State of California – Natural Resources Agency
DEPARTMENT OF FISH AND WILDLIFE
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EDMUND G. BROWN JR., Governor
CHARLTON H. BONHAM, Director

May 23, 2018

Joseph Yun
Executive Officer
California Water Commission
P.O. Box 942836
Sacramento, CA 94236-0001

Dear Mr. Yun:

RELATIVE ENVIRONMENTAL VALUE OF WATER STORAGE INVESTMENT PROGRAM PROJECTS AND DEPARTMENT FINDINGS

Thank you for your leadership during this process. As you know, the California Department of Fish and Wildlife (Department) is tasked with the responsibility of making recommendations to the California Water Commission (Commission). I acknowledge the complexity of the process has been challenging for you, Commissioners, the reviewing agencies, and each applicant. No one has tried a competitive approach to water storage on such a scale before. The good news is that the Commission and applicants are as close as ever to adding much needed water storage capacity through a portfolio of different types of projects across a diverse geography.

This competitive approach must adhere to the controlling statute and the implementing regulations. At each step of your process, our Department has always based our recommendations on the plain instructions in the statute and the regulations. All of the current applicants, as members of a broad-based stakeholder advisory group, helped develop these regulations during a two-year dialogue. At the last Commission meeting, the Department's recommendations to the Commission on monetized ecosystem benefits to include in the public benefit ratio calculations were discussed. This package contains our next assignment under the regulations related to our calculation of relative environmental value for the ecosystem improvements of a project and preliminary findings. However, as I describe at the end of this letter, each applicant retains an important obligation to complete due diligence for their projects promptly.

Pursuant to the Water Storage Investment Program (WSIP) regulations, this letter and attachments transmit to California Water Commission (Commission) staff (1) the relative environmental value scores calculated by the California Department of Fish and Wildlife (Department) and (2) the Department's findings on the public benefits claimed by each WSIP project. The WSIP regulations require the Department to calculate a relative environmental value for ecosystem improvements, based on information supplied in each project's application. (Cal. Code Regs. tit. 23, § 6007, subd. (c).) Additionally, if the Department "finds the public benefits as described in a project's application meet all of the requirements of Water Code section 79750 *et seq.* for which the reviewing

agency is responsible, the reviewing agency shall provide to the Commission a written statement confirming the finding." (Cal. Code Regs., tit. 23, § 6012, subd. (d).) This finding is a "preliminary assessment of public benefits based on information supplied in the application that indicates that a project's public benefits meet the requirements of Water Code section 79750 *et seq.*" (Cal. Code Regs., tit. 23, § 6012, subd. (a).)

For each ecosystem benefit quantified, project applications were required to identify at least one applicable ecosystem priority listed in section 6007, subdivision (c), of the WSIP regulations. (Cal. Code Regs., tit. 23, § 6003, subd. (a)(1)(Q).) The Department applied the 10 relative environmental value criteria outlined in Table 2 of section 6007, subdivision (c)(1)(A)(1), to score each of the ecosystem priorities identified by the applicant. Based on information supplied in the application, the Department considered information supporting ecosystem benefits including the analytical methods, modeling results, and physical, chemical, or biological information. (Cal. Code Regs., tit. 23, § 6007, subd. (c)(1)(A)(1).) Section 6007, subdivision (c)(1)(A)(2), states the score shall be assigned by evaluating the degree of change between with- and without-project conditions, and the degree to which ecosystem improvements associated with each claimed priority would be provided by a project.

The relative environmental value scores reflect the Department's critical and thorough evaluations of project applications and include comments to the Commission and its staff that address the many aspects of the projects as proposed. The Department's analysis contained in this package is consistent with our analysis related to public benefits.

The Department recognizes that the projects in many cases have a long history in water management planning in California, and have additional steps in front of them that will refine the projects, reduce uncertainties, and further inform the Commission's decisionmaking. The regulations emphasize the preliminary nature of the findings submitted to you today, and the fact that changes may occur after a reviewing agency's findings. (Cal. Code Regs., tit. 23, § 6012(g).) Moreover, prior to the Commission encumbering funding, each successful applicant must enter into enforceable contracts for public benefits and non-public benefit cost shares, complete feasibility studies and environmental documentation, obtain all required federal, state, and local approvals, and provide extensive additional information to the Commission, as applicable, on items including labor compliance, urban water management plans, agricultural water management plans, and groundwater management plans or GSP(s). (Cal. Code Regs., tit. 23, § 6013(a)(1), (c).)

This letter and attachments represent the completion of the Department's technical review of WSIP projects for the purpose of contributing toward the maximum conditional eligibility determination of each project that the Commission must make. The Department looks forward to continuing to work with the Commission and project

applicants in the next phase of the WSIP.

Sincerely,

Charlton H. Bonham
Director

Encl: CDFW Findings on WSIP Public Benefits, Relative Environmental Value Scores, Technical Review Comments

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Temperance Flat Reservoir – Relative Environmental Value Score

Project Overview

The San Joaquin Valley Water Infrastructure Authority (Applicant) is proposing the Temperance Flat Reservoir Project (Project), to be located on the San Joaquin River in Madera and Fresno Counties. The Project would construct an on-stream dam and reservoir above Friant Dam, and partially within the footprint of Millerton Reservoir, adding approximately 1.26 million acre-feet of additional surface water storage on the San Joaquin River. The Project would capture and store water that would otherwise be released as flood flows from Friant Dam, to provide increased water deliveries to water users during the irrigation season. Most flows would be captured during normal wet and wet water years. The Applicant states that the Project will provide temperature and flow benefits to spring-run and fall-run Chinook, as well as additional water deliveries to wildlife refuges.

Ecosystem Priorities Identified by the Applicant

The Applicant has identified the following ecosystem priorities:

- Priority 1 – Provide cold water at times and locations to increase the survival of salmonid eggs and fry.
- Priority 2 – Provide flows to improve habitat conditions for in-river rearing and downstream migration of juvenile salmonids.
- Priority 3 – Maintain flows and appropriate ramping rates at times and locations that will minimize dewatering of salmonid redds and prevent stranding of juvenile salmonids in side channel habitat.
- Priority 4 – Improve ecosystem water quality.
- Priority 6 – Increase attraction flows during upstream migration to reduce straying of anadromous species into non-natal tributaries.
- Priority 9 – Enhance flow regimes or groundwater conditions to improve the quantity and quality of riparian and floodplain habitats or aquatic and terrestrial species.
- Priority 10 – Enhance the frequency, magnitude, and duration of floodplain inundation to enhance primary and secondary productivity and the growth and survival of fish.
- Priority 11 – Enhance the temporal and spatial distribution and diversity of habitats to support all life stages of fish and wildlife species.
- Priority 12 – Enhance access to fish spawning, rearing, and holding habitat by eliminating barriers to migration.
- Priority 14 – Provide water to enhance seasonal wetlands, permanent wetlands, and riparian habitat for aquatic and terrestrial species on State and Federal wildlife refuges and on other public and private lands.

- Priority 15 – Develop and implement invasive species management plans utilizing techniques that are supported by best available science to enhance habitat and increase the survival of native species.

The California Code of Regulations requires the California Department of Fish and Wildlife (Department) to apply 10 Relative Environmental Value (REV) criteria to score each of the priorities that an applicant claims would be provided by a project. (Cal. Code Regs., tit. 23, § 6007, subd. (c)(1)(A)(1).) Based on the information provided in the application, the Department scored each ecosystem priority listed above to determine the ecosystem REV score shown below. To implement REV Criterion 1, the Department has developed a standard calculation to assign points based on the number of ecosystem priorities a project has claimed. For each priority claimed, the Department added 0.375% to a project's final ecosystem REV score. REV Criterion 2 through 10 were each scored on a scale of 0 to 6. Detailed scores are provided in Table 1. A summary of comments for each Priority-REV combination is provided in Temperance Flat Reservoir – Technical Review Comments.

REV Score Summary

Total Points Possible	594
Total Points Received	151.3
Additional % for Number of Ecosystem Priorities (REV Criterion 1)	4.1%
Total REV Score	**29.6%**

Temperance Flat Reservoir Project – Technical Review Comments

REV Criterion 1 (Number of different ecosystem priorities claimed)

To implement Relative Environmental Value (REV) Criterion 1, the California Department of Fish and Wildlife (Department) has developed a standard calculation to assign points based on the number of ecosystem priorities a project has claimed. For each priority claimed, the Department added 0.375% to the final REV score. The Department has applied the standard calculation to each of the projects.

In its application for funding under the Water Storage Investment Program, the San Joaquin Valley Water Infrastructure Authority (applicant) identified eleven ecosystem priorities for the Temperance Flat Reservoir Project (Project). The calculation described above resulted in an increase of 4.1% for the Project's ecosystem REV score. The Department applied the other nine REV criteria to each priority identified by the applicant. The Department's evaluation of each priority is described below.

Priority 1 - Provide cold water at times and locations to increase the survival of salmonid eggs and fry.

Priority 1 – REV Criterion 2 (Magnitude of ecosystem improvements) Score = 1.6

The Project proposes that it would provide a temperature benefit by reducing the number of days with temperatures above the threshold of 13° Celsius (C), at which negative impacts begin to occur to incubation and emergence life stages of salmonids, for the with-Project conditions compared to without-Project conditions. The Project would provide cold water benefits primarily in the uppermost reaches of the San Joaquin River Restoration Program (SJRRP) area (Reaches 1A and 1B). However, the magnitude of this benefit is diminished because the with-Project modeling shows temperatures increasing above without-Project conditions in all reaches at times that could detrimentally impact various spring-run Chinook life stages. Specifically, under the 2030 climate scenario, the Project would increase temperatures above without-Project conditions in Reach 1A and 1B, where spawning and incubation is projected to primarily occur, for more than six months of the year in dry, normal dry, and normal wet years, while increasing temperatures approximately five months of the year in wet years. Under the 2070 climate scenario, the Project would increase temperatures above without-Project conditions in Reach 1A for more than four months of the year in all water year types, while increasing temperatures in Reach 1B for three months of the year in dry years, and four months of the year in normal dry, normal wet, and wet years. In many months, the increases in temperature under the with-Project scenario would result in temperatures just below the 13° Celsius (C) threshold, at which negative impacts begin to occur to incubation and emergence life stages of salmonids. All models inherently contain varying degrees of error. The hydrologic model, reservoir temperature model, and subsequent river temperature model used by the applicant feed into one another, and therefore the error from the preceding model feeds into the next model. Thus, it is reasonable to assume that temperatures could vary from the results reported in the application. The temperature fluctuations resulting from Project operations range between a 1-3° C change in temperature. Recognizing that there is a range of error in the temperature results, the 13° C threshold could potentially be exceeded more often than indicated in the application. As such, temperature improvements could be less than predicted. Overall, in light of the persistent modeled increases in temperatures resulting from the Project, the magnitude of the claimed benefit likely would be minimal.

Priority 1 – REV Criterion 3 (Spatial and temporal scale of ecosystem improvements) Score = 2.0

The application identifies all reaches of the SJRRP area as the extent of the ecosystem benefit. However, results from the temperature modeling show that the flows provided by the Project would only improve temperature conditions in the uppermost reaches of the SJRRP area. At times the Project would diminish temperature conditions in all reaches of the SJRRP area. The times during which temperature improvements are shown in Reaches 1A and 1B overlaps with the timing of spawning for both spring-run and fall-run Chinook. However, Project operations would also increase temperature in the SJRRP area's same reaches during much of the incubation and emergence period for both spring-run and fall-run Chinook.

Priority 1 – REV Criterion 4 (Inclusion of an adaptive management and monitoring program that includes measureable objectives, performance measures, thresholds, and triggers to achieve the ecosystem benefits) Score = 1.4

The adaptive management plan provided with the application primarily describes the SJRRP adaptive management framework, but provides little detail on the adaptive management plan that would be developed as part of the Project. The application states that the Project's adaptive management plan would include access to SJRRP-collected data and evaluations, such as water temperature, quality, and flow, but does not state how the Project would use this data to adaptively manage Project operations. The application states that more detailed monitoring and management programs would be developed by the Project, as necessary, to identify specific methods of implementation, including exact monitoring locations, standards for data collection, guidelines for implementation of long-term management actions, and provisions to adjust the timing of deliveries for downstream diversion to refuges to achieve ecosystem improvements. However, the application does not include any detail describing how the Project would develop measurable objectives and performance measures or establish thresholds and triggers to adaptively manage Project operations, in order to maintain and improve upon the claimed ecosystem benefits. The Project provides no explanation as to how operational decisions will be made if physical parameters and biological responses fall outside the range of anticipated benefits. The applicant did not provide an explanation of the environmental uncertainties relevant to the claimed ecosystem benefit that would be included in the adaptive management plan. The application does not identify funding sources that would be made available for the formation and implementation of an adaptive management plan. Additionally, the application does not discuss the adaptive management plan in the specific context of providing cold water at times and locations to increase the survival of salmonid eggs and fry.

Priority 1 – REV Criterion 5 (Immediacy of ecosystem improvement actions and realization of benefits) Score = 1.4

The application states that operational storage capacity for the Project would be available upon completion of the sixth year of construction in 2030, or 96 months following grant encumbrance in January 2022. According to the application, additional flow and cold water would be available immediately upon completion of the sixth year of construction in 2030. The application states that the volume of cold water available would be dependent on the hydrologic conditions and water year type experienced in the watershed during the last three years of the construction period, when reservoir filling would occur. However, the application does not provide any support for the claim that the reservoir would fill to the point that it could begin providing temperature and flow benefits in 2030. Additionally, the application contains a statement that additional flow and cold water would be made

available prior to completion of the Project, but does not provide any documentation to indicate when this additional flow and cold water would fully deliver the claimed ecosystem benefit as described.

Priority 1 – REV Criterion 6 (Duration of ecosystem improvements) Score = 1.8

The application states that the Project would provide 94 years of ecosystem improvements, equivalent to the life of the Project. However, the duration of the ecosystem benefit is dependent on whether the benefit would occur. Low confidence in the claimed ecosystem benefit results in low confidence in the duration of the benefit.

Priority 1 – REV Criterion 7 (Consistency with species recovery plans and strategies, initiatives, and conservation plans) Score = 1.6

The application identifies several species recovery plans and strategies, initiatives, and conservation plans that apply to the benefit described under this priority. The application states that the Project would be consistent with the following goals and actions including:

SJRRP Goals:

- Restoration Goal - To restore and maintain fish populations in "good condition" in the restoration area, including naturally reproducing and self-sustaining populations of salmon and other fish.
- Water Management Goal – To reduce or avoid adverse water supply impacts on all of the Friant Division long-term contractors that may result from the Interim and Restoration flows provided for in the Settlement.

2015 California Statewide Wildlife Action Plan:

- Goal 1 – Abundance and richness: Maintain and increase ecosystem and native species distributions in California while sustaining and enhancing species abundance and richness.
- Goal 2 – Enhance ecosystem conditions: Maintain and improve ecological conditions vital for sustaining ecosystems in California.
- Goal 3 – Enhance ecosystem functions and processes: Maintain and improve ecosystem functions and processes vital for sustaining ecosystems.

California Water Action Plan:

- More reliable water supplies.
- The restoration of important species and habitat.
- A more resilient, sustainably managed water resources system (water supply, water quality, flood protection, and environment) that can better withstand inevitable and unforeseen pressures in the coming decades.

2014 Westside-San Joaquin Integrated Water Resources Plan:

- Provide reasonable opportunity to advance ecosystem restoration through balanced project implementation.
- Develop regional solutions that protect environmental and habitat concerns and provide potential for improvement.
- Improve South-of Delta water supply reliability by an average of 25%.

However, low confidence in the claimed ecosystem benefit results in low confidence that the ecosystem improvement provided by the Project would contribute to the goals and objectives of the plans described.

Priority 1 – REV Criterion 8 (Location of ecosystem improvements and connectivity to areas already being protected or managed for conservation values) Score = 1.2

The application states that the Project is ideally located to manage flows and water temperature conditions on the San Joaquin River immediately downstream from Friant Dam. Given the Project's location just above the SJRRP area, it would be appropriately located to provide flow and temperature improvements. However, the documentation provided in the application indicates that the Project would, at times, detrimentally impact flow and temperature in the SJRRP area and possibly downstream of the SJRRP area. Consequently, the Project could negatively affect areas being managed for conservation values.

Priority 1 – REV Criterion 9 (Efficient use of water to achieve multiple ecosystem benefits) Score = 0.6

The application states that water supplies developed by the Project would be managed to provide multiple benefits. Further, the application states that all ecosystem improvements addressed in each ecosystem priority would be incidentally realized through the Project's water deliveries. Thus, the application states that efficient use of water would simultaneously provide benefits to Ecosystem Priorities 1, 2, 3, 4, 6, 9, 10, 11, 12, 14, and 15. However, there is low confidence in the ecosystem benefits provided by the Project except for the delivery of Incremental Level 4 (IL4) water deliveries for wildlife refuges.

Priority 1 – REV Criterion 10 (Resilience of ecosystem improvements to the effects of changing environmental conditions, including hydrologic variability and climate change) Score = 1.8

The application states that the Project siting, design, and operations account for temperature changes, drought events, flooding events, changes in precipitation, and climate change. However, the application provides no further discussion of how these changing environmental conditions were considered with respect to this ecosystem priority and ensuring realization of the benefit in light of such conditions. Additionally, there is low confidence in the magnitude of the claimed ecosystem priority. Thus, there is low confidence in the resiliency of the proposed ecosystem improvement to the effects of changing environmental conditions, including hydrologic variability and climate change.

Priority 2 – Provide flows to improve habitat conditions for in-river rearing and downstream migration of juvenile salmonids.

Priority 2 – REV Criterion 2 (Magnitude of ecosystem improvements) Score = 0.6

The application provides Ecosystem Diagnosis and Treatment (EDT) modeling results to demonstrate that the flows provided by the Project would improve habitat conditions for in-river rearing and downstream migration of spring-run Chinook salmon. The EDT model incorporates the results from the river temperature model, which in turn incorporates results from the Project's reservoir temperature model, to represent temperature conditions under the with-Project scenario. Additionally, the EDT model incorporates the results from the Project's hydrologic modeling to represent flow under the with-Project scenario. Error from the hydrologic and temperature modeling results directly feeds into and affects the results produced by the EDT model. Results from the EDT model reflect the overall fishery benefits for spring-run Chinook projected by the applicant. However, the application does not provide a discussion of how the EDT model incorporates providing flows to improve habitat conditions for in-river rearing and downstream migration of juvenile salmonids and how or whether the claimed benefit provided by the improvement in flow contributes to the model results. Thus, the Department was unable to assess the magnitude of the claimed ecosystem benefit in terms of this priority. The EDT

model results also do not provide any indication of what the magnitude of the claimed ecosystem benefit would be for fall-run Chinook.

As discussed under Priority 1, the Project would also increase temperatures in all other reaches of the SJRRP area, and likely below the confluence of the San Joaquin and Merced Rivers. The applicant did not provide analysis of temperature impacts below the Merced River. However, temperature tends to increase as water moves downstream. Thus, if temperatures in the lower reaches of the SJRRP area increase due to Project operations, it is reasonable to assume that Project operations would result in temperature increases below the Merced River. The application identifies temperature thresholds for negative impacts to in-river rearing for spring-run Chinook of 16 ° C and 18° C for emigration of spring-run and fall-run Chinook. Documentation provided with the application shows that Project operations would result in temperature increases beyond these thresholds at times that coincide with time periods in which cold water would be needed for in-river rearing of spring-run Chinook and emigration of spring-run and fall-run Chinook. The analysis shows that these temperature increases are primarily due to reductions in flow resulting from Project operations. Thus, temperature impacts caused by the Project would likely degrade habitat conditions for in-river rearing and downstream migration of juvenile salmonids. Additionally, Project operations would reduce flows in the lower portion of the San Joaquin River in wet years, which could result in a decrease in the frequency of floodplain inundation, which would potentially impact rearing habitat for juvenile Chinook.

For the reasons described above, the magnitude of the claimed ecosystem benefit is likely minimal.

Priority 2 – REV Criterion 3 (Spatial and temporal scale of ecosystem improvements) Score = 1.0

The application lists all of the reaches in the SJRRP area as the spatial extent of the ecosystem benefit and provides figures illustrating the timing of when the Project would provide flows. The documentation provided with the application indicates that while the Project does provide increases in flow at times that would benefit in-river rearing and downstream juvenile salmonid migration, it would also reduce flow at other times that also occur within these same life stages.

Priority 2 – REV Criterion 4 (Inclusion of an adaptive management and monitoring program that includes measureable objectives, performance measures, thresholds, and triggers to achieve the ecosystem benefits) Score = 1.4

See comments under Priority 1 – REV Criterion 4.

Priority 2 – REV Criterion 5 (Immediacy of ecosystem improvement actions and realization of benefits) Score = 1.2

The application states that operational storage capacity for the Project would be available upon completion of the 6th year of construction in 2030, or 96 months following grant encumbrance in January 2022. According to the application, additional flow and cold water will be available immediately upon completion of the 6th year of construction in 2030. The application states that the volume of cold water available would be dependent on the hydrologic conditions/water year type experienced in the watershed during the last three years of the construction period when reservoir filling would occur. However, the application does not provide any support for the claim that the reservoir would fill to the point that it could begin providing temperature and flow benefits in 2030. Additionally, the documentation provided with the application does not directly discuss the immediacy or realization of the benefit being claimed under this ecosystem priority.

Priority 2 – REV Criterion 6 (Duration of ecosystem improvements) Score = 1.8

See comments under Priority 1 – REV Criterion 6.

Priority 2 – REV Criterion 7 (Consistency with species recovery plans and strategies, initiatives, and conservation plans) Score = 1.6

See comments under Priority 1 – REV Criterion 7.

Priority 2 – REV Criterion 8 (Location of ecosystem improvements and connectivity to areas already being protected or managed for conservation values) Score = 1.4

The application states that the Project is ideally located to manage flows and water temperature conditions on the San Joaquin River immediately downstream from Friant Dam. Given the Project's location just above the SJRRP area, it would be well located to provide flow and temperature improvements. However, the documentation provided in the application indicates that the Project would, at times, detrimentally impact flow and temperature in, and possibly downstream of the SJRRP area. Additionally, the application does not discuss the benefit provided by the location of the Project in the context of this claimed ecosystem benefit. The application describes how the Project is hydrologically connected to the SJRRP area and would provide IL4 refuge water, in dry and critically dry years, to wildlife refuges adjacent to, or near the San Joaquin River, downstream from the Project. The connectivity between the Project and wildlife refuges would allow for the delivery of IL4 refuge water, which would provide a benefit to wildlife refuges in dry and critically dry years. However, this connectivity is not applicable to the claimed ecosystem benefit.

Priority 2 – REV Criterion 9 (Efficient use of water to achieve multiple ecosystem benefits) Score = 0.6

See comments under Priority 1 – REV Criterion 9.

Priority 2 – REV Criterion 10 (Resilience of ecosystem improvements to the effects of changing environmental conditions, including hydrologic variability and climate change) Score = 1.8

See comments under Priority 1 – REV Criterion 10.

Priority 3 – Maintain flows and appropriate ramping rates at times and locations that will minimize dewatering of salmonid redds and prevent stranding of juvenile salmonids in side channel habitat.

Priority 3 – REV Criterion 2 (Magnitude of ecosystem improvements) Score = 1.2

The application states that Project operations would help to minimize dewatering of Chinook redds and prevent stranding of juvenile Chinook in side channel habitat by eliminating the need for flood releases in late spring and early summer. The application states that flood releases could cause rapid dewatering of Chinook redds and strand juveniles in side channels. However, the application does not provide documentation to support the claim that ramping rates associated with flood flows are or would be a problem under without-Project conditions for both the dewatering of Chinook redds and the stranding of juvenile Chinook in side channel habitats. This is currently an uncertainty, given that only test populations of spring-run Chinook are present in the SJRRP area and fall-run are currently unable to access the area due to migration barriers.

The application uses EDT model results to demonstrate the magnitude of the claimed ecosystem improvement. Results from the EDT model reflect the overall fishery benefits for spring-run Chinook projected by the applicant. However, the application does not provide a discussion to demonstrate how the EDT model incorporated maintenance of flows and appropriate ramping rates at times and locations that will minimize dewatering of salmonid redds and prevent stranding of juvenile salmonids in side channel habitat and how or whether the maintenance of flow and ramping rate claimed benefit contributes to the model results. Therefore, there is low confidence in EDT model results presented as evidence that the Project will maintain flows and appropriate ramping rates at times and locations that will minimize dewatering of salmonid redds and prevent stranding of juvenile salmonids in side channel habitat. The EDT model results also do not provide any indication of what the magnitude of the claimed ecosystem benefit would be for fall-run Chinook.

Priority 3 – REV Criterion 3 (Spatial and temporal scale of ecosystem improvements) Score = 1.6

The information provided states salmonid redds and in-river juveniles are expected to occur primarily in Reach 1 of the SJRRP area, and juvenile migration will occur in all five reaches of the SJRRP area. The application provides documentation to show that flood releases would occur at the end of June and July under without-project conditions. The application states that these rapid spikes of flow released for flood control disrupt riparian recruitment, and could cause rapid dewatering of salmonid redds and strand juveniles in side channel habitat. As stated in REV Criterion 2, the application does not provide any documentation to indicate that this currently is or would be a problem under without-Project conditions. With respect to timing, salmonid redds would not be present in the river in June and July, as spring-run Chinook emerge from redds from November to March and fall-run Chinook emerge from redds from mid-November to late-January. By June and July most if not all juvenile fall-run Chinook would have emigrated out of the system. The only life stage that could possibly experience a temporal benefit from the capture of flood flows is juvenile spring-run Chinook, because a portion of the juvenile spring-run Chinook populations would likely be present in the SJRRP area as yearlings. However, no documentation was provided to demonstrate that uncaptured flood flows would lead to the stranding of juvenile Chinook under without-Project conditions.

Priority 3 – REV Criterion 4 (Inclusion of an adaptive management and monitoring program that includes measureable objectives, performance measures, thresholds, and triggers to achieve the ecosystem benefits) Score = 1.4

See comments under Priority 1 – REV Criterion 4.

Priority 3 – REV Criterion 5 (Immediacy of ecosystem improvement actions and realization of benefits) Score = 1.4

See comments under Priority 2 – REV Criterion 5.

Priority 3 – REV Criterion 6 (Duration of ecosystem improvements) Score = 1.8

See comment under Priority 1 – REV Criterion 6.

Priority 3 – REV Criterion 7 (Consistency with species recovery plans and strategies, initiatives, and conservation plans) Score = 1.4

See comments under Priority 1 – REV Criterion 7.

Priority 3 – REV Criterion 8 (Location of ecosystem improvements and connectivity to areas already being protected or managed for conservation values) Score = 1.6

See comments under Priority 2 – REV Criterion 8.

Priority 3 – REV Criterion 9 (Efficient use of water to achieve multiple ecosystem benefits) Score = 1.2

See comments under Priority 1 – REV Criterion 9.

Priority 3 – REV Criterion 10 (Resilience of ecosystem improvements to the effects of changing environmental conditions, including hydrologic variability and climate change) Score = 1.6

See comments under Priority 1 – REV Criterion 10.

Priority 4 – Improve ecosystem water quality.

Priority 4 – REV Criterion 2 (Magnitude of ecosystem improvements) Score = 0.8

The application states that the Project would provide water quality benefits by improving temperature, reducing concentrations of salinity, dissolved solids, selenium, and various pesticides, and increasing dissolved oxygen levels. Comments regarding the Department's review of the temperature benefit are discussed in detail in Priorities 1 and 2. The application states that increases in flow provided by the Project would, through increased dilution, reduce concentrations of salinity, dissolved solids, selenium, and various pesticides, while increases in dissolved oxygen levels would result from decreases in temperature provided by the Project. However, no analysis or supporting documentation is provided to support the claim that increased flows would reduce salinity, dissolved solids, selenium, and various pesticides from without-Project conditions, or that decreases in temperature from Project operations would increase dissolved oxygen. The application cites the results from the EDT model in support of the claimed ecosystem benefit. Results from the EDT model reflect the overall fishery benefits for spring-run Chinook projected by the applicant. However, the application does not provide a discussion that indicates how the EDT model incorporates improving ecosystem water quality and how or whether Project-related improvements to ecosystem water quality contribute to the model results. Therefore, there is low confidence in EDT model results presented as evidence that the Project will improve ecosystem water quality.

Priority 4 – REV Criterion 3 (Spatial and temporal scale of ecosystem improvements) Score = 1.6

The Project's temperature benefits would primarily be realized in Reach 1A of the SJRRP area, while at times the Project would increase temperatures in the downstream reaches. The application provided no documentation on the spatial extent of the proposed improvements to salinity, dissolved solids, selenium, various pesticides, and dissolved oxygen levels. The timing of the temperature improvements provided by the Project would coincide with portions of the spawning, incubation, and rearing Chinook life stages. Temperature improvements are displayed as the average increase in the number of days in which the temperatures would remain below a certain temperature threshold, under with-Project conditions versus without-Project conditions, by water year type. However, the application does not show whether these temperature improvements equate to continuous days of improvement throughout the critical Chinook life stages, or if these discrete days of improvement may fluctuate between long periods when temperature would exceed critical thresholds. Additionally, the timing of modeled temperature decreases coincides in some years with increases in temperature caused by the Project in other reaches of the SJRRP area. The application provided no documentation on the temporal improvement for salinity, dissolved solids, selenium, various pesticides, and dissolved oxygen levels.

Priority 4 – REV Criterion 4 (Inclusion of an adaptive management and monitoring program that includes measureable objectives, performance measures, thresholds, and triggers to achieve the ecosystem benefits) Score = 1.4

See comments under Priority 1 – REV Criterion 4.

Priority 4 – REV Criterion 5 (Immediacy of ecosystem improvement actions and realization of benefits) Score = 1.4

The application states that operational storage capacity for the Project would be available upon completion of the sixth year of construction in 2030, or 96 months following grant encumbrance in January 2022. According to the application, additional flow and cold water would be available immediately upon completion of the sixth year of construction in 2030. The application states that the volume of cold water available would be dependent on the hydrologic conditions and water year type experienced in the watershed during the last three years of the construction period, when reservoir filling would occur. However, the application does not provide any support for the claim that the reservoir would fill to the point that it could begin providing temperature and flow benefits in 2030. The application contains a statement that additional flow and cold water would be made available prior to completion of the Project, but does not provide any documentation to indicate when this additional flow and cold water would fully deliver the claimed ecosystem benefit as described. Additionally, the documentation provided with the application does not discuss the immediacy or realization of the benefit with regard to a reduction in concentrations salinity, dissolved solids, selenium, and various pesticides, and an increase in dissolved oxygen levels.

Priority 4 – REV Criterion 6 (Duration of ecosystem improvements) Score = 1.8

See comments under Priority 1 – REV Criterion 6.

Priority 4 – REV Criterion 7 (Consistency with species recovery plans and strategies, initiatives, and conservation plans) Score = 1.6

See comments under Priority 1 – REV Criterion 7.

Priority 4 – REV Criterion 8 (Location of ecosystem improvements and connectivity to areas already being protected or managed for conservation values) Score = 1.6

See comments under Priority 2 – REV Criterion 8.

Priority 4 – REV Criterion 9 (Efficient use of water to achieve multiple ecosystem benefits) Score = 0.6

See comments under Priority 1 – REV Criterion 9.

Priority 4 – REV Criterion 10 (Resilience of ecosystem improvements to the effects of changing environmental conditions, including hydrologic variability and climate change) Score = 1.8

See comments under Priority 1 – REV Criterion 10.

Priority 6 – Increase attraction flows during upstream migration to reduce straying of anadromous species into non-natal tributaries.

Priority 6 – REV Criterion 2 (Magnitude of ecosystem improvements) Score = 1.0

The application states that the Project would benefit spring-run and fall-run Chinook under this priority. No quantification of the benefit to fall-run Chinook was provided. The application cites the results of the EDT model in support of the magnitude of the claimed ecosystem benefit to spring-run Chinook. Results from the EDT model reflect the overall fishery benefits for spring-run Chinook projected by the applicant. However, the documentation provided does not explain how the EDT model incorporated attraction flows and how or whether such flows contribute to the model results. Therefore, there is low confidence that EDT model results demonstrate that the Project would increase attraction flows during upstream migration and consequently reduce straying of anadromous species into non-natal tributaries.

The Project would reduce flows to the San Joaquin River in wet, normal wet, and normal dry water year types. This reduction in flow, particularly to the lower portions of the San Joaquin River, could potentially reduce attraction flows to the detriment of both spring-run and fall-run Chinook. Additionally, information in the application indicates that in wet years the Project could potentially reduce flows during the period of fall-run Chinook migration within the SJRRP area.

For these reasons, there is low confidence in the claimed ecosystem benefit.

Priority 6 – REV Criterion 3 (Spatial and temporal scale of ecosystem improvements) Score = 1.4

The Project would only provide attraction flows within the SJRRP area, while potentially limiting or eliminating attraction flows further downstream. Specifically, the majority of water released at Friant Dam, under with-project conditions, would be recaptured and diverted upstream of the San Joaquin River's confluence with the Merced River. The application states that only in dry, critically high and critically low years, when the Project would provide IL4 refuge water, would flow improvements extend beyond Reach 3 of the SJRRP Restoration Area. The applicant states that it intends to coordinate the timing of the attraction flows with the irrigation season, specifically April through September. Spring-run Chinook migration periods, during which additional flows could increase attraction and reduce straying, occur from March through July, and the fall-run Chinook migration period is from July through December. The period in which Project flows would occur coincides with portions of the adult spring-run and fall-run Chinook migration, but not the full period of migration. Additionally, the Project would reduce flow in wet years during the period of spring-run and fall-run Chinook migration within the SJRRP area.

Priority 6 – REV Criterion 4 (Inclusion of an adaptive management and monitoring program that includes measureable objectives, performance measures, thresholds, and triggers to achieve the ecosystem benefits) Score = 1.4

See comments under Priority 1 – REV Criterion 4.

Priority 6 – REV Criterion 5 (Immediacy of ecosystem improvement actions and realization of benefits) Score = 1.4

See comments under Priority 2 – REV Criterion 5.

Priority 6 – REV Criterion 6 (Duration of ecosystem improvements) Score = 1.8

See comments under Priority 1 – REV Criterion 6.

Priority 6 – REV Criterion 7 (Consistency with species recovery plans and strategies, initiatives, and conservation plans) Score = 1.4

See comments under Priority 1 – REV Criterion 7.

Priority 6 – REV Criterion 8 (Location of ecosystem improvements and connectivity to areas already being protected or managed for conservation values) Score = 1.2

See comments under Priority 2 – REV Criterion 8.

Priority 6 – REV Criterion 9 (Efficient use of water to achieve multiple ecosystem benefits) Score = 0.6

See comments under Priority 1 – REV Criterion 9.

Priority 6 – REV Criterion 10 (Resilience of ecosystem improvements to the effects of changing environmental conditions, including hydrologic variability and climate change) Score = 1.6

See comments under Priority 1 – REV Criterion 10

Priority 9 – Enhance flow regimes or groundwater conditions to improve the quantity and quality of riparian and floodplain habitats for aquatic and terrestrial species.

Priority 9 – REV Criterion 2 (Magnitude of ecosystem improvements) Score = 0.8

The application states that Project operations would improve the quantity and quality of riparian and floodplain habitat along the San Joaquin River by increasing flows in dry years, and reducing the frequency, magnitude, and duration of Friant Dam releases greater than SJRRP flows. The application includes tables that show an increase in floodplain activation flows under with-Project conditions, in comparison to the without-Project conditions. These tables also show that under current and 2070 conditions, there is no increase in floodplain activation flows in dry years, and in normal-wet and wet years there is a decrease in the floodplain activation flows with the Project. The application includes a brief explanation of how floodplain activation flows are calculated and states that the analysis uses these flows as a surrogate for floodplain inundation. The methodology to calculate floodplain activation flows does not appear to be based on field measurements. The application does not state whether actual topographic data or riparian and floodplain survey data were incorporated into the analysis to determine whether or not the calculated floodplain activation flows would result in floodplain inundation, beyond what would be achieved under the SJRRP flow schedule. Absent this information, the magnitude of riparian and floodplain habitat improvement over baseline conditions cannot be assessed, because an increase in flow does not necessarily equate to an increase in floodplain inundation.

Riparian and floodplain habitat could benefit from a variation in flood flows, but the application seems to suggest that only the calculated floodplain activation flows would be provided. The application further suggests that large unmanaged flood flows, especially those that occur in wet years, are detrimental to riparian and floodplain habitat. However, these flows provide a critical part of a river's natural cycle and help provide fish with access to extensive floodplain habitat that they cannot access under lower flow conditions. These flows also provide for channel formation and redistribute gravels and woody debris. The documentation provided in the application suggests that Project operations would entirely eliminate large flood flows from the natural hydrograph, eliminating much of the natural hydrologic complexity and creating a hydrologic regime with little variation. The alteration of natural flow regimes is commonly identified as a contributing factor to decreases in the quality of riparian and floodplain habitats that benefit aquatic and terrestrial species.

The application cites the results of the EDT model in support of the magnitude of the claimed ecosystem benefit. Results from the EDT model reflect the overall fishery benefits for spring-run Chinook projected by the applicant. However, the documentation provided does not explain how the EDT model incorporated enhancing flow regimes to improve the quantity and quality of riparian and floodplain habitats for aquatic and terrestrial species and how or whether improved riparian or floodplain habitat contributes to the model results. Therefore, there is low confidence in EDT model results presented as evidence that the Project will enhance flow regimes to improve the quantity and quality of riparian and floodplain habitats for aquatic and terrestrial species.

Priority 9 – REV Criterion 3 (Spatial and temporal scale of ecosystem improvements) Score = 1.5

The application states that the Project flow regime would benefit the San Joaquin River and have the potential to enhance the quantity and quality of riparian and floodplain habitats. However, the application's floodplain activation flow analysis does not indicate whether a benefit would be achieved within the identified spatial area, because it provides no specific information on riparian or floodplain locations that could be improved with increased flows. Additionally, the application discusses the timing of floodplain activation flows in terms of water year types, rather than on a seasonal basis. The monthly flow averages that correspond to the water year types in the floodplain activation flow tables indicate that the increase in floodplain activation flows would occur during the irrigation season. Thus, in drier years, the Project would artificially increase the volume of flow at a time when flows would naturally be lower. In wetter years, the Project would artificially decrease the volume of flow at times when flows would be naturally higher.

Priority 9 – REV Criterion 4 (Inclusion of an adaptive management and monitoring program that includes measureable objectives, performance measures, thresholds, and triggers to achieve the ecosystem benefits) Score = 1.4

See comments under Priority 1- REV Criterion 4.

Priority 9 – REV Criterion 5 (Immediacy of ecosystem improvement actions and realization of benefits) Score = 1.0

See comments under Priority 2 – REV Criterion 5.

Priority 9 – REV Criterion 6 (Duration of ecosystem improvements) Score = 1.8

See comments under Priority 1 – REV Criterion 6.

Priority 9 – REV Criterion 7 (Consistency with species recovery plans and strategies, initiatives, and conservation plans) Score = 1.4

See comments under Priority 1 – REV Criterion 7.

Priority 9 – REV Criterion 8 (Location of ecosystem improvements and connectivity to areas already being protected or managed for conservation values) Score = 1.2

The application states that the Project is ideally located to manage flows and water temperature conditions on the San Joaquin River immediately downstream from Friant Dam. Given the Project's location just above the SJRRP area, it would be well located to provide flow and temperature improvements. However, the documentation provided in the application indicates that the Project would, at times, detrimentally impact flow and temperature in, and possibly downstream of the SJRRP

area. Additionally, the application does not discuss the claimed benefit provided by the location of the Project in the context of Priority 9.

Priority 9 – REV Criterion 9 (Efficient use of water to achieve multiple ecosystem benefits) Score = 1.0

See comments under Priority 1 – REV Criterion 9.

Priority 9 – REV Criterion 10 (Resilience of ecosystem improvements to the effects of changing environmental conditions, including hydrologic variability and climate change) Score = 1.8

See comments under Priority 1 – REV Criterion 10.

Priority 10 – Enhance the frequency, magnitude, and duration of floodplain inundation to enhance primary and secondary productivity and the growth and survival of fish.

Priority 10 – REV Criterion 2 (Magnitude of ecosystem improvements) Score = 0.7

The application states that Project operations would improve the quantity and quality of floodplain habitat along the San Joaquin River by increasing flows in dry years and reducing the frequency, magnitude, and duration of Friant Dam releases greater than SJRRP flows. The application includes tables that show an increase in floodplain activation flows under with-Project conditions, in comparison to the without-Project conditions. These tables also show that under current and 2070 conditions, there is no increase in floodplain activation flows in dry years, and in normal-wet and wet years there is a decrease in the floodplain activation flows with the Project. The application includes a brief explanation of how floodplain activation flows are calculated and states that its analysis uses these flows as a surrogate for floodplain inundation. The methodology to calculate floodplain activation flows consists of a desktop analysis. The application does not state whether actual topographic data or floodplain survey data were incorporated into the analysis to determine whether or not the calculated floodplain activation flows would result in significant floodplain inundation, beyond what would be achieved under the SJRRP flow schedule. Absent this information, the frequency, magnitude, and duration of floodplain inundation over baseline conditions cannot be assessed, because an increase in flow does not necessarily equate to an increase in floodplain inundation. Additionally, it is possible that Project operations would result in a net decrease in the frequency, magnitude, and duration of floodplain inundation. This is because increased flows provided by the Project would not extend beyond the SJRRP area, and the reduction in flow below the Merced River under with-Project conditions would likely reduce floodplain inundation in the lower San Joaquin River.

The application does not address how floodplain activation flows provided by the Project would enhance primary and secondary productivity for the growth and survival of fish. However, the Project would capture natural flood flows, potentially reducing access to floodplain habitat that enhances primary and secondary productivity for the growth and survival of fish. The documentation provided in the application suggests that Project operations would entirely eliminate large flood flows from the natural hydrograph.

The application cites the results of the EDT model in support of the magnitude of the claimed ecosystem benefit. Results from the EDT model reflect the overall fishery benefits for spring-run Chinook projected by the applicant. However, the documentation provided does not explain how the EDT model incorporated enhancing the frequency, magnitude, and duration of floodplain inundation to enhance primary and secondary productivity and the growth and survival of fish and how or whether the benefit

contributes to the model results. Therefore, there is low confidence in EDT model results presented as evidence that the Project will enhance the frequency, magnitude, and duration of floodplain inundation to enhance primary and secondary productivity and the growth and survival of fish.

Priority 10 – REV Criterion 3 (Spatial and temporal scale of ecosystem improvements) Score = 1.7

See comments under Priority 9 – REV Criterion 3.

Priority 10 – REV Criterion 4 (Inclusion of an adaptive management and monitoring program that includes measureable objectives, performance measures, thresholds, and triggers to achieve the ecosystem benefits) Score = 1.3

See comments under Priority 1 – REV Criterion 4.

Priority 10 – REV Criterion 5 (Immediacy of ecosystem improvement actions and realization of benefits) Score = 1.0

See comments under Priority 2 – REV Criterion 5.

Priority 10 – REV Criterion 6 (Duration of ecosystem improvements) Score = 1.7

See comments under Priority 1 – REV Criterion 6.

Priority 10 – REV Criterion 7 (Consistency with species recovery plans and strategies, initiatives, and conservation plans) Score = 1.2

See comments under Priority 1 – REV Criterion 7.

Priority 10 – REV Criterion 8 (Location of ecosystem improvements and connectivity to areas already being protected or managed for conservation values) Score = 1.5

See comments under Priority 9 – REV Criterion 8.

Priority 10 – REV Criterion 9 (Efficient use of water to achieve multiple ecosystem benefits) Score = 0.7

See comments under Priority 1 – REV Criterion 9.

Priority 10 – REV Criterion 10 (Resilience of ecosystem improvements to the effects of changing environmental conditions, including hydrologic variability and climate change) Score = 1.5

See comments under Priority 1 – REV Criterion 10.

Priority 11 – Enhance the temporal and spatial distributions and diversity of habitats to support all life stages of fish and wildlife species.

Priority 11 – REV Criterion 2 (Magnitude of ecosystem improvements) Score = 1.0

The information provided with the application to support this ecosystem improvement is a repetition of information provided for the previous priorities. The comments pertaining to the information provided in support of Priority 11, REV Criterion 2 can be found in the REV Criterion 2 discussions for Priorities 1, 2, 3, 6, 9, and 10. Based on the comments provided in previous priorities, there is low confidence that the information provided supports the claim that the Project would enhance the temporal and spatial

distributions and diversity of habitats to support all life stages of fish and wildlife, and any magnitude associated with this priority is minimal.

Priority 11 – REV Criterion 3 (Spatial and temporal scale of ecosystem improvements) Score = 1.2

The comments pertaining to the information provided in support of Priority 11, REV Criterion 3 can be found in the REV Criterion 3 discussions for Priorities 1, 2, 3, 6, 9, and 10.

Priority 11 – REV Criterion 4 (Inclusion of an adaptive management and monitoring program that includes measureable objectives, performance measures, thresholds, and triggers to achieve the ecosystem benefits) Score = 1.8

See comments under Priority 1 – REV Criterion 4.

Priority 11 – REV Criterion 5 (Immediacy of ecosystem improvement actions and realization of benefits) Score = 1.0

See comments under Priority 2 – REV Criterion 5.

Priority 11 – REV Criterion 6 (Duration of ecosystem improvements) Score = 1.8

See comments under Priority 1 – REV Criterion 6.

Priority 11 – REV Criterion 7 (Consistency with species recovery plans and strategies, initiatives, and conservation plans) Score = 1.0

The application identifies several species recovery plans and strategies, initiatives, and conservation plans that apply to the benefit described under this priority. The application states that the Project would be consistent with the following goals and actions including:

National Wildlife Refuge Comprehensive Conservation Plans:

- San Joaquin River Riparian Habitat Restoration Program Pilot Project to establish riparian habitat along the river where little or none existed before using releases from Friant Dam to disperse and germinate native tree seed.
- The National Wildlife Refuge (NWR) comprehensive conservation plans for Merced NWR and San Luis NWR, goals to restore and manage upland, riparian, and wetland habitats on refuge lands for the purpose of conserving natural diversity.

SJRRP Goals:

- Restoration Goal - To restore and maintain fish populations in "good condition" in the restoration area, including naturally reproducing and self-sustaining populations of salmon and other fish.
- Water Management Goal – To reduce or avoid adverse water supply impacts on all of the Friant Division long-term contractors that may result from the Interim and Restoration flows provided for in the Settlement.

2015 California Statewide Wildlife Action Plan:

- Goal 1 – Abundance and richness: Maintain and increase ecosystem and native species distributions in California while sustaining and enhancing species abundance and richness.
- Goal 2 – Enhance ecosystem conditions: Maintain and improve ecological conditions vital for sustaining ecosystems in California.

- Goal 3 – Enhance ecosystem functions and processes: Maintain and improve ecosystem functions and processes vital for sustaining ecosystems.

California Water Action Plan:

- More reliable water supplies.
- The restoration of important species and habitat.
- A more resilient, sustainably managed water resources system (water supply, water quality, flood protection, and environment) that can better withstand inevitable and unforeseen pressures in the coming decades.

2014 Westside-San Joaquin Integrated Water Resources Plan:

- Provide reasonable opportunity to advance ecosystem restoration through balanced project implementation.
- Develop regional solutions that protect environmental and habitat concerns and provide potential for improvement.
- Improve South-of Delta water supply reliability by an average of 25%.

However, low confidence in the claimed ecosystem benefit results in low confidence that the ecosystem improvement provided by the Project would contribute to the goals and objectives of the plans described.

Priority 11 – REV Criterion 8 (Location of ecosystem improvements and connectivity to areas already being protected or managed for conservation values) Score = 1.4

See comments under Priority 9 – REV Criterion 8.

Priority 11 – REV Criterion 9 (Efficient use of water to achieve multiple ecosystem benefits) Score = 1.0

See comments under Priority 1 – REV Criterion 9.

Priority 11 – REV Criterion 10 (Resilience of ecosystem improvements to the effects of changing environmental conditions, including hydrologic variability and climate change) Score = 1.8

See comments under Priority 1 – REV Criterion 10.

Priority 12 – Enhance access to fish spawning, rearing, and holding habitats by eliminating barriers to migration.

Priority 12 – REV Criterion 2 (Magnitude of ecosystem improvements) Score = 1.0

The application provided information on changes in flow and temperature in the SJRRP area in support of Priority 12. However, the application did not provide information or supporting documentation to demonstrate how the proposed flow and temperature changes would result in the elimination of barriers to Chinook migration. The application provided no information regarding the locations of barriers to migration within the SJRRP area, or to demonstrate that such barriers exist or would be eliminated under with-Project conditions. Additionally, the application cites the results of the EDT model in support of the magnitude of the claimed ecosystem benefit. Results from the EDT model reflect the overall fishery benefits for spring-run Chinook projected by the applicant. However, the documentation provided does not explain how the EDT model incorporated enhancing access to fish spawning, rearing, and holding habitats by eliminating barriers to migration and how or whether barrier elimination contributes to the model results. Therefore, there is low confidence in EDT model results presented as evidence that the Project would enhance access to fish spawning, rearing, and holding habitats by

eliminating barriers to migration. Without information on existing migration barriers and an analysis of how the Project would eliminate those barriers, the magnitude of the claimed ecosystem improvement between without- and with-Project conditions cannot be assessed.

Priority 12 – REV Criterion 3 (Spatial and temporal scale of ecosystem improvements) Score = 1.3

The applicant did not identify the locations of the barriers to migration that would be eliminated by the Project, and did not specify the timing of when barriers to migration would be eliminated. Therefore, the spatial extent and temporal scale of the ecosystem improvement associated with this priority cannot be assessed.

Priority 12 – REV Criterion 4 (Inclusion of an adaptive management and monitoring program that includes measureable objectives, performance measures, thresholds, and triggers to achieve the ecosystem benefits) Score = 1.8

See comments under Priority 1 – REV Criterion 4.

Priority 12 – REV Criterion 5 (Immediacy of ecosystem improvement actions and realization of benefits) Score = 1.3

See comments under Priority 2 – REV Criterion 5.

Priority 12 – REV Criterion 6 (Duration of ecosystem improvements) Score = 2.0

See comments under Priority 1 – REV Criterion 6.

Priority 12 – REV Criterion 7 (Consistency with species recovery plans and strategies, initiatives, and conservation plans) Score = 1.8

See comments under Priority 1 – REV Criterion 7.

Priority 12 – REV Criterion 8 (Location of ecosystem improvements and connectivity to areas already being protected or managed for conservation values) Score = 2.0

See comments under Priority 2 – REV Criterion 8.

Priority 12 – REV Criterion 9 (Efficient use of water to achieve multiple ecosystem benefits) Score = 0.8

See comments under Priority 1 – REV Criterion 9.

Priority 12 – REV Criterion 10 (Resilience of ecosystem improvements to the effects of changing environmental conditions, including hydrologic variability and climate change) Score = 2.3

See comments under Priority 1 – REV Criterion 10.

Priority 14 – Provide water to enhance seasonal wetlands, permanent wetlands, and riparian habitat for aquatic and terrestrial species on State and Federal wildlife refuges and on other public and private lands.

Priority 14 – REV Criterion 2 (Magnitude of ecosystem improvements) Score = 2.7

The application states that the Project would provide water to enhance seasonal wetlands, permanent wetlands, and riparian habitat in the SJRRP area and in State and Federal wildlife refuges. Water

Operations review confirmed that increased storage from the Project would be used for supplemental releases to deliver IL4 water to wildlife refuges. The application states that 10 thousand acre-feet (TAF) of water would be provided in dry years and that 15 TAF would be provided in critically dry years to wildlife refuges. The Project's proposed operational rules could provide flexibility as to how this benefit would be realized for wildlife refuge purposes. The location of the Project, south of the Delta, avoids conveyance limitations of refuge water supplies sourced from the Delta. South-of-Delta storage would add a layer of climate resilience for wildlife refuges, in light of conditions that could affect Delta pumping. Dedicated refuge storage adds operational flexibility and adds improved reliability when leveraging exchanges of refuge water supplies with other water users that have different water sources or timing of water demands. Additionally, the location of the Project allows refuge water deliveries to supplement SJRRP flows, which could make it easier for refuge water supplies to be delivered to hard-to-reach refuges.

The application also proposes that Project flows would benefit riparian and wetland habitats within the SJRRP area. However, for the SJRRP area, no information was provided on the current state of non-wildlife refuge riparian and wetland habitat. Additionally, the application cites the results of the EDT model in support of the magnitude of the claimed ecosystem benefit. Results from the EDT model reflect the overall fishery benefits for spring-run Chinook projected by the applicant. However, the documentation provided does not explain how the EDT model incorporated providing water to enhance seasonal wetlands, permanent wetlands, and riparian habitat for aquatic and terrestrial species on State and Federal wildlife refuges and on other public and private lands and how or whether the benefit contributes to the model results. Therefore, there is low confidence in EDT model results presented as evidence that the Project will provide water to enhance seasonal wetlands, permanent wetlands, and riparian habitat for aquatic and terrestrial species on State and Federal wildlife refuges and on other public and private lands. Without knowledge of baseline conditions, the magnitude of improvement from without- and with-Project conditions cannot be assessed.

Priority 14 – REV Criterion 3 (Spatial and temporal scale of ecosystem improvements) Score = 3.7

With respect to the IL4 wildlife refuge water deliveries, the spatial extent and timing of the benefit would provide water to the right geographic locations at a time of the year when water is frequently unavailable.

With respect to the claimed improvements to riparian and wetland habitat in the SJRRP area, increased flow would occur in the right geographic locations for the proposed benefit. However the timing of the increases in flow that would provide these supplies to refuges does not align with the natural hydrologic regime of the San Joaquin River. This is because the Project would provide water during the irrigation season when conditions are normally dry, and would capture water at times when wetlands and riparian habitat are often inundated by flood flows.

Priority 14 – REV Criterion 4 (Inclusion of an adaptive management and monitoring program that includes measureable objectives, performance measures, thresholds, and triggers to achieve the ecosystem benefits) Score = 3.3

The Project would provide a dedicated 50 TAF of reservoir storage for IL4 wildlife refuge water, which would allow for operational flexibility in managing water deliveries. Releases for refuge water could be provided throughout the irrigation season, or delivered in the fall for refuge flooding. The portion of the adaptive management plan that pertains to adaptively managing IL4 wildlife refuge water deliveries is adequately described. However, the applicant does not address how the adaptive management program

would operate to ensure the delivery of water to enhance non-wildlife refuge riparian and wetland habitat in the SJRRP area. The adaptive management plan included in the application primarily describes the SJRRP adaptive management framework. The application states that the Project adaptive management plan would include access to SJRRP-collected data and evaluations, such as water temperature, quality, and flow, but does not state how this data would be used to adaptively manage Project operations. The application states that more detailed monitoring and management programs would be developed by the Project, as necessary, to identify specific methods of implementation, including exact monitoring locations, standards for data collection, and guidelines for implementation of long-term management actions. However, the application does not include any detail describing how the Project would develop measurable objectives and performance measures or establish thresholds and triggers to adaptively manage Project operations in order to maintain and improve upon the claimed ecosystem benefits. The Project provides no explanation as to how operational decisions will be made if physical parameters and biological responses fall outside the range of anticipated benefits. The application did not provide an explanation of the environmental uncertainties relevant to the claimed ecosystem benefit that would be included in the adaptive management plan. The application does not identify funding sources for the formation and implementation of an adaptive management plan.

Priority 14 – REV Criterion 5 (Immediacy of ecosystem improvement actions and realization of benefits) Score = 1.8

See comments under Priority 2 – REV Criterion 5.

Priority 14 – REV Criterion 6 (Duration of ecosystem improvements) Score = 3.3

The application states that the Project would provide 94 years of ecosystem improvements. The Project would dedicate 50 TAF of storage in Project for IL4 refuge water supply, and would deliver 10 TAF of IL4 in dry years and 15 TAF in critically dry water years. The duration of the ecosystem benefit, with regard to IL4 wildlife refuge water, is sufficiently documented in the application. The duration of the benefit, with regard to the Project providing water to enhance riparian and wetland habitat within the SJRRP area, is dependent on whether the ecosystem benefit would occur. There is low confidence in the magnitude of the claimed ecosystem benefit, with regard to the Project providing water to enhance non-wildlife refuge riparian and wetland habitat within the SJRRP area, which results in low confidence in the duration of the benefit.

Priority 14 – REV Criterion 7 (Consistency with species recovery plans and strategies, initiatives, and conservation plans) Score = 2.3

The application identifies several species recovery plans and strategies, initiatives, and conservation plans that apply to the benefit described under this priority. The application states that the Project would be consistent with the following goals and actions including:

National Wildlife Refuge Comprehensive Conservation Plans:

- San Joaquin River Riparian Habitat Restoration Program Pilot Project to establish riparian habitat along the river where little or none existed before using releases from Friant Dam to disperse and germinate native tree seed.
- The National Wildlife Refuge (NWR) comprehensive conservation plans for Merced NWR and San Luis NWR, goals to restore and manage upland, riparian, and wetland habitats on refuge lands for the purpose of conserving natural diversity.

SJRRP Goals:

- Restoration Goal - To restore and maintain fish populations in "good condition" in the restoration area, including naturally reproducing and self-sustaining populations of salmon and other fish.
- Water Management Goal – To reduce or avoid adverse water supply impacts on all of the Friant Division long-term contractors that may result from the Interim and Restoration flows provided for in the Settlement.

2015 California Statewide Wildlife Action Plan:

- Goal 1 – Abundance and richness: Maintain and increase ecosystem and native species distributions in California while sustaining and enhancing species abundance and richness.
- Goal 2 – Enhance ecosystem conditions: Maintain and improve ecological conditions vital for sustaining ecosystems in California.
- Goal 3 – Enhance ecosystem functions and processes: Maintain and improve ecosystem functions and processes vital for sustaining ecosystems.

California Water Action Plan:

- More reliable water supplies.
- The restoration of important species and habitat.
- A more resilient, sustainably managed water resources system (water supply, water quality, flood protection, and environment) that can better withstand inevitable and unforeseen pressures in the coming decades.

2014 Westside-San Joaquin Integrated Water Resources Plan:

- Provide reasonable opportunity to advance ecosystem restoration through balanced project implementation.
- Develop regional solutions that protect environmental and habitat concerns and provide potential for improvement.
- Improve South-of Delta water supply reliability by an average of 25%.

The ecosystem improvement provided by IL4 wildlife refuge water is consistent with several goals, objectives, or actions in these plans. However, there is low confidence in the magnitude of the claimed ecosystem benefit, regarding providing water to enhance non-wildlife refuge riparian and wetland habitat within the SJRRP area, which results in low confidence that this ecosystem improvement provided by the Project would contribute to the goals and objectives of the plans described.

Priority 14 – REV Criterion 8 (Location of ecosystem improvements and connectivity to areas already being protected or managed for conservation values) Score = 2.7

The application states that the Project is ideally located to manage flows and water temperature conditions on the San Joaquin River immediately downstream from Friant Dam. Given the Project's location just above the SJRRP area, it would be well located to provide flow and temperature improvements. However, the documentation provided in the application indicates that the Project would, at times, detrimentally impact flow and temperature in, and possibly downstream of the SJRRP area. Additionally, the application did not provide a map detailing the location of the non-wildlife refuge riparian and floodplain habitat within the SJRRP area that would be benefited by the Project. The application describes how the Project is hydrologically connected to the SJRRP area and would provide IL4 refuge water in dry and critically dry years to wildlife refuges adjacent to or near the San Joaquin River downstream from the Project. The connectivity between the Project and wildlife refuges would allow for the delivery of IL4 refuge water, which would provide a benefit to wildlife refuges in dry and critically dry years.

Priority 14 – REV Criterion 9 (Efficient use of water to achieve multiple ecosystem benefits) Score = 2.7

The applicant states that efficient use of water would simultaneously provide benefits to Ecosystem Priorities 1, 2, 3, 4, 6, 9, 10, 11, 12, 14, and 15. Project provided IL4 wildlife refuge water could be used to efficiently deliver water to multiple hard-to-reach wildlife refuges. However, other than water deliveries for IL4 wildlife refuges, there is low confidence in the ability of the Project to achieve of the other ecosystem benefits identified in the application.

Priority 14 – REV Criterion 10 (Resilience of ecosystem improvements to the effects of changing environmental conditions, including hydrologic variability and climate change) Score = 2.7

The application states that the Project would provide 50 TAF of dedicated reservoir storage for IL4 wildlife refuge water. This increases the resiliency of the benefits to wildlife refuges, as this dedicated storage would be maintained throughout the life of the Project. The application states that the Project siting, design, and operations account for temperature changes, drought events, flooding events, changes in precipitation, and climate change. However, the application provides no direct discussion of how these changing environmental conditions were considered with respect to this ecosystem priority. Additionally, there is low confidence that the Project would enhance non-wildlife refuge riparian and floodplain habitat within the SJRRP area. Thus, there is low confidence in the resiliency of the proposed ecosystem improvement to the effects of changing environmental conditions, including hydrologic variability and climate change.

Priority 15 – Develop and implement invasive species management plans utilizing techniques that are supported by best available science to enhance habitat and increase the survival of native species.

Priority 15 – REV Criterion 2 (Magnitude of ecosystem improvements) Score = 1.0

The information provided under this priority discusses the application's intent to establish an invasive species management plan to prevent the introduction of zebra mussel, Quagga mussel, and various nonnative plants in the Project area. The information provided does not address whether invasive species are currently a problem in the Project area or the degree to which the proposed invasive species management plan, including revegetation, would improve upon current conditions. No documentation describes the invasive species management plan. Thus, the Department was unable to assess the magnitude of change between with- and without-Project conditions.

Priority 15 – REV Criterion 3 (Spatial and temporal scale of ecosystem improvements) Score = 1.3

The spatial scale identified for this priority is the area that would be inundated by the reservoir. For the temporal scale of the priority, the application states that the invasive species management plan would remain in place throughout the year and under all hydrologic conditions. The application provides no information on what specific actions will be taken or when they would occur. The small spatial scale and limited details on the temporal scale of the proposed ecosystem benefit result in low confidence that the spatial and temporal scale of the Project would result in an ecosystem improvement.

Priority 15 – REV Criterion 4 (Inclusion of an adaptive management and monitoring program that includes measureable objectives, performance measures, thresholds, and triggers to achieve the ecosystem benefits) Score = 2.0

The application states that the Project's adaptive management plan for invasive species management would include measures to monitor, control, and eradicate invasive species within and adjacent to the Project area where possible. The plan would include revegetation of native vegetation to minimize

opportunities for invasive plant species to establish or expand. However, the application does not describe how the Project would develop measurable objectives and performance measures or establish thresholds and triggers to adaptively manage plan implementation to maintain and improve upon the invasive species management. The application provides no explanation as to how decisions would be made if the invasive species management plan fails to achieve the anticipated benefits. The application does not provide an explanation of the environmental uncertainties relevant to adaptively managing the invasive species management plan. Additionally, the application does not identify sources of funding for the formation and implementation of an adaptive management plan.

Priority 15 – REV Criterion 5 (Immediacy of ecosystem improvement actions and realization of benefits) Score = 1.3

The application states that recreational activities that could be a source of invasive species risks and would be subject to the Project's invasive species control plan would not occur until the completion of construction in 2033. The implementation of the revegetation plan would occur upon the initiation of site clearing activities for the construction of the Project. However, the application did not provide information indicating how the invasive species management plan would improve upon current conditions.

Priority 15 – REV Criterion 6 (Duration of ecosystem improvements) Score = 1.3

The application states that the ecosystem improvements for this priority would last 91 years. However, the duration of the ecosystem benefit is dependent on whether the benefit would occur. Low confidence in the claimed ecosystem benefit results in low confidence in the duration of the benefit.

Priority 15 – REV Criterion 7 (Consistency with species recovery plans and strategies, initiatives, and conservation plans) Score = 2.3

The application identifies several species recovery plans and strategies, initiatives, and conservation plans that apply to the benefit described under this priority. The application states that the Project would be consistent with the following plan's goals and actions including:

SJRRP Goals:

- Restoration Goal - To restore and maintain fish populations in "good condition" in the restoration area, including naturally reproducing and self-sustaining populations of salmon and other fish.
- Water Management Goal – To reduce or avoid adverse water supply impacts on all of the Friant Division long-term contractors that may result from the Interim and Restoration flows provided for in the Settlement.

California Statewide Wildlife Action Plan:

- Providing resources and coordinating efforts with partners to eradicate or control invasive species and prevent new introductions.

California Aquatic Invasive Species Management Plan:

- Identify the steps that need to be taken to minimize the harmful ecological, economic and human health impacts of aquatic invasive species in California.

However, low confidence in the claimed ecosystem benefit results in low confidence that the ecosystem improvement provided by the Project would contribute to the goals and objectives of the plans described.

Priority 15 – REV Criterion 8 (Location of ecosystem improvements and connectivity to areas already being protected or managed for conservation values) Score = 1.3

The application describes the location of the invasive species management plan as covering the primary Project area. According to the application, this area is connected to the Big Table Mountain Ecological Reserve, the McKenzie Table Mountain Preserve, and the Austin & Mary Ewell Memorial Preserve, which could be affected by the Project's construction. However, because the applicant did not provide information indicating how the Project's invasive species management activities would improve upon current conditions, there is low confidence in the ability of the Project to complement other invasive species management activities based on its location and connectivity to other protected areas.

Priority 15 – REV Criterion 9 (Efficient use of water to achieve multiple ecosystem benefits) Score = 2.0

See comments under Priority 1 – REV Criterion 9.

Priority 15 – REV Criterion 10 (Resilience of ecosystem improvements to the effects of changing environmental conditions, including hydrologic variability and climate change) Score = 1.7

See comments under Priority 1 – REV Criterion 10.

Table 1. Relative Environmental Value Scores for the Temperance Flat Reservoir												
Priority	REV2	REV3	REV4	REV5	REV6	REV7	REV8	REV9	REV10	REV1	Points Possible	Points Received
P 1	1.6	2.0	1.4	1.4	1.8	1.6	1.2	0.6	1.8	X	54	13.4
P 2	0.6	1.0	1.4	1.2	1.8	1.6	1.4	0.6	1.8	X	54	11.4
P 3	1.2	1.6	1.4	1.4	1.8	1.4	1.6	1.2	1.6	X	54	13.2
P 4	0.8	1.6	1.4	1.4	1.8	1.6	1.6	0.6	1.8	X	54	12.6
P 6	1.0	1.4	1.4	1.4	1.8	1.4	1.2	0.6	1.6	X	54	11.8
P 9	0.8	1.5	1.4	1.0	1.8	1.4	1.2	1.0	1.8	X	54	11.9
P 10	0.7	1.7	1.3	1.0	1.7	1.2	1.5	0.7	1.5	X	54	11.3
P 11	1.0	1.2	1.8	1.0	1.8	1.0	1.4	1.0	1.8	X	54	12.0
P 12	1.0	1.3	1.8	1.3	2.0	1.8	2.0	0.8	2.3	X	54	14.3
P 14	2.7	3.7	3.3	1.8	3.3	2.3	2.7	2.7	2.7	X	54	25.2
P 15	1.0	1.3	2.0	1.3	1.3	2.3	1.3	2.0	1.7	X	54	14.2
TOTAL									REV1 = [1]	4.1%	594	151.3
										TOTAL REV SCORE[2]		29.6%

[1]Additional 0.375 percent applied to total REV score for each priority claimed

[2]Total REV Score equals total points received divided by total points possible, plus REV1 percentage addition