Reservoir and conveyance facilities operating under specified diversion criteria (p. 2-31). The EPA is concerned that the modeling approach presented in the SDEIS does not represent the best available information on project operations. CalSim-II only evaluates historical hydrology through 2003 and does not include the more recent severe 2012-2016 drought. CalSim-II was replaced by CalSim 3.0 in 2017, which includes historical data through 2015, improved supply and demand estimation, finer spatial resolution, and a daily rainfall-runoff model. These factors suggest that CalSim 3.0 may be more a more appropriate operations model, and better suited to assessing potential effects of climate change on the proposed Sites Reservoir. Additionally, the EPA has concerns that the operating criteria identified on p. 2-31 used to model diversions to Sites are based on state and federal requirements that are currently being revisited.

Recommendations:

In the FEIS, fully describe the finalized operations of the proposed project and ensure that any operations not contemplated in the diversion criteria or CalSim-II results are reflected in the water supply, surface water quality, and aquatic biological resources chapters. Consider using CalSim 3.0 (or most current version) to evaluate whether modeled operations are affected by a longer temporal scope and other improvements over CalSim-II. Conduct a sensitivity analysis to evaluate the sensitivity of operations model results to reasonably foreseeable climate change impacts such as reduced and altered timing of runoff and increased crop and vegetation evapotranspiration.

Consider modifying one alternative to include more stringent diversion criteria to meet Delta outflow objectives and protect Delta beneficial uses. In the 2018 Framework for the Sacramento/Delta Update to the Bay-Delta Plan[1], the State Water Resources Control Board states that existing requirements are insufficient to protect the Bay-Delta ecosystem and proposes new inflow-based Delta outflow objectives of 55% of unimpaired flow withing an adaptive range of 45-65%.

Consider modifying the Bend Bridge Pulse Protection diversion criterion (p. 2-31) to initiate pulse protection proactively using leading indicators, such as river stage forecasts from the National Oceanic and Atmospheric Administration's California-Nevada River Forecast Center, rather than lagging indicators such as visual observation of fish migration.

[1] https://www.waterboards.ca.gov/waterrights/water_issues/programs/bay_delta/docs/sed/sac_delta_framework_070618%20.pdf

Scope of Analysis

While the 2017 DEIS/DEIR analyzed potential impacts of the project on the Trinity River and lower Klamath River, the SDEIS states on p. 2-30 that "the Project would not affect or result in changes in operation of the CVP, [or] Trinity River Division [sic] facilities (including Clear Creek)." It is unclear how this statement is supported. As noted above, diversions and releases from Sites Reservoir would be coordinated with CVP operations, which include the Trinity River Diversion. Proposed CVP exchanges with Lake Shasta would alter CVP operations, which in turn could affect operations of the Trinity River Diversion. Reclamation investment in the project, as high as 25% in Alternative 3, could result in significant amounts of new north-of-Delta CVP storage, utilization of which would likely result in impacts to north-of-Delta CVP operations.

> ***Recommendations:***
> In the FEIS, analyze and disclose how CVP exchanges could alter Trinity River Diversion operations, and how these changes may affect water supply, surface water quality, aquatic biological resources, and tribal trust resources in the Trinity River and lower Klamath basin.
>
> Provide an update on consultation between Reclamation and Klamath Basin tribal governments. Discuss issues that were raised, how those issues were addressed in relation to the proposed project, and how impacts to tribal or cultural resources would be avoided or mitigated, consistent with Executive Order 13175, *Consultation and Coordination with Indian Tribal Governments*, Section 106 of the National Historic Preservation Act, and Executive Order 13007 *Indian Sacred Sites*.

Wetlands and Clean Water Act Section 404

As noted in the EPA's 2018 letter on the Sites Reservoir DEIS, the proposed project would require a permit for the discharge of fill material into waters of the U.S. under Section 404 of the Clean Water Act. The information in Chapter 9 (Vegetation and Wetland Resources) and Appendix 9B (Vegetation and Wetland Methods and Information) of the SDEIS indicates that the estimates of direct (fill) and indirect (inundation) impacts to waters of the U.S. were assessed primarily using interpretation of aerial imagery, and that a protocol-level aquatic resource delineation has not been conducted in the proposed reservoir footprint in over 20 years. Based on the information presented, construction of the reservoir and appurtenant facilities under Alternatives 1 or 3 would result in permanent impacts to approximately 425 acres of wetlands and 234 acres of streams, with impacts under Alternative 2 slightly lower due to a smaller reservoir footprint (p. 9-19, 9-29). These impacts to waters of the United States are jurisdictional under Section 404 of the Clean Water Act and require analyses and findings, such as the determination of a least environmentally damaging practicable alternative (LEDPA), that cannot currently be supported without additional site-specific information which is not provided in Chapter 9. The EPA encourages concurrent analysis of alternatives under NEPA and CWA Section 404 to ensure that the LEDPA is included in NEPA alternatives and can be selected in the Record of Decision. Under the 2008 Mitigation Rule (40 CFR 230.91-98), avoidance, minimization, and compensation for impacts are required for compliance with Section 404 in that order, and compensatory mitigation should be sited properly using a watershed approach to ensure that impacts are appropriately offset. The extent of the impacts to aquatic resources from construction of Sites Reservoir would far exceed any other recent project in the Sacramento Valley; it may prove difficult to compensate for such impacts.

Chapter 9 does not present information on how project operations would affect wetlands along the Sacramento River downstream of water conveyance facilities and in the Sutter and Yolo bypasses other than to conclude that they would not be substantially affected. However, the bypass flow and weir spill analysis in Appendix 11M (Inundated Floodplain and Side-Channel Habitat Analysis, including Yolo and Sutter Bypasses) suggests that project operations would reduce the area of inundated areas in both bypasses and in Sacramento side channel habitat. These areas also include extensive areas of riparian and floodplain wetlands, including pending and approved mitigation banks providing CWA Section 404 mitigation credits.

Recommendations:
In the FEIS, disclose steps taken to achieve compliance with Section 404 of the Clean Water Act and implementing regulations (40 C.F.R. Part 230).

- Using approved protocols, delineate all waters to be affected by the construction of Sites Reservoir and associated facilities, and work with the US Army Corps of Engineers and the EPA to obtain a formal jurisdictional determination.
- To support a LEDPA determination, conduct a formal and reproducible assessment of the condition of aquatic resources in the reservoir footprint using an approved conditional assessment such as the California Rapid Assessment Method (CRAM).[2]
- Identify potential opportunities for compensatory mitigation in the Sacramento River watershed to support development of a Mitigation Plan (40 CFR 230.94(c)) following LEDPA determination.

In the FEIS, update Chapter 9 to include a description of how changes in timing and reductions in bypass and side-channel inundation caused by project operations may affect wetland function outside of the construction footprint.

<u>Sediment Management</u>

As discussed in Chapter 6 (Surface Water Quality), a large proportion of total concentrations of metals and pesticides in Sacramento River water under high discharge conditions are associated with sediments. Construction of the reservoir, access roads, and recreational facilities is also likely to result in erosion and mobilization of sediments in runoff. Sediments from the Sites watershed and Sacramento River would likely accumulate in Sites Reservoir and conveyance facilities, requiring active management and removal of sediment deposits. Conversely, waterbodies such as the Colusa Basin Drain (CBD) used to convey Sites deliveries, would experience higher flows that may increase mobilization of contaminated sediments into sensitive waterbodies like the Yolo Bypass and lower Sacramento River. Movement and resuspension of contaminated sediments can result in longer term ecological impacts via several mechanisms: sediment bioaccumulation into the food web such as for methylmercury and some pesticides, and acute and chronic toxicity resulting from discrete flushes (e.g., fall flush of the CBD through the Yolo Bypass containing higher concentrations of heavy metals and pesticides would directly impact sensitive fish and other aquatic species). The SDEIS proposes best management practices in Appendix 2D (Best Management Practices, Management Plans, and Technical Studies) to ameliorate potential impacts from the project on water and sediment quality. Appendix 2D.3.3 (Metals) also discusses measurement of water quality metal concentrations; it does not specifically call for testing of metal concentrations in sediment or sediment elutriates. Appendix 2D.5 (Sediment Technical Studies Plan), discusses the sediment monitoring program but does not include background screening for potential contaminants of concern (PCOCs) and toxicity.

[2] California Wetland Monitoring Workgroup (CWMW). 2019. Using the California Rapid Assessment Method (CRAM) for Project Assessment as an Element of Regulatory, Grant, and other Management Programs. Technical Bulletin – Version 2.0, 85 pp. https://www.cramwetlands.org/sites/default/files/2019CRAM_TechnicalBulletin.pdf

The Delta Long Term Management Strategy[3] (LTMS) includes a goal of maximizing beneficial reuse of dredged material in the Delta. Appendix 2D includes dredged material testing and disposal commitments. BMP-11 (Management of Dredged Material) states "Prior to dredging, a chemical evaluation of Funks Reservoir water and sediment will be conducted to determine contaminant concentrations. This will help evaluate the suitability of dredged material for beneficial use and determine compliance with water quality standards."

Recommendations:
In the FEIS, include additional design BMPs that hydrologically disconnect, on a permanent basis, the associated existing and proposed new roads from the immediate reservoir watershed to prevent sediment erosion runoff into the reservoir.

To inform the development of a sediment monitoring plan, include an initial screening of metal concentrations in sediments as part of the project's assessment of the presence and movement of metals. Sediment monitoring in the Sacramento River at the Red Bluff Pumping Plant and Hamilton City Pump Station intakes should include a minimum level of sediment quality characterization for conventional contaminants, known PCOCs (especially bioaccumulative compounds), and baseline suspended sediment and solid-phase bioassays. Consider additional sediment monitoring locations at critical waterbody junctions along the project route to establish background levels, such as where Stony Corral Creek outflows and at the furthest downstream point of the CBD before entering the Yolo Bypass.

In the FEIS, set specific dredged material beneficial reuse goals consistent with the LTMS, and commit to placing material in accessible sites to promote beneficial reuse of material. Commit to testing sediment quality according to standardized and acceptable protocols, i.e., the Inland Testing Manual,[4] and evaluated against relevant sediment criteria, such as those used by the SF Bay Dredged Material Management Office for upland beneficial reuse sites. Discuss how placement of dredged material on peat soils would affect subsidence and levee stability. Proactively identify potential sites for dredged material acceptance, including already established sites such as Antioch Dunes, Montezuma Wetland Restoration Project, Cullinan Ranch Restoration Project, and Sherman Island (owned by DWR).

Climate Change

Climate change is already causing severe stresses on California's water supply infrastructure and ecosystems, with hydrologic extremes (both floods and droughts) expected to worsen as storms become more infrequent and intense, and a higher proportion of precipitation occurs as rainfall in important source water basins in the Sierra Nevada mountains.

Climate Effects on Project Operations

While the SDEIS acknowledges the constraints California is already experiencing due to climate change, the EPA is concerned that the analysis in Chapter 28 (Climate Change) does not fully assess the effects of future climate change or support many of its assertions that climate change is likely to result in minor

[3] Delta LTMS is an official Regional Dredging Team established to implement the National Dredging Policy: http://water.epa.gov/type/oceb/oceandumping/dredgedmaterial/aboutactionagenda.cfm
[4] https://dots.el.erdc.dren.mil/guidance.html

changes in Sites Reservoir storage and operations. The analysis uses a model centered on 2035 for hydrology and sea level rise, which, while appropriate for assessing near-term climate effects for analysis of operations of existing water infrastructure, offers less relevant insights for a proposed reservoir which is not expected to begin operating until 2030.

Recommendation: In the FEIS, include an assessment of effects of climate change on project operations using a planning horizon that reflects the timeline of the project, such as the "mid-century" scenario (2045-2074, centered on 2060) analyzed by DWR's Bay-Delta Office for California's Fourth Climate Change Assessment.[5] As noted above, CalSim 3.0 is likely better-suited to assess impacts of climate change on project operations than CalSim-II.

Greenhouse Gases

Man-made reservoirs are a globally important source of anthropogenic greenhouse gas emissions, particularly methane. Chapter 21 (Greenhouse Gases) of the SDEIS states that quantifying greenhouse gas (GHG) emissions generated from land use change to inundated areas requires site-specific assessments which are not available until the Sites Project Authority takes control of the lands. The EPA disagrees that insufficient information is available to estimate GHG emissions from land use change; these GHG emissions may be estimated in the absence of site-specific data, using default emission factors from the International Panel on Climate Change's Guidance for National Greenhouse Gas Inventories and other publicly available data. The 2019 Refinement to the IPCC Guidance for National Greenhouse Gas Inventories[6] includes guidance on calculating carbon dioxide and methane emissions from land converted to flooded lands (Ch. 7.3.2, p.7.20), which can be compared to estimated emissions from land-cover types already known to exist in the reservoir footprint, including wetlands and grazing lands.

Recommendation: In the FEIS, include an estimate of greenhouse gas emissions generated as a result of inundating the lands in the reservoir footprint. If site access prevents collection of site-specific data to quantify net GHG emissions, estimate net emissions using default emissions factors and other available data.

Surface Water Quality

The water quality analysis presented in Chapter 6 indicates that once constructed, Sites would likely experience impaired water quality conditions with high levels of metals, as well as warm and still water conditions conducive to the formation of harmful algal blooms (HABs).

Mercury and Other Metals

Methylmercury production and bioaccumulation is likely in the reservoir, Funks Creek, and Stone Corral Creek; all three waterbodies are expected to exceed the California Office of Environmental Health Hazard Assessment's 0.2 mg/kg wet weight sport fish objective (p. 6-73, 6-74). Modeling results presented in Appendix 6E suggest that Sites Reservoir concentrations of aluminum, copper, and iron would routinely approach or exceed water quality objectives for aquatic life protection, limiting the ability of Sites to provide environmental flows and benefits to receiving waterbodies as proposed. Mitigation measure WQ-1.1 outlines the proposed management of impacts of methylmercury on Sites

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[5] Wang, J., H. Yin, J. Anderson, E. Reyes, T. Smith, and F. Chung. 2018. *Mean and Extreme Climate Change Impacts on the State Water Project*. A report for California's Fourth Climate Change Assessment CCCA4-EXT-2018-004. Accessed 21 January 2021 from https://www.energy.ca.gov/sites/default/files/2019-12/Water_CCCA4-EXT-2018-004_ada.pdf

[6] https://www.ipcc.ch/report/2019-refinement-to-the-2006-ipcc-guidelines-for-national-greenhouse-gas-inventories/

Reservoir and receiving waters and relies on recommendations from a draft staff report[7] that has not yet been approved. Additionally, many of the proposed mitigation measures would conflict with other measures meant to adaptively manage HABs, such as adding nitrate to stimulate algal growth or releasing water from the epilimnion (upper reservoir). The SDEIS also proposes to delay fish stocking to mitigate methylmercury bioaccumulation in reservoir fish; however, we note that delays of planned fish stocking will likely not reduce bioaccumulation unless other measures are taken to significantly inhibit methylmercury production. We further note that unauthorized fish stocking is common in United States and may not be easily preventable once recreational facilities become operational.

Recommendations:

In the FEIS, consider the effects of higher methylmercury concentrations in Sites Reservoir and receiving waters on tribal and subsistence fisherpersons who may not be protected by the 0.2 mg/kg wet weight sport fish objective.

Consider actions under mitigation measure WQ-1.1 that would prevent or inhibit mercury methylation, such as minimizing the frequency of water surface fluctuations which are known to contribute to mercury methylation, or installation of oxygenation systems in the reservoir at construction to better enable hypolimnetic oxygenation.[8]

Provide information regarding the likelihood that Sites Reservoir would not thermally stratify due to low storage in a given year, limiting the ability to mitigate releases of methylmercury and other metals under mitigations measures WQ-1.1 and WQ-2.1

Harmful Algal Blooms

While the EPA concurs with Chapter 6's finding that construction and operation of Sites Reservoir is likely to create conditions conducive to the formation of HABs, the conclusion that there would be no adverse effect does not appear to be supported by the analysis of HAB risks. The SDEIS characterizes HABs as dependent on specific conditions (p. 6-24); we note that these conditions only represent the optimal conditions for planktonic HABs, which can occur outside of optimal conditions, in flowing waters, and can alter buoyancy to obtain nutrients from deep waters.[9] The SDEIS does not consider the potential for benthic HABs which could occur in a reservoir such as Sites.[10] In addition to human health risks, HABs may contribute to degradation of ecosystem structure and function by causing anoxia, bioaccumulation of cyanotoxins in organisms, or directly causing fish mortality.[9]

Table 6-20 presents unadjusted average monthly temperatures derived from CalSIM outputs to assess when warm reservoir temperature conditions would support HABs; we note that this data is inappropriately applied since stratification would support warmer surface temperatures from early summer well into the fall. The SDEIS also incorrectly asserts that microcystin and other cyanotoxins

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[7] *Draft Staff Report for Scientific Peer Review for the Amendment to the Water Quality Control Plan for Inland Surface Waters, Enclosed Bays, and Estuaries of California, Mercury Reservoir Provisions – Mercury TMDL and Implementation Program for Reservoirs* (State Water Resources Control Board 2017b)

[8] Statewide methylmercury control program for reservoirs factsheet. California Water Boards 2013. https://www.waterboards.ca.gov/water_issues/programs/mercury/reservoirs/docs/factsheet.pdf

[9] Graham, J.L., Dubrovsky, N.M., and Eberts, S.M., 2017, Cyanobacterial harmful algal blooms and U.S. Geological Survey science capabilities (ver 1.1, December 2017): U.S. Geological Survey Open-File Report 2016–1174, 12 p., https://doi.org/10.3133/ofr20161174.

[10] FAQ on toxic algal mats. My Water Quality: California Harmful Algal Blooms Portal. https://mywaterquality.ca.gov/habs/resources/benthic_education.html

would undergo rapid photodegradation and would be unlikely to affect downstream waters (p. 6-92); cyanotoxins produced in reservoir HABs commonly persist for weeks or months, and cyanobacteria released into downstream waters can travel downstream to inoculate receiving waterbodies.[11] No separate mitigation measures are proposed to manage HAB impacts, although the Reservoir Management Plan (p. 2D-30) describes a general HAB monitoring plan and actions to be taken to protect public health if trigger criteria are exceeded, including releasing water from deeper in the reservoir. Throughout the bloom season, monitoring for cyanobacteria species and cyanotoxins is critical to ensure appropriate protective measures are in place to address the cyanobacteria species and cyanotoxin concentrations present.

Recommendations:
In Chapter 11 of the FEIS, update Impact FISH-18 to include an assessment of the effects of HABs and resulting anoxia on reservoir fish in Sites Reservoir.

Revise the Reservoir Management Plan to improve HAB monitoring. We recommend monitoring occur more frequently than monthly near the start of the bloom season to identify blooms, implement management measures as quickly as possible and extend monitoring until the bloom ends, usually occurring upon reservoir turnover in late fall/early winter (not October as speculated on p. 2D-31). Base the assessment of the presence of cyanobacteria on:

- cell density OR cyanotoxin concentrations as trigger levels (not "and" as is proposed).
- both planktonic (water column) and benthic HABs;
- other indicators of benthic HABs, beyond confirmation by microscopy, such as the observation of benthic HABs or detached mats, or the detection of cyanotoxins characteristic of benthic HABs (e.g., anatoxin-a).
- California Cyanobacteria and Harmful Algal Bloom Network Trigger Levels,[12] as amended, or updated. The California Water Quality Monitoring Council periodically updates the guidelines and trigger levels to reflect evolving understanding of HABs.

In the FEIS, identify criteria to determine the appropriate depth to avoid HAB releases and describe how these multiple factors will be balanced and prioritized if no single depth interval meets release criteria for temperature, HABs, and metals. Describe how appropriate depth levels for water releases from the Sites I/O works will be determined in a way that allows for providing warm epilimnetic water for rice production while avoiding releasing cyanobacteria and cyanotoxins (likely to occur in the epilimnion during rice growing season) and avoiding releases of methylmercury and other metals (likely to occur in higher concentrations in the hypolimnion).

<u>Temperature Effects on Native Salmonids</u>

As noted in the EPA's 2018 letter on the Sites DEIS, operation of the proposed reservoir could affect temperature-dependent mortality of Endangered Species Act (ESA) listed fish species in the Sacramento River and its tributary streams, including Chinook salmon. Exchanges with Lake Shasta and Lake Oroville could help maintain the cold water pool needed to support salmonid spawning and rearing

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[11] Otten, T.G., Crosswell, J.R., Mackey, S. and Dreher, T.W., 2015. Application of molecular tools for microbial source tracking and public health risk assessment of a Microcystis bloom traversing 300 km of the Klamath River. Harmful Algae, 46, pp.71-81.

[12] California Guidance for Cyanobacteria HABs in Recreational Inland Waters, https://mywaterquality.ca.gov/habs/resources/habs_response.html

habitats, and a robust analysis of the project's potential effects on temperature-dependent mortality is critical for understanding potential benefits of improved temperature conditions for salmonids.

The EPA is concerned that the temperature analysis presented in Chapter 11 (Aquatic Biological Resources) and Appendix 11D (Fisheries Water Temperature Assessment) relies on models – Interactive Object-Oriented Simulation (IOS) and Oncorhynchus Bayesian Analysis (OBAN) – that are proprietary and not transparent and may not be as robust as other available models, such as NOAA's Winter Run Life Cycle Model (WRLCM). There also appear to be multiple instances where Appendix 11D gives apparently conflicting results with a higher number of days exceeding temperature thresholds yet lower or unchanged average temperatures, or vice versa (for example, see Tables 11D-3, 11D-80, 11D-86, 11D-164). As noted above, EPA also has concerns about the robustness and responsiveness of the CalSim-II operations modeling approach which underlies much of the analysis presented in the SDEIS. Understanding the effects of climate change on temperature-dependent mortality in ESA listed salmonids is critical to understanding the potential effects of the project, but CalSim-II modeling has a temporal scale ending in 2003, prior to the 2012-2016 drought and ongoing drought which have resulted in significant salmon mortality.

The SDEIS concludes that there would be no adverse effect on native salmonid species, which appears to be unsupported by the modeling results presented in Chapter 11 and Appendix 11D. The modeling results are presented as monthly averages, which may reduce the impact of high values and could suppress real temperature trends, in particular trends occurring across temperature transition months (e.g., April-May and October-November). We are also concerned that the modeling results are presented as single values without confidence intervals – all models have inherent uncertainty and knowing the range of plausible values is critical for risk evaluation and disclosure to the public and decision-makers.

Although the tables in Appendix 11D and the assessment in Chapter 11 consider the relative increase of thermal stress of the Alternatives, there does not appear to be a robust quantitative description of the level of thermal stress expected on salmon or the other fish species under the no action alternative. Such information provides critical context on the overall impact that would occur as a result of the alternatives. While it is useful to understand how project alternatives will affect temperature relative to the no-action alternative, understanding baseline and future temperature stress on native fish is crucial to contextualizing project impacts and evaluating potential tipping points.

Recommendations:

Clarify the apparently conflicting model results in Appendix 11D and consider analyzing temperature effects on fisheries using an alternative modeling approach, such as the WRLCM. The WRLCM's strengths include significant transparency (including documentation of stakeholder input on model development and applications), state of the art temperature dependent mortality modeling, highly detailed modeling of Yolo Bypass, and high frequency data of Delta tidal and export conditions in assessing passage and survival.

Conduct a temperature analysis over the period from 2003 to present, in addition to the period presented in Chapter 11 and Appendix 11D. This more recent hydrograph information is likely more representative of future conditions and could provide more accurate information on instream temperature and extent and frequency of temperature impacts. Additionally, given the greater resolution of a shorter period, analysis of 2003 to present would likely provide greater model response.

Present modeling results averaged over a shorter timeframe in the FEIS for April-May and October-November. Regardless of which biological models are used, include in the assessment results an analysis of uncertainty with confidence intervals or some other measure of the range of plausible output values.

Describe the level of thermal stress expected under the no-action alternative (NAA) as compared to known species life stage temperature thresholds used in the Appendix 11D. Such an analysis of existing thermal stress (i.e., comparison of the temperatures under the NAA to the temperature thresholds) should also be considered for the more recent period of 2003 to the present (see above comment).