Long-Term Operation – Draft Environmental Impact Statement

Appendix D Mitigation Measures

July 2024

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Appendix D Mitigation Measures

This appendix documents the mitigation measures outlined in the Environmental Impact Statement (EIS).

D.1 Introduction

NEPA requires federal agencies to consider appropriate mitigation measures to avoid or minimize specific impacts. Consideration and adoption of mitigation is a continuous process through completion of the EIS and Record of Decision (ROD). The Council on Environmental Quality (CEQ) defines mitigation to include avoidance, minimization, rectification, reduction over time, and compensation for impacts (Section 1508.20). Avoidance involves not taking a certain action or parts of an action. Minimization is defined as limiting the degree or magnitude of the action and its implementation. Rectification means repairing, rehabilitating, or restoring the affected environment. Reduction over time involves preservation and maintenance operations during the life of the action. Compensation over time means replacing or providing substitute resources or environments.

In addition to mitigation associated with the Alternatives discussed in this EIS, there are independent but related programs and activities that address some of the impacts inherent in the long-term operations of the CVP and SWP. The scope and complexity of agency actions in the Central Valley involve multiple activities with ongoing effects on federally listed species that are implemented separately from the long-term operation. These "independent related actions" with their independent NEPA and section 7 consultations, where warranted, are part of the affected environment but are not part of the operation of the CVP and SWP to store, release, divert, route, and blend water. Nevertheless, because of the ongoing and long-term operation of the CVP and SWP, some of these actions rectify and reduce and compensate impacts associated with operation of these facilities.

D.2 Water Quality

D.2.1 Alternative 1

D.2.1.1 Avoidance and Minimization Measures

- *State Water Resources Control Board: Bay Delta Water Quality Control Plan* – Reclamation will implement the State Water Resources Control Board (State Water Board) Water Quality Control Plan. The Water Quality Control Plan covers the Bay-Delta Estuary and tributary watersheds. A water quality control plan consists of: (1) beneficial uses to be protected; (2) water quality objectives for the reasonable protection of beneficial uses; and (3) a program of implementation for achieving the water quality objectives. This plan provides reasonable protection for the Estuary's beneficial uses that require control of salinity and constituents of concern.

- *Water Temperature Management* - Relevant to water quality because high water temperature in combination with increased nutrient runoff can decrease dissolved oxygen, all these factors support the growth harmful cyanobacterial.

    - Reclamation would operate the TCD on Shasta Dam, consistent with WRO 90-5, to target 56°F at the most downstream location feasible, up to Red Bluff Diversion Dam, from May 15 through October 30 each year.

    - Reclamation would target Whiskeytown Dam releases to not exceed the mean daily temperatures at Igo gauge of:

        - 61°F from June 1 through August 15.
        - 60°F from August 16 through September 15.
        - 56°F from Sept 15 through Nov 15.

- *Minimum Instream Flows* – Relevant to water quality because minimum instream flows are necessary to help preserve desired water quality parameters prescribed by D-1641.

    - Reclamation will operate to the minimum flows set forth in WRO 90-5 for the Sacramento River. The minimum flows set forth are as follows:

        - March 1 through August 31 – minimum flows of 2,300 cfs
        - September 1 through the end of February – minimum flows of 3,250 cfs

      In addition, the agreement contains a schedule providing for flow reductions in critical dry years.
    - Reclamation would operate to the 1987 Stipulation with CDFW for the Stanislaus River.

D.2.1.2 Additional Mitigation

- *Mitigation Measure WQ-1: Develop a water quality mitigation and monitoring program* - A program shall be developed and implemented to reduce, minimize, or eliminate increases in water quality constituents. The program will develop a monitoring plan, including frequent sampling and reporting, particularly for existing constituents of concern. Reclamation will coordinate with the implementation of current TMDLs to share monitoring information and contribute to the efforts to reduce constituents of concern. Efforts could include water quality (through the water column), soil, and fish and invertebrate tissue monitoring.

D.2.1.3 Independent but Related Programs

- *Suisun Marsh Preservation Agreement* - Pursuant to the Suisun Marsh Preservation Agreement, Reclamation and DWR maintain water monitoring stations in the Delta. These monitoring stations inform Reclamation and DWR's operation of the CVP and SWP to meet State Water Board's Bay Delta Water Quality Control Plan.

D.2.2 Alternative 2

D.2.2.1 Avoidance and Minimization Measures

- *Adult Migration and Holding Water Temperature Objectives* - Relevant to water quality because it will influence the management of water temperatures, which is a component of water quality.

  Under a circumstance where conditions may cause water temperatures to rise to concerning levels prior to the final TMP, Reclamation will begin water temperature management as early as March 1 to target water temperatures of 58.0° F daily average at the Sacramento River above the Clear Creek Gage (CCR). Reclamation is a higher priority on maintaining storage for drought protection. The strategy is framed around a framework adapted from the multi-year drought sequence experienced in Victoria, Australia (Mount et al. 2016, "Victorian Objectives") that establishes different objectives depending on hydrologic conditions and identifies actions that can be taken for fishery management and drought protection.

- *Pulse Flows* – Relevant to Clear Creek water quality because it will result in higher flows, which may increase dilution capability is a beneficial component of water quality.

  Except in years with significant uncontrolled spill, Reclamation will release up to 10,000 acre-feet from Whiskeytown Dam for channel maintenance, spring attraction flows, and to meet other physical and biological objectives. In critical years, Reclamation will release up to 5,000 acre-feet. Reclamation, through CCTT, will develop pulse flow schedules, which include measures (e.g., nighttime down ramping, slow down ramping rates, coordination with natural precipitation events) to mitigate for potential risks (e.g., potential juvenile fish stranding).

- *Water Temperature Management* - Relevant to water quality because it will influence the management of water temperatures in Clear Creek to the targets shown in Table 3-12, which is a component of water quality. Reclamation will target Whiskeytown Dam releases to not exceed the mean daily temperatures at Igo gauge:

  - 61°F from June 1 through August 15.
  - 60°F from August 16 through September 15.
  - 56°F from September 16 through November 15.

  Reclamation may not be able to meet these water temperatures and will operate Whiskeytown Dam as close to these water temperatures as practicable.

- *Delta Smelt Adult Entrainment Protection Action (Turbidity Bridge)* - Relevant to water quality because it will influence turbidity, which is a component of Delta water quality. If after a "First Flush" Action or after December 20, whichever occurs first, daily average turbidity remains or becomes elevated to 12 FNU or higher at each of three turbidity sensors in the OMR corridor creating a continuous bridge of turbidity from the lower San Joaquin River to the CVP and SWP export facilities, Reclamation and DWR will manage exports to achieve a five-day average OMR flow that is no more negative than -3,500 cfs until the daily average turbidity in at least one of the three turbidity sensors is less than 12

FNU for two consecutive days, thereby indicating a break in the continuous Turbidity Bridge.

- *Spring Delta Outflow* – Relevant to water quality because this measure will enhance Delta outflows in the Spring, which is a component of Delta water quality. Reclamation and DWR will take actions intended to supplement Delta outflow per the terms of the voluntary agreements (VAs). Reclamation and DWR will operate consistent with the VAs approved by the SWRCB and executed agreements by VA Parties.

  Actions that will support the additional Delta outflow include: (1) Reclamation and DWR south of Delta export modifications; (2) Reclamation reoperating upstream reservoirs to advance and allow for scheduling of water made available by contractors in CVP watersheds; and (3) passing Delta inflow from water made available by VA Parties. Volumes are reflected in the Memorandum of Understanding signed by VA parties in March 2022.

- *Delta Smelt Summer and Fall Habitat* - Relevant to water quality because it will enhance Delta outflows to maintain the location of X2, which addresses salt intrusion in the Delta. Maintain a 30-day average X2 ≤80 km for September through October in above normal and wet years.

  Under Alternative 2, DWR will operate the SMSCG in summer and fall (June through October) for 60 days using a seven-day tidal -seven-day open operation (7-7) schedule to maximize the number of days that Belden's Landing three-day average salinity is equal to, or less than, 4 practical salinity units. In dry years following below normal years, DWR will operate SMSCG for 30 days using 7-7 operation to maximize the number of days Belden's Landing three-day salinity is equal to, or less than 6 practical salinity units.

D.2.2.2 Additional Mitigation

Same as Alternative 1.

D.2.2.3 Independent but Related Programs

Same as Alternative 1.

D.2.3 Alternative 3

D.2.3.1 Avoidance and Minimization Measures

- *Water Temperature Management Sacramento* - Relevant to water quality because this measure will influence the management of water temperatures, which is a component of water quality. Reclamation would develop an annual temperature management plan, consistent with WRO 90-5. The TMP will be reviewed and approved by NMFS on or before April 15, and will be approved before Reclamation releases water from Shasta Dam for delivery to or diversion by any contractor.

- *Winter and Spring Pulses and Delta Outflow Sacramento River* – Relevant to water quality because this measure will enhance Delta outflows, increasing the dilution

capability in the Delta. Alternative 3 bypasses 55% of unimpaired inflow to Shasta Reservoir from December through May to achieve the monthly Delta Outflow criteria in Table E.6-1, as described in Section E.6.1.2, *Winter and Spring Pulses Delta Outflow* (Appendix E). If the monthly Delta Outflow criteria in Table E.6-1 is met, then releases from Shasta Reservoir that month may be reduced to 45% of unimpaired inflows from December to May.

- *Minimum Instream Flows Stanislaus River* - Relevant to water quality because this measure will contribute to meeting minimum flows at Vernalis as a component of Delta water quality. The 2018 Bay-Delta Water Quality Control Plan states that the Lower San Joaquin River water quality objectives provide for reasonable protection of fish and wildlife beneficial uses. this measure requires reservoir releases to meet 40% of unimpaired inflow on a 7-day running average to the confluence with the San Joaquin in February through June. In the months of February through June, Reclamation also would make releases from New Melones as necessary to contribute its share (29%) of meeting the 1,000 cfs minimum flow at Vernalis required in the Bay-Delta Water Quality Control Plan.

D.2.3.2 Additional Mitigation

Same as Alternative 1.

D.2.3.3 Independent but Related Programs

Same as Alternative 1.

D.2.4 Alternative 4

D.2.4.1 Avoidance and Minimization Measures

- *Water Temperature Management* – Relevant to water quality to fisheries because this will influence the management of water temperatures. Reclamation, through governance, would prepare a TMP consistent with requirements in WRO 90-5 and update the plan throughout the water temperature management season to improve water temperature conditions in the Sacramento River on or after June 16.

- *Fall and Winter Instream Flows* - Relevant to Sacramento River water quality because it will result in higher flows, which is a beneficial component of water quality by augmenting the dilution capacity of the Sacramento River.

Table D-1. Keswick Dam December through February Default Release Schedule determined by EOS Storage.

Keswick Release (cfs)	Shasta EOS Storage (MAF)
3,250	<2.4
4,000	≥2.4
4,500	≥2.8

Keswick Release (cfs)	Shasta EOS Storage (MAF)
5,000	≥3.2

EOS = end-of-September; cfs = cubic feet per second; MAF = million acre-feet.

D.2.4.2 Additional Mitigation

Same as Alternative 1.

D.2.4.3 Independent but Related Programs

Same as Alternative 1.

D.3 Water Supply

D.3.1 Alternative 1

D.3.1.1 Avoidance and Minimization Measures

No Avoidance and Minimization Measures have been identified.

D.3.1.2 Additional Mitigation

No mitigation measures are identified for the water supply effects,

D.3.1.3 Independent but Related Programs

- *WaterSMART* - Through WaterSMART Grants, Reclamation provides financial assistance to water managers for projects that seek to conserve and use water more efficiently, implement renewable energy, investigate and develop water marketing strategies, mitigate conflict risk in areas at a high risk of future water conflict, and accomplish other benefits that contribute to sustainability in the western United States. Cost-shared projects that can be completed within two or three years are selected annually through a competitive process. Three categories of WaterSMART Grants are offered through separate funding opportunities: Water and Energy Efficiency Grants; Small-Scale Water Efficiency Projects; and Water Marketing Strategy Grants.

- *Calfed Water Use Efficiency* - The Water Use Efficiency Program includes actions to assure efficient use of existing and any new water supplies developed by this program. Efficiency actions can alter the pattern of water diversions and reduce the magnitude of diversions, providing ecosystem benefits. Efficiency actions can also result in reduced discharge of effluent or drainage, improving water quality. The Water Use Efficiency Program builds on the work of the existing Agricultural Water Management Council and California Urban Water Conservation Council process, supporting and supplementing those processes through planning and technical assistance and through targeted financial incentives (both loans and grants). The Water Use Efficiency Program has identified potential recovery of currently irrecoverable water losses of over 1.4 million acre-feet of water annually by 2020 as a result of CALFED actions. CALFED identifies measurable

goals and objectives for its urban and agricultural water conservation program, water reclamation programs and managed wetlands programs.

- *Water Transfer Program* – The Water Transfer Program (separate from the conveyance of transferred water included in some of the alternatives discussed in this EIS) focuses on the structure and operation of the existing water market. It proposes several actions to address current impediments increase conveyance availability, lower transaction costs and increase information sharing. However, does not specify transactions. The WTP established clear policies and protocols for the use of available conveyance and storage capacity, including dedicating a portion of increased Delta pumping capacity to the first right of refusal for water transfers involving non-project water, improving pumping and conveyance capacity forecasts and disclosing information through the On Tap web site. To the extent permitted, proponents are required to provide additional assessment for potential local: groundwater impacts, cumulative impacts and third-party socioeconomic impacts.

- *Drought Plan* - San Luis & Delta Mendota Water Authority, Friant Water Authority, San Joaquin River Exchange Contractors Water Authority and Reclamation (collectively the Parties) have been working collaboratively on a Drought Plan to increase water supply reliability to Central Valley Project (CVP) water users that rely on Sacramento-San Joaquin River Delta (Delta) exports for water service. The Drought Plan seeks for participating entities to voluntarily conserve and securely store or exchange a portion of their CVP south of Delta deliveries for subsequent use with the goal of providing at least a 5% allocation to south of Delta contractors, reducing reliance on Delta exports in the driest hydrologic conditions, and reducing the risk for a potential call on Friant Dam for EC deliveries while supporting flow and temperature goals of the San Joaquin River Restoration Program (SJRRP). The Parties are fully supportive of the SJRRP and have agreed to collaborate towards a full implementation. . The Drought Plan actions are all related to enhanced management of CVP deliveries south of the Delta and is not expected to influence CVP's north of Delta operations.

D.3.2 Alternative 2

D.3.2.1 Avoidance and Minimization Measures

- *Fall and Winter Base flows for Shasta Refill and Redd Maintenance* - Relevant to water supply because it will result in more predicable management of storage in Shasta Reservoir. Alternative 2 updates the table for December through February releases to require more storage in Shasta Reservoir for higher release as shown below.

Table D-2. Keswick Dam December through February Default Release Schedule determined by EOS Storage.

Keswick Release (cfs)	Shasta EOS Storage (MAF)
3,250	≤2.4
4,000	≤2.8

Keswick Release (cfs)	Shasta EOS Storage (MAF)
4,500	≤3.2
5,000	>3.2

EOS = end-of-September; cfs = cubic feet per second; MAF = million acre-feet. These may be refined through future modeling and/or analysis efforts as part of the seasonal operations planning.

- *Minimum Instream Flows* - Relevant to water supply because it will allow more water to be placed in Shasta Reservoir storage when certain minimum flow conditions are met. In response to major storm events, Reclamation, after coordination through the SRG and SHOT, and also through adaptive management, may determine that lower flows achieve the same biological effects as the minimum flow of 3,250 cfs at Keswick Dam. If these flows are determined to meet the same biological intent, Reclamation may temporarily reduce below 3,250 cfs to preserve storage.

- *Water Temperature and Storage Management* – Relevant to water supply because it provides for a better balance between flood control releases and maintaining water storage in Shasta Reservoir. Reclamation is proposing to change the balance between risks of flood control releases for Shasta Reservoir and place a higher priority on maintaining storage for drought protection. The strategy is framed around a framework adapted from the multi-year drought sequence experienced in Victoria, Australia (Mount et al. 2016, "Victorian Objectives") that establishes different objectives depending on hydrologic conditions and identifies actions that can be taken for fishery management and drought protection.

  Storm-Flex - The Storm-Flex AMM is relevant to water supply because it allows for a capture of high flows during storm-events which would enhance water supplies. During the OMR management season, Reclamation and DWR, through WOMT, may prepare an assessment to evaluate operating to an OMR index no more negative than -6,250 cfs between the start of OMR management season and the larval and juvenile delta smelt Protection Action onramp or the last day of February, whichever occurs first, to capture peak flows during storm-related events. If conditions indicate an entrainment protection condition is likely to trigger, Reclamation and DWR will reduce south Delta exports to achieve a 14-day average OMR index no more negative than -5,000 cfs, unless a further reduction in exports is required. If an entrainment protection condition is triggered, Reclamation and DWR will cease storm-flex and implement the entrainment protection condition.

D.3.2.2 Additional Mitigation

Same as Alternative 1.

D.3.2.3 Independent but Related Programs

Same as Alternative 1.

D.3.3 Alternative 3

D.3.3.1 Avoidance and Minimization Measures

No Avoidance and Minimization Measures have been identified.

D.3.3.2 Additional Mitigation

Same as Alternative 1.

D.3.3.3 Independent but Related Programs

Same as Alternative 1.

D.3.4 Alternative 4

D.3.4.1 Avoidance and Minimization Measures

- *The Fall and Winter instream flows for Shasta Refill and Redd Maintenance* - Relevant to water supply because it will result in more predicable management of storage in Shasta Reservoir. Alternative 4 updates the table for December through February releases to require storage in Shasta Reservoir for higher release as shown in below.

Table D-3. Keswick Dam December through February Default Release Schedule determined by EOS Storage.

Keswick Release (cfs)	Shasta EOS Storage (MAF)
3,250	<2.4
4,000	≥2.4
4,500	≥2.8
5,000	≥3.2

EOS = end-of-September; cfs = cubic feet per second; MAF = million acre-feet.

- *Sacramento Water Temperature and Storage Management* - Relevant to water supply because it maintains water storage in Shasta Reservoir during drought conditions. Alternative 4 includes drought toolkit actions such as Wilkins Slough Relief and relaxation of D-1641 water quality requirements that may improve the volume of coldwater pool and level of drought protection in Shasta Reservoir.

  Reclamation would coordinate through governance to implement a water temperature management strategy that considers:

  - EOS Coldwater Pool
  - Minimization of modeled Temperature Dependent Mortality.

- *Storm Flex*

The Storm-Flex AMM is relevant to water supply because it allows for a capture of high flows during storm-events which would enhance water supplies. Reclamation and DWR may operate to an OMR no more negative than -6,250 cfs to capture peak flows during storm-related events when no backstop conditions are triggered and following conditions are met:

- The Delta is in excess conditions as defined in 2018 amendment to the COA, and
- QWEST is greater than 0.

DWR and Reclamation, through Governance, will use estimates of the real-time distribution of winter-run Chinook salmon, Particle Track Model, and prediction tool output to assess potential winter-run Chinook salmon entrainment risk differences using OMR inputs of -5000, and -6250 cfs. If the assessment indicates that additional entrainment protections are unlikely to be triggered, Reclamation and DWR may operate to OMR no more negative than -6,250 cfs and will update the assessment no less than weekly. If conditions indicate a backstop condition is likely to trigger, Reclamation and DWR will resume OMR no more negative than -5,000 cfs. If a backstop condition is triggered, Reclamation and DWR will cease storm-flex and implement the backstop.

D.3.4.2 Additional Mitigation

Same as Alternative 1.

D.3.4.3 Independent but Related Programs

Same as Alternative 1.

D.4 Groundwater

D.4.1 Alternative 1

D.4.1.1 Avoidance and Minimization Measures

No Avoidance and Minimization Measures have been identified.

D.4.1.2 Additional Mitigation

No Mitigation Measures have been identified.

D.4.1.3 Independent but Related Programs

- *Groundwater Banking* - Reclamation implements water banking, as authorized by the Central Valley Project Improvement Act, and as allowed by certain Federal contracts. Reclamation recognizes groundwater banking as an important water management tool in optimizing the use of CVP water, while addressing groundwater overdraft in some areas. Groundwater Banking creates operational flexibility and water supply reliability to CVP Contractors. The banking guidelines set forth the standards under which Reclamation may approve the Banking and Recovery of CVP Water outside of the Contractor's Contract Service Area while protecting the integrity of the CVP. Contractors request

approval to Bank or Recover CVP Water by submitting a water Banking proposal to Reclamation. A Contractor consults with Reclamation before and during the formulation of a water Banking proposal. Reclamation analyzes all Proposals to ensure consistency with state and federal laws and that no Banking action will result in adverse third-party impacts to the CVP, other Contractors, other legal users of water, or the environment, as determined through the environmental compliance process.

- *Groundwater Monitoring Program* - The Groundwater Ambient Monitoring and Assessment Program is California's comprehensive groundwater quality monitoring program that was created by the State Water Resources Control Board in 2000 and expanded in 2001. The purpose is to improve statewide comprehensive groundwater monitoring and increase the availability to groundwater quality information to the public. The Groundwater Ambient Monitoring and Assessment Program is based on interagency collaboration with the state, federal, local water agencies and well owners.

D.4.2 Alternative 2

D.4.2.1 Avoidance and Minimization Measures

Same as Alternative 1.

D.4.2.2 Additional Mitigation

Same as Alternative 1.

D.4.2.3 Independent but Related Programs

Same as Alternative 1.

D.4.3 Alternative 3

D.4.3.1 Avoidance and Minimization Measures

Same as Alternative 1.

D.4.3.2 Additional Mitigation

Same as Alternative 1.

D.4.3.3 Independent but Related Programs

Same as Alternative 1.

D.4.4 Alternative 4

D.4.4.1 Avoidance and Minimization Measures

Same as Alternative 1.

D.4.4.2 Additional Mitigation

Same as Alternative 1.

D.4.4.3 Independent but Related Programs

Same as Alternative 1.

D.5 Indian Trust Assets

D.5.1 Alternative 1-4

D.5.1.1 Avoidance and Minimization Measures

No Avoidance and Minimization Measures have been identified.

D.5.1.2 Additional Mitigation

No Mitigation Measures have been identified.

D.5.1.3 Independent but Related Programs

No Independent but Related Actions have been identified.

D.6 Cultural Resources

D.6.1 Alternative 1-4

D.6.1.1 Avoidance and Minimization Measures

No Avoidance and Minimization Measures have been identified.

D.6.1.2 Additional Mitigation

No Mitigation Measures have been identified.

D.6.1.3 Independent but Related Programs

No Independent but Related Actions have been identified.

D.7 Air Quality

D.7.1 Alternative 1-4

D.7.1.1 Avoidance and Minimization Measures

No Avoidance and Minimization Measures have been identified.

D.7.1.2 Additional Mitigation

No Mitigation Measures have been identified.

D.7.1.3 Independent but Related Programs

No Independent but Related Actions have been identified.

D.8 Greenhouse Gas Emissions

D.8.1 Alternative 1-4

D.8.1.1 Avoidance and Minimization Measures

No Avoidance and Minimization Measures have been identified.

D.8.1.2 Additional Mitigation

No Mitigation Measures have been identified.

D.8.1.3 Independent but Related Programs

No Independent but Related Actions have been identified.

D.9 Visual Resources

D.9.1 Alternative 1

D.9.1.1 Avoidance and Minimization Measures

No Avoidance and Minimization Measures have been identified.

D.9.1.2 Additional Mitigation

- *Mitigation Measure VIS-1: Develop a Visual Resources Monitoring and Mitigation Program for Clear Creek (Alternative 1)* - A program will be developed and implemented to reduce, minimize, or eliminate adverse changes in visual resources along Clear Creek, such as mortality of riparian species and substantial exposure of typically inundated substrate. The program will develop a monitoring plan, including frequent surveying and reporting, particularly for mortality of riparian species. Reclamation will coordinate with other monitoring efforts, as relevant, to identify comprehensive and consistent measures to address riparian species mortality and exposure of inundated substrate. Measures may include habitat restoration that considers changes in water levels. Measures will be conducted in coordination with the Clear Creek Technical Team.

D.9.1.3 Independent but Related Programs

No Independent but Related Actions have been identified.

D.9.2 Alternative 2

D.9.2.1 Avoidance and Minimization Measures

Same as Alternative 1.

D.9.2.2 Additional Mitigation

- *Mitigation Measure AG-1: Diversify Water Portfolios* - Water agencies should diversify their water portfolios. Diversification could include the sustainable conjunctive use of

groundwater and surface water, water transfers, water conservation and efficiency upgrades, and increased use of recycled water or water produced through desalination where available.

D.9.2.3 Independent but Related Programs

Same as Alternative 1.

D.9.3 Alternative 3

D.9.3.1 Avoidance and Minimization Measures

Same as Alternative 1.

D.9.3.2 Additional Mitigation

- *Mitigation Measure AG-1: Diversify Water Portfolios* - Water agencies should diversify their water portfolios. Diversification could include the sustainable conjunctive use of groundwater and surface water, water transfers, water conservation and efficiency upgrades, and increased use of recycled water or water produced through desalination where available.

- *Mitigation Measure VIS-2: Develop a Visual Resources Monitoring and Mitigation Program for San Luis Reservoir* - A program will be developed and implemented to reduce, minimize, or eliminate adverse changes in visual resources along San Luis Reservoir, such as substantial exposure of typically inundated substrate. The program will develop a monitoring plan, including frequent surveying and reporting, particularly for increased exposure of denuded soil along the shoreline. Reclamation will coordinate with other monitoring efforts, as relevant, to identify comprehensive and consistent measures to exposure of inundated substrate, such as revegetation of areas no longer subject to frequent inundation.

D.9.3.3 Independent but Related Programs

Same as Alternative 1.

D.9.4 Alternative 4

D.9.4.1 Avoidance and Minimization Measures

Same as Alternative 1.

D.9.4.2 Additional Mitigation

Same as Alternative 2.

D.9.4.3 Independent but Related Programs

Same as Alternative 1.

D.10 Fish and Aquatic Resources

D.10.1 Alternative 1

D.10.1.1 Avoidance and Minimization Measures

Table D-4 lists Avoidance and Minimization Measures for fish and aquatic resources for Alternative 1.

Table D-4. Summary of Alternative 1 Avoidance and Minimization Measures for Fish and Aquatic Resources

Avoidance and Minimization Measure	Geography & Listed Species Impacted	Impact
Ramping Rates	Sacramento River (salmonids and sturgeon) Clear Creek (salmonids) American River (salmonids and sturgeon) Stanislaus River (salmonids)	Changes in river elevation from reservoir releases can strand fishes. Ramping rates can decrease the risk of stranding of fishes; however, this benefit comes at the consequence of increasing water temperatures and dissolved oxygen levels.
Minimum instream flows	Sacramento River (salmonids and sturgeon) Clear Creek (salmonids) American River (salmonids and sturgeon) Bay-Delta (salmonids, sturgeon, and smelt)	Certain hydrologic circumstances may cause short-term periods of high flows. Minimum instream flows are temporary reductions in reservoir releases to preserve water storage. Minimum instream flows store water in reservoirs and decrease flows resulting in increased and decreased water temperatures and dissolved oxygen levels, decreased and increased refuge habitat and spawning habitat dependent on geography, muted outmigration cues as a consequence of flattening the hydrograph, increased stranding and dewatering of eggs, decrease stranding and juvenile dewatering, and decreased food availability for smelt and the size of the Low Salinity Zone as a

Avoidance and Minimization Measure	Geography & Listed Species Impacted	Impact
		consequence of decreasing Delta inflow.
Water Temperature Management	Sacramento River (salmonids and sturgeon) Clear Creek (salmonids) American River (salmonids and sturgeon)	Cooler water improves habitat

D.10.1.2 Additional Mitigation

- *Mitigation Measure AQUA-1: Develop and Implement Program to Expand Adult Holding, Spawning, Egg Incubation, and Fry/Juvenile Rearing Habitat* - Reclamation will develop and implement a program to expand suitable adult holding, spawning, egg incubation, and fry/juvenile rearing habitat for Central Valley spring-run Chinook salmon, fall- /late fall-run Chinook salmon, and Central Valley steelhead elsewhere in the Northwestern California Diversity Group. The program will be designed to prevent hybridization and improve genetic integrity of spring-run Chinook salmon, and to improve spawning success, fry/juvenile survival, and production of all three species, thereby contributing to their recovery. Increases in Salmon and Steelhead production potential created by the program will equal or exceed the reduced production potential in Clear Creek that would result from cessation of the Clear Creek Restoration Program and reduced flows below Whiskeytown Dam.

- *Mitigation Measure AQUA-2: Delta Smelt Monitoring*- Reclamation will continue to monitor Delta smelt.

- *Mitigation Measure AQUA-3: Longfin Smelt Monitoring* - Reclamation will continue to monitor Longfin smelt.

D.10.1.3 Independent but Related Programs

- *Battle Creek Restoration Program and Battle Creek Reintroduction Plan for Winter-run Chinook Salmon* - The purpose of the restoration project is to restore approximately 42 miles of habitat on Battle Creek and an additional six miles of habitat on tributaries to Battle Creek for threatened and endangered salmon and steelhead, while minimizing the loss of clean and renewable energy produced at PG&E's Battle Creek Hydroelectric Project.

- *Central Valley Project Improvement Act Habitat and Facility Improvements (Competitive Grant Process)* - Reclamation and the USFWS complete CVPIA Habitat and Facility Improvements through a competitive grant process that solicits projects through a Notice of Funding Opportunity available at www.grants.gov.

- *Central Valley Project Improvement Act Small Fish Screen Program* - Reclamation has contributed funding toward the construction of positive barrier fish screens structures and water-diversion and conveyance facilities operated along the Sacramento River.

- *Central Valley Project Improvement Act Spawning and Rearing Habitat Restoration* - Through CVPIA, Reclamation augments spawning and rearing habitat for listed species in CVP tributaries by developing side channels and adding gravels.

- *Delta Cross Channel Improvement Project* - The DCC is more than 65 years old, and its gates rely on Reclamation operators to travel to the facility to change their position. When the gates are open, they provide a critical diversion for freshwater reaching the CVP and SWP south Delta export facilities. The gates are closed to prevent scouring near the facility during high flows, reduce salinity intrusion in the western Delta, and protect Sacramento River federally listed and non-listed salmonids.

- *Georgiana Slough Non-physical Barrier* - DWR, in coordination with Reclamation, will seasonally install and operate a salmonid migratory barrier at Georgiana Slough each year to reduce entrainment into the central and south Delta of emigrating juvenile winter-run Chinook salmon and spring-run Chinook salmon encountering the Sacramento River–Georgiana Slough junction.

- *Livingston Stone National Fish Hatchery (Conservation Hatcheries)* - The Livingston Stone National Fish Hatchery, located in the upper Sacramento River, was constructed by Reclamation in 1997 for the explicit purpose of propagating Sacramento River winter-run Chinook Evolutionary Significant Unit (ESU) salmon to assist in its recovery.

- *University of California Davis Fish Conservation and Culture Laboratory (Conservation Hatcheries)* - Since 1996, the FCCL has been a part of the Biological and Agricultural Engineering Department of the University of California Davis. Reclamation and DWR are the primary funding sources for the FCCL. The two main goals of the refuge population (annually, approximately 32,000 adults) at the FCCL are to maintain a population in captivity that is as genetically close to as possible to the wild population, and to provide a safeguard against extinction.

- *U.S. Fish and Wildlife Service Fish Technology Center and Estuarine Research Station (Conservation Hatcheries)* - USFWS is planning on designing and constructing a Fish Technology Center and to study Delta smelt and other imperiled species. The Fish Technology Center is envisioned to operate as a stand-alone facility for maintaining a refugial population of Delta smelt and for propagation research, conservation, and study of other imperiled fishes.

- *Coleman National Fish Hatchery (Production Hatcheries)* - The Coleman National Fish Hatchery was constructed in 1942 adjacent to Battle Creek, and currently propagates three salmonid stocks; fall-run Chinook salmon, late-fall Chinook salmon and steelhead. The Coleman National Fish Hatchery serves to partially mitigate the negative effects of the construction of Shasta Dam.

- *Nimbus Hatchery (Production Hatcheries)* - The Nimbus Fish Hatchery is operated by CDFW under a cooperative agreement with Reclamation. The purpose of Nimbus Hatchery is to provide fall-run Chinook salmon for harvest in ocean (commercial and recreational) and freshwater recreational fisheries, as well as hatchery and natural area escapement to the lower American River.

- *Head of Old River Scour Hole Predation Reduction Project* - Reclamation is currently developing alternatives to modify the scour hole located at the head of Old River to increase the survival of downstream-migrating juvenile CV steelhead and spring-run Chinook salmon in the San Joaquin River by reducing the predation intensity they encounter at this site. The main goal of the project is to improve habitat conditions through permanent modifications of channel geometry.

- *San Joaquin River Restoration Program* - The San Joaquin River Restoration Program is a multi-agency effort to restore self-sustaining fish populations to the San Joaquin River, focusing on threatened spring-run Chinook salmon. The restoration area stretches for 150 miles of the San Joaquin River, from the base of Friant Dam to the confluence with the Merced River.

- *Shasta Temperature Control Device Performance Evaluation* - The purpose of the Shasta Temperature Control Device Performance Evaluation was to study whether there were problems or limitations with the function of the Shasta Dam Temperature Control Device under low storage conditions.

- *Suisun Marsh Habitat Management, Preservation and Restoration Plan* - The Suisun Marsh Habitat Management, Preservation and Restoration Plan (SMP) is a comprehensive plan designed to address the various conflicts regarding use of marsh resources, with the focus on achieving an acceptable multi-stakeholder approach to the restoration of tidal wetlands and the management of managed wetlands and their functions.

- *Tracy Fish Collection Facility Improvement Program* - Reclamation conducts studies and physical modifications at the Tracy Fish Collection Facility to improve fish survival and improve facility efficiency, reducing mortality through the facility, fish hauling, and release operations through the Tracy Fish Facility Improvement Program. Activities include predation studies and piscivorous predator control, improvement of hydrologic monitoring and telemetry systems, holding-area improvements including fish-count automation and tank aeration and screening, improvement of data management, as well as aquaculture facility maintenance, operation, and improvements.

- *Tidal Habitat Restoration* - The 2008 and 2019 USFWS Biological Opinion's on the long-term operation included an RPA for DWR to implement a program to create or restore 8,000 acres of intertidal and associated subtidal habitat in the Delta and Suisun Marsh. 2,000 acres of tidal habitat restoration has been constructed by DWR of the total 8,000 acres thus far.

- *Trinity River Restoration Program* - The Trinity River Restoration Program is a partnership comprised of federal and California State agencies, Hoopa Valley and Yurok Tribes, and Trinity County, California. These entities work collaboratively with stakeholders to restore the Trinity River between Lewiston Dam and the confluence of the North Fork Trinity River, California to mitigate impacts of the Trinity River Division of the CVP on anadromous fish populations in the Trinity River by successfully implementing the 2000 Trinity River ROD and achieving Congressionally mandated restoration goals.

- *Lower Klamath River Long-Term Plan* - Lower Klamath River Long-Term Plan provides supplemental flows from mid-August to late September, from Lewiston Dam to prevent a disease outbreak in the lower Klamath River in years when the flow in the lower Klamath River is projected to be less than 2,800 cfs. Supplemental flows come from water stored in Trinity Reservoir. The Lower Klamath River Long-Term Plan consists of three different flow-augmentation components to be implemented as needed in a phased approach, based on environmental and biological conditions.

- *Water Temperature Modeling Platform* - The Water Temperature Modeling Platform project is intended to modernize the analytical tools that support activities and decision-making for water temperature management in CVP reservoirs for fishery species protection in downstream river reaches. The focus of the project is to enhance modeling capabilities to predict summer and fall water temperature prediction through facilities operations specifically designed for temperature management such as the Shasta Dam Temperature Control Device and Folsom Dam Temperature Shutters with effective performance measure reporting functions.

- *Water Transfer Program* - Water transfers and exchanges are an integral part of CVP water operations, particularly in drought years, as long as transfers can occur consistent with state and federal laws governing water transfers. The hydrological alteration associated with water transfers are included in this consultation. Section 3405(a) of the CVPIA authorizes the transfer of all or a portion of a CVP contractors contracted water supply to any other California water user or water agency, state or federal agency, Indian Tribe, or private nonprofit organization for project purposes or any purpose recognized as beneficial under State law.

- *Wilkins Slough Flow Relief* - Due to historical navigation criteria many of the diversions on the Sacramento River were designed around a 5,000 cfs minimum flow near Wilkins Slough. This program is a focus within the CVPIA Small Fish Screen program to provide grants to senior water right holders within this area to install new diversions and screens that would operate at the lower flows, which would allow Reclamation to have greater flexibility in managing Sacramento River flows and temperatures for both water users and wildlife, including listed salmonids (Northern California Water Association 2014).

- *Yolo Bypass Salmonid Habitat Restoration and Fish Passage Project* - To assist in recovering some of the hundreds of thousands of acres of floodplain that were disconnected from Central Valley streams starting in the 1800s, Reclamation and DWR are currently in the process of modifying infrastructure at Fremont Weir to increase

access to floodplain habitat in the Yolo Bypass for juvenile salmonids. These modifications will also increase the ability of adult salmon and sturgeon to migrate from the Yolo Bypass to the Sacramento River.

D.10.2 Alternative 2

D.10.2.1 Avoidance and Minimization Measures

Table D-5 lists Avoidance and Minimization Measures for fish and aquatic resources for Alternative 2.

Table D-5. Summary of Alternative 2 Avoidance and Minimization Measures for Fish and Aquatic Resources

Avoidance and Minimization Measure	Geography & Listed Species Impacted	Impact
Ramping Rates = limit how quickly releases are reduced.	• Sacramento River (salmonids and sturgeon) • Clear Creek (salmonids) • American River (salmonids and sturgeon) • Stanislaus River (salmonids)	Changes in river elevation from reservoir releases can strand fishes. Ramping rates can decrease the risk of stranding of fishes; however, this benefit comes at the consequence of increasing water temperatures and dissolved oxygen levels.
Minimum Instream Flows	• Sacramento River (salmonids and sturgeon) • Clear Creek (salmonids) • American River (salmonids and sturgeon) • Bay-Delta (salmonids, sturgeon, and smelt)	Certain hydrologic circumstances may cause short-term periods of high flows. Minimum instream flows are temporary reductions in reservoir releases to preserve water storage. Minimum instream flows store water in reservoirs and decrease flows resulting in increased and decreased water temperatures and dissolved oxygen levels, decreased and increased refuge habitat and spawning habitat dependent on geography, muted outmigration cues as a consequence of flattening the hydrograph, increased stranding and dewatering of eggs, decrease stranding and juvenile dewatering, and decreased food availability for smelt and the size of the Low Salinity Zone as a consequence of decreasing Delta inflow.
Pulse Flows = releases of water from reservoirs can result in pulses of flows in rivers.	• Sacramento River (salmonids and sturgeon) • Clear Creek (salmonids) • Bay-Delta (salmonids, sturgeon, and smelt)	Pulse flows are spatiotemporally coordinated releases to benefit migration of fish. Pulse flows can decrease and increase water temperature stressors, increase outmigration travel Rate and decrease outmigration travel time, decrease entrainment risk, increase redd dewatering potential,

Avoidance and Minimization Measure	Geography & Listed Species Impacted	Impact
	• American River (salmonids and sturgeon)	and increase food availability for smelt and size of the Low Salinity Zone as a consequence of increased Delta inflow.
Fall and Winter Baseflows for Shasta Reservoir Refill and Redd Maintenance	• Sacramento River (salmonids and sturgeon)	Required storage management or flood control releases must be balanced with supporting refill capabilities for Shasta Reservoir to build the coldwater pool for the following year. Fall and Winter Baseflows build and conserve storage to balance pool management with salmonid redd dewatering risk and baseflows are set annually to balance that risk in the coming fall and winter with the following year. Fall and Winter Baseflows may increase or decrease the risk of redd dewatering, water temperatures, refuge habitat and food availability, and outmigration cues.
Adult Migration & Holding Water Temperature Objectives	• Sacramento River (salmonids and sturgeon)	Under a circumstance where low flows combined with warm air temperatures and/or an intentional warmwater power bypass cause water temperatures to rise to concerning levels prior to the final Temperature Management Plan, Reclamation will begin temperature management as early as March 1st through May to target water temperatures of 58°F daily average at CCR.
SRS Contractors: Delaying or Shifting Spring Diversions, Shifting Timing of Delivery of Transfer Water, Rice Decomposition Smoothing	Sacramento River (salmonids)	Reclamation may request that the Sacramento River Settlement Contractors (SRSC) delay diversions in the spring to increase the likelihood that Shasta Reservoir elevations reach the upper gates on the Temperature Control Device. Reclamation may request that the SRSC shift timing of delivery of transfer water to increase the amount of water in Shasta Reservoir through the water temperature management season. Final decision making is done by the SRSC; therefore, these two actions are not analyzed. Rice decomposition smoothing involves coordination of diversions to lower peak rice decomposition demand. Early reductions balance the potential for winter-run Chinook salmon dewatering with water demands. The measure may impact stranding, redd dewatering, refuge habitat, and outmigration in the fall.
Flow and Non-Flow Measures from the Voluntary Agreements	• Sacramento River (salmonids) • Bay-Delta (salmonids and smelt)	Flow and non-flow measures may increase flows in the spring prior to the water temperature management season, at the cost of depleting the coldwater pool, to

Avoidance and Minimization Measure	Geography & Listed Species Impacted	Impact
		advance inflows to the Delta. These measures may also decrease flows in the summer. Increased flows from increased spring releases may lower water temperatures for adult salmonids while decreased flows in the summer may increase water temperatures. Juvenile and yearling salmonids may benefit from increased spring flows which would decrease travel time and increase migration rates. Flow and non-flow measures from the VAs may also increase Delta inflow increasing food availability for smelt and the size / location of the Low Salinity Zone.
Wilkins Slough Minimum Flow Criteria Relief	• Sacramento River (salmonids and sturgeon) • Bay-Delta (salmonids, sturgeon, and smelt)	Minimum flows at Wilkins Slough are targeted in certain driest of year water years, particularly summer flows. Minimum flows are met under considerations for storage, fisheries, and water deliveries. Minimum flow criteria relief may decrease water temperatures in the following year if Shasta Reservoir coldwater pool is conserved; however, this benefit comes at the consequence of increasing water temperatures by decreasing spring and summer releases. Minimum flow criteria may also decrease Delta inflow decreasing food availability for smelt.
Rebalancing between other CVP Reservoirs	• Sacramento River (salmonids and sturgeon) • Bay-Delta (salmonids, sturgeon, and smelt)	Rebalancing between reservoirs can be used to conserve Shasta Reservoir storage and operate the TCD to temperature targets. Rebalancing allows for temperature management during critical salmonid spawning and egg incubation; however, this benefit comes at the consequence of increased water temperatures when spring and summer flows are reduced. Rebalancing may also decrease Delta inflow decreasing food availability for smelt and size / location of the Low Salinity Zone.
Limitation on CVP Allocations for EOS storage	• Sacramento River (salmonids and sturgeon) • Bay-Delta (salmonids, sturgeon, and smelt)	Water supply reductions may occur in dry water years, with the goal of conserving storage and meeting minimal water temperature objectives. The goal of reductions is to increase end of September storage for Shasta Reservoir. Limitation on allocations may increase end of September storage which may provide increased coldwater pool in the following year; however, this benefit may come at the cost of increased water temperatures when summer flows are reduced.

Avoidance and Minimization Measure	Geography & Listed Species Impacted	Impact
		Limitations may also decrease Delta inflow decreasing food availability for smelt.
Modifications to Water Transfers	• Sacramento River (salmonids and sturgeon) • Bay-Delta (salmonids, sturgeon, and smelt)	Modifications to water transfers involve shifting the timing of delivery of transfer water during the typical irrigation season. Water transfer modifications may help improve water temperature management, protect winter-run Chinook salmon redds from dewatering, and fall-run Chinook salmon from stranding; however, this benefit of increased Sacramento River flows may come at the cost of decreased storage in Shasta Reservoir and subsequent decreased coldwater pool volume the following year. Water transfer modifications may also increase Delta inflow increasing food availability for smelt.
Situation-Specific Adjustments to Delta Water Quality Standards	• Sacramento River (salmonids and sturgeon) • Bay-Delta (salmonids, sturgeon, and smelt)	Sacramento River flows may decrease in dry years as one approach to conserving storage in Shasta Reservoir. Relaxation of Delta outflow and salinity requirements historically occur in the winter, spring, and summer. The measure may increase or decrease the water temperature related impacts. Water temperatures may increase with lower flows in the Sacramento River during the summer and may decrease the following year by increasing the volume of water in storage. The measure may impact outmigration and refuge habitat with lower flows in the Sacramento River during the winter.
Limitations in SRS Contractors Water Available Under Contract	• Sacramento River (salmonids and sturgeon)	Sacramento River flows may decrease in the spring, summer, and fall of dry years as one approach to conserving storage in Shasta Reservoir. The measure may increase or decrease the water temperature related impacts. Water temperatures may increase with lower flows in the Sacramento River during the spring, summer, and fall; and may decrease temperatures the following year by increasing the volume of water in storage. The measure may impact entrainment through routing and migration timing, outmigration cues, and refuge habitat.
Refuge Coordination for Instream Flow, Lake Levels, and Refuge Needs	• Sacramento River (salmonids and sturgeon)	Shasta Reservoir releases to refuges in the summer and fall may decrease during the driest of years to increase Shasta Reservoir storage.

Avoidance and Minimization Measure	Geography & Listed Species Impacted	Impact
		The measure may increase or decrease water temperatures. Decreasing Sacramento River flows may warm in-river temperatures; however, conserving Shasta Reservoir storage may reduce water temperatures in the following year. The measure may also impact outmigration by decreasing Sacramento River flows.
Egg Incubation and Emergence Water Temperature Objectives	• Sacramento River (salmonids and sturgeon) • Bay-Delta (salmonids, sturgeon, and smelt)	Water temperature management would target 53.5°F through operation of the Temperature Control Device on Shasta Dam, selectively withdrawing and blending water from different elevations within Shasta Reservoir. Water temperatures are typically targeted from May 15 – October 30; however, start and end dates may be adjusted through coordination with the SRG and SHOT based on the winter-run Chinook salmon spawning and emergence. The measure may increase or decrease water temperatures. Water temperature management may reduce stress May 15 - October 30; however, reducing Shasta Reservoir storage may increase water temperatures in the following year. The measure may impact outmigration and refuge habitat in the fall and winter by decreasing Sacramento River flows.
Annual Winter-Run Chinook Salmon Brood Year Assessment	• Sacramento River	Based on the outcome of the broodyear assessment prepared by the Winter-run JPE sub-team, Reclamation, NMFS, USFWS and CDFW will convene appropriate technical staff to make recommendations if it is necessary to increase the production of winter-run Chinook salmon associated with the Integrated-Recovery Supplementation Program or take other actions to protect production of winter-run Chinook salmon at the LSNFH. USFWS, through coordination with the SHOT, will implement measures as appropriate. The outcome of the broodyear assessment may also be considered in implementing actions within the drought toolkit. Reclamation believes this is a USFWS action.
Drought Operations Priority Framework	• Sacramento River (salmonids and sturgeon) • Bay-Delta (salmonids, sturgeon, and smelt)	Reclamation will develop a Drought Emergency Plan that establishes system priorities and seeks to provide Winter-run Chinook salmon spawning water temperatures. The measure may increase or decrease the water temperatures by decreasing Sacramento River flows

Avoidance and Minimization Measure	Geography & Listed Species Impacted	Impact
		into the Delta; however, increasing Shasta Reservoir storage may provide for more suitable water temperatures in the following year. The measure may also impact outmigration by decreasing Sacramento River flows into the Delta.
Clear Creek Water Temperature Management	• Clear Creek (salmonids and sturgeon)	Reclamation will target Whiskeytown Dam releases to not exceed the mean daily temperatures at Igo gage: • 61°F from June 1 through August 15. • 60°F from August 16 through September 15. • 56°F from September 16 through November 15. In dry, critical, or transfer curtailment years, Reclamation may not be able to meet these water temperatures and will operate Whiskeytown Dam as close to these water temperatures as practical. Water temperature management in Clear Creek will subsequently impact salmonids in the Sacramento River below the confluence. Cooler water temperatures below Whiskeytown may provide a benefit to salmonids.
Redd Dewatering Protective Adjustment	• American River (salmonids)	Adjusts the minimum release requirements to account for hydrology and potential dewatering impacts to fall-run Chinook salmon redds in January and February and steelhead redds in February through May based on the minimum release requirements. The measure may decrease stranding and dewatering by softening changes in the minimum release requirements.
Folsom Reservoir Flow and Temperature Management	• American River (salmonids)	Reclamation will implement the Automated Temperature Selection Procedure, which was developed in consultation with representatives of state and federal agencies and prioritizes water temperatures during the summer to support steelhead rearing over water temperatures in the fall to support fall-run Chinook salmon spawning. The measure is expected to be beneficial by targeting lower water temperatures in the summer, at the consequence of potentially increasing water temperatures in the fall due to release of cold water.
Winter Instability Flows	• Stanislaus River (salmonids)	Reclamation releases additional flow in February to simulate natural variability in the winter hydrograph and to enhance access to varied rearing habitats. Reclamation, through the Stanislaus Watershed Team,

Avoidance and Minimization Measure	Geography & Listed Species Impacted	Impact
		schedules the winter instability flow volume. Whenever possible, the pulse is scheduled to coincide with a natural storm event, which may naturally cue outmigration. In some years, natural rain events may provide sufficient natural variability in the hydrograph and an additional pulse may be determined to be necessary. The measure may decrease water temperatures and provide more rearing habitat in the winter at the consequence of reducing reservoir storage and potentially increasing water temperatures in subsequent months.
DCC Gates Closures	• Bay-Delta (salmonids, sturgeon and smelt)	Reclamation closes the Delta Cross Channel during the late fall, winter, and spring to reduce straying of fall-run Chinook salmon, protect outmigrating salmonids from entering the interior Delta, facilitate the State Water Board D-1641 Rio Vista flow objectives for fish passage, and reduce potential scouring and flooding that might occur in the channels on the downstream side of the gates when Sacramento River flows exceed 20,000 cfs on a sustained basis. The measure may decrease entrainment risk by potentially aquatic species from being diverted into the interior Delta.
Barker Slough Pumping Plant	• Bay-Delta (smelt)	DWR proposes to operate the BSPP to protect larval Delta Smelt from March 1 to June 30 of dry and critical water years. If the water year type changes after March 1 to below normal, above normal, or wet, this action will be no longer in effect. If the water year type changes after March 1 to dry or critical, DWR proposes to operate according to this measure. The measure may benefit Delta smelt and longfin smelt through reduced entrainment risk.
Tracy Fish Collection Facility and Skinner Delta Fish Protective Facility	• Bay-Delta (salmonids, sturgeon and smelt)	Reclamation will operate the Tracy Fish Collection Facility to screen fish from Jones Pumping Plant. The primary channel is a behavioral barrier with effectiveness that depends on the pumping Jones Pumping Plant. The secondary channel is a positive fish barrier. When south Delta hydraulic conditions allow and conditions are within the original design criteria for the Tracy Fish Collection Facility, the secondary channel is operated to achieve water approach velocities for striped bass of approximately 1 to 2.5

Avoidance and Minimization Measure	Geography & Listed Species Impacted	Impact
		feet per second from June 1 through October 31 and for salmon of approximately 3 feet per second from November 1 through May 31. The measure may decrease entrainment risk by potentially preventing aquatic species from being entrained at the export facility.
Old and Middle River Flow Management Start	• Bay-Delta (salmonids, sturgeon and smelt)	Reclamation will reduce exports to achieve a 7-day average OMR value no more negative than -5,000 cfs for seven consecutive days when the genetically verified 7-day rolling sum of winter-run early season migration and spring-run Chinook salmon loss, calculated daily, exceeds the following annually calculated thresholds. The measure may decrease entrainment risk by potentially preventing aquatic species from being entrained at the export facility.
Old and Middle River Management Real Time Operation	• Bay-Delta (salmonids, sturgeon and smelt)	Reclamation and DWR will manage diversion rates from the South of Delta modified based on abiotic and biotic factors for several listed species. The measure may decrease entrainment risk by potentially preventing aquatic species from being entrained at the export facility.
Summer and Fall Delta Outflow and Habitat	• Bay-Delta (salmonids, sturgeon and smelt)	Reclamation and DWR will maintain a 30-day average X2 ≤ 80 km for September through November in Wet and Above Normal years. The measure may decrease entrainment risk by increasing flows in the Delta and, thus, benefitting the migratory transport to the estuary and potentially preventing entrainment at the export facility. The measure may also benefit outmigration and food availability by increasing flow through the Delta.
Spring Delta Outflow	• Bay-Delta (salmonids, sturgeon and smelt)	Reclamation and DWR will take actions intended to supplement Delta outflow per the terms of the VAs approved by the SWRCB and executed agreements by Voluntary Agreement (VA) Parties. The measure may decrease entrainment risk by increasing migratory transport to the estuary, potentially preventing entrainment at the export facility. The measure may also benefit outmigration cues and food availability by increased flow through the Delta.

Avoidance and Minimization Measure	Geography & Listed Species Impacted	Impact
Delta Smelt Supplementation	• Bay-Delta (smelt)	Reclamation and DWR, through the Culture and Supplementation of Smelt Steering Committee, will continue to collaborate with USFWS and CDFW on the development of a program to conduct supplementation of the wild Delta smelt population with propagated fish consistent with USFWS' Supplementation Strategy (USFWS 2020), which document is currently being updated by CDFW and USFWS. The measure is expected to be generally beneficial to the Delta smelt population due to the increased releases into the Delta.

D.10.2.2 Additional Mitigation

Same as Alternative 1.

D.10.2.3 Independent but Related Programs

Same as Alternative 1.

D.10.3 Alternative 3

D.10.3.1 Avoidance and Minimization Measures

- *Water Temperature Clear Creek* – Relevant to fish and aquatic resources because it will improve the water temperature conditions for relevant fisheries. Reclamation will manage Whiskeytown Dam releases to not exceed mean daily water temperatures of 60°F at the Igo gauge from June 1 through September 15 and 56°F from September 15 through November 15.

- *Minimum Instream Flows (Minimum Release Requirements) American River* - Relevant to fish and aquatic resources because it will improve coldwater pool and habitat conditions for steelhead and fall-run Chinook salmon. Reclamation would incorporate the following Folsom Reservoir storage requirements: **EOS:** 300 TAF (230 TAF in a second consecutive dry or critical water year type) **EOD:** 300 TAF. Reclamation would prioritize minimum flows under the MRR, then storage, then additional Delta outflow in the winter and spring, then water deliveries.

- *Old and Middle River Reverse Flows* - Relevant to fish and aquatic resources because this measure may decrease entrainment risk by potentially preventing aquatic species from being entrained at the export facility.

From the earlier of January 1 or the onset of OMR management, until the earlier of June 30 or the offramp of OMR Management, OMR flows shall not exceed -5,000 cfs on a 14-day running average. These requirements do not apply when San Joaquin River flows at Vernalis are greater

than 20,000 cfs. In addition, when the SVI has been classified as a critically dry year for a second (or more) consecutive year, OMR flows shall not exceed -2,500 cfs on a 14-day running average.

From April 1 to May 31, Reclamation and DWR shall operate to achieve a 2:1 ratio of San Joaquin River inflow at Vernalis to combined CVP/SWP exports in all water year types.

- *Winter and Spring Delta Outflow* – Relevant to fish and aquatic resources because it is intended to reduce the adverse impacts of CVP/SWP operations on listed species, by increasing abundance and productivity of longfin smelt, increasing survival of winter-run Chinook salmon, spring-run Chinook salmon, and Central Valley steelhead (as a result of increased flows that increased survival in the Sacramento River and increase survival through the Delta), increasing recruitment of Delta smelt, and increasing survival and abundance of green sturgeon. Reclamation and DWR shall operate to meet the Delta Outflow criteria in Appendix E, Table E.6 1 for the months of July to November. For the months of December through June, on a monthly basis, Reclamation and DWR shall operate to meet Delta Outflow that is the lesser of 65 percent of unimpaired Delta inflow or the Delta Outflow criteria in Table E.6 1.

Reclamation and DWR shall bypass 55% of unimpaired inflow to Shasta, Folsom, and Oroville reservoirs and 40% of unimpaired inflow to New Melones Reservoir. If the storage requirements and monthly Delta Outflow criteria in Alternative 3 are met, then releases from Shasta, Folsom, and Oroville reservoirs that month may be reduced to 45% of unimpaired inflows from December through May. Reclamation and DWR may release stored water to meet Delta outflow criteria in May through November.

Reclamation and DWR would prioritize meeting the storage requirements described in Alternative 3 before making additional reservoir releases beyond what is required to meet D-1641 and human health and safety.

- *Delta Smelt Summer and Fall Habitat* - Relevant to fish and aquatic resources because it may decrease entrainment risk by increasing flows in the Delta and, thus, benefitting the migratory transport to the estuary and potentially preventing entrainment at the export facility. The measure may also benefit outmigration and food availability by increasing flow through the Delta. Releases from upstream reservoirs are constrained to a Delta outflow of 7,100 cfs in November of wet and above normal years. Fall salinity may vary based on the ability of export reductions to achieve Fall X2 subject to public health and safety.

- *Drought* - Relevant to fish and aquatic resources because it improves temperature conditions, migration, and increase hatchery production for relevant fisheries. Alternative 3 prohibits the use of a temporary urgency change petition. Alternative 3 does not include construction nor operation of the Drought Barrier in West False River.

Other actions may be considered and analyzed as necessary. Reclamation and DWR, through Governance, may update the toolkit.

D.10.3.2 Additional Mitigation

Same as Alternative 1.

D.10.3.3 Independent but Related Programs

Same as Alternative 1.

D.10.4 Alternative 4

D.10.4.1 Avoidance and Minimization Measures

- *Water Temperature Management* – Relevant to fish and aquatic resources because it will improve the temperature conditions for relevant fisheries.

    - Reclamation will target Whiskeytown Dam releases to not exceed the mean daily water temperatures at Igo gauge:

        - 61°F from June 1 through August 15.
        - 60°F from August 16 through September 15.
        - 56°F from September 15 through November 15.

    Water temperature management on Clear Creek is implemented through changes in guard gate configurations and flow manipulations. In dry, critical, or import curtailment years, Reclamation may not be able to meet these water temperatures, and will operate Whiskeytown Dam as close to these temperatures as practicable.

    - By June 15, Reclamation, through Governance, will annually prepare a TMP for the summer through fall. By May 15, Reclamation will provide a draft TMP to solicit input. The priority for use of the lowest water temperature control shutters at Folsom Dam, within operational constraints, shall be to achieve the water temperature requirement for steelhead, and may also be used to provide cold water for fall-run Chinook salmon spawning. During plan implementation, if the water temperature is exceeded for three consecutive days, or is exceeded by more than 3°F for a single day, Reclamation, will notify NMFS through Governance, and outline steps to realign lower American River water temperatures with the TMP. Reclamation will implement the ATSP described in the 2023 MFMS.

- *Minimum Instream Flows (Minimum Release Requirement) American River* – Relevant to fish and aquatic resources because it will improve coldwater pool and habitat conditions for steelhead and fall-run Chinook salmon. Reclamation would adopt the minimum flow schedule outlined in the "2023 Updates and Refinements to the Lower American River 2017 Flow Management Standard Technical Memorandum" ("2023 MFMS"). The 2023 MFMS includes MRR ranges from 500 to 2000 cfs based on time of year and annual hydrology. The flow schedule is intended to improve coldwater pool and habitat conditions for steelhead and fall-run Chinook salmon.

- *Old and Middle River Flow Management* - Relevant to fish and aquatic resources because it may decrease entrainment risk by potentially preventing aquatic species from being entrained at the export facility.

Reclamation and DWR will reduce exports to achieve OMR no more negative than -5,000 cfs when one or more of the following conditions have occurred:

- "First Flush" - In addition to the reduction in exports described in the No Action Alternative, Reclamation and DWR may initiate the "first flush" if, through Governance, monitoring indicates a high risk of migration and dispersal of smelt into areas at high risk of future entrainment. "First Flush" may be offramped to OMR no more negative than -5,000 cfs if the San Joaquin River at Vernalis is flowing at 10,000 cfs or more.

- Delta Smelt Salvage- After December 1 if the Enhanced Delta Smelt Monitoring Program observes Delta smelt in the Lower San Joaquin River and Southern Delta region or if any salvage of Delta smelt occurs. Reclamation and DWR, through Governance, may cease OMR restrictions related to this trigger or adjust the trigger requirements if hatchery release and monitoring data indicate that Delta smelt catch within the south Delta represent <5% of the overall catch.

- Adult Longfin Salvage - After December 1 if monitoring data indicates that longfin smelt catch within the south Delta represent ≥5% of the overall catch or if any salvage of longfin smelt occurs. Reclamation and DWR, through Governance, may cease OMR restrictions related to this trigger if monitoring data (e.g., Enhanced Delta Smelt Monitoring Program, Bay Study, Fall Midwater Trawl) indicate that longfin smelt catch within the south Delta represent <5% of the overall catch.

- Juvenile Salmonid Salvage - After December 1, Reclamation and DWR, through Governance, may incorporate additional or different predictive models as necessary to improve the onset of OMR management season for salmonid species if any of the following occurs: Gaeta et al.'s (2023) machine learning model predicts one week in advance the presence of winter-run length-at-date juvenile Chinook salmon across all 30 submodels, or salvage of genetically confirmed juvenile winter-run or spring-run Chinook salmon, or annual cumulative loss total reaches 60 or above for wild Central Valley steelhead.

- Real-time Adjustments 0 In addition to "First Flush", additional restrictions use real-time monitoring to identify an increased risk of entrainment. Reclamation and DWR will manage to a more positive OMR than -5,000 cfs under the following conditions:

- Adult Delta Smelt Turbidity Protection - Reclamation and DWR would manage exports to OMR no more negative than -2,000 cfs when daily average turbidity at both Holland Cut, and Old River at Bacon Island are at or above 12 FNU. Reclamation and DWR will maintain OMR at no more negative than -2,000 cfs for one week, and then no more negative than -3,500 cfs until measured daily average turbidity at both sensors are less than 12 FNU, or as revised through Governance.

- Adult Delta smelt protection will off-ramp when three-day average water temperature at Jersey Point reaches 59ºF. This off ramp will be based on data from the San Joaquin River at Jersey Point averaged over three days.

- Delta Smelt Larvae and Juveniles Protection - Larval and juvenile Delta smelt management period will initiate when detected within the entrainment zone based on real-time sampling, or adult Delta smelt protection has off-ramped based on water temperature, whichever comes first. The presence of Delta smelt larvae and juveniles can also be identified through a detection of spent adult females in survey or salvage. Reclamation and DWR will restrict exports to allow OMR no more negative than -3,500 cfs when Secchi depth average measurement is equal or less than one meter.

- Longfin Smelt Larvae and Juveniles Protection - Recent studies indicated that regulations limiting Delta export for salmonids and Delta smelt since 2008-2009 have been protective for populations of longfin smelt.

- Winter-Run Annual Cumulative Loss Thresholds - Reclamation and DWR will manage OMR to remain below the total annual loss thresholds for genetically-verified winter-run Chinook salmon at the Tracy and Skinner fish facilities:

    - Natural Winter-run Chinook salmon: Salvage Loss <0.5% of JPE (same as the No Action Alternative)

    - Hatchery Winter-run Chinook salmon: Salvage Loss <0.5% of JPE

During the brood year, if at any time cumulative loss of natural or hatchery winter-run Chinook salmon exceed the total annual loss threshold, DWR and Reclamation shall restrict south Delta exports to maintain an OMR value of no more negative than -3,500 cfs for 14 days. Reclamation and DWR, through Governance, will also develop, implement, and update weekly an OMR schedule for the rest of the OMR management season to avoid further exceeding the annual loss thresholds using entrainment prediction tools and documented in an assessment.

- Winter-Run Chinook Salmon High Salvage Avoidance - Reclamation and DWR will reduce exports to achieve OMR of no more negative than -3,500 cfs for at least seven days when Gaeta et al.'s (2023) machine learning model predicts one week in advance the high presence of winter-run length-at-date juvenile Chinook salmon across all 30 submodels. High presence is defined as seven-day moving average of more than 4.29 winter-run Chinook salmon expanded salvage at the salvage facilities. This action can only occur in the months of February, March, and April. OMR would continue to be managed to be no more negative than -3,500 cfs for longer than seven days until Gaeta et al.'s (2023) model no longer predicts high presence across all submodels.

- Spring-Run Chinook Salmon Surrogate Thresholds - Reclamation and DWR will reduce exports to achieve OMR no more negative than -3,500 cfs for seven days the first instance cumulative salvage loss of a release group equals or exceeds 0.5% of the releases group at Delta entry. Reclamation and DWR, through Governance, will

develop the locations and times of in-river surrogate releases to best represent natural juvenile spring-run Chinook salmon migration into the Sacramento River and Delta. The percentage of the release group at Delta entry will be determined by survival from the release site to the Delta, similar to the development of the winter-run Chinook salmon JPE.

- Storm Flex - Reclamation and DWR may operate to an OMR no more negative than -6,250 cfs to capture peak flows during storm-related events when no backstop conditions are triggered and following conditions are met:
    - The Delta is in excess conditions as defined in 2018 amendment to the COA, and
    - QWEST is greater than 0.

DWR and Reclamation, through Governance, will use estimates of the real-time distribution of winter-run Chinook salmon, Particle Track Model, and prediction tool output to assess potential winter-run Chinook salmon entrainment risk differences using OMR inputs of -5000, and -6250 cfs. If the assessment indicates that additional entrainment protections are unlikely to be triggered, Reclamation and DWR may operate to OMR no more negative than -6,250 cfs and will update the assessment no less than weekly. If conditions indicate a backstop condition is likely to trigger, Reclamation and DWR will resume OMR no more negative than -5,000 cfs. If a backstop condition is triggered, Reclamation and DWR will cease storm-flex and implement the backstop.

D.10.4.2 Additional Mitigation

Same as Alternative 1.

D.10.4.3 Independent but Related Programs

Same as Alternative 1.

D.11 Terrestrial Biological Resources

D.11.1 Alternative 1

D.11.1.1 Avoidance and Minimization Measures

No Avoidance and Minimization Measures have been identified.

D.11.1.2 Additional Mitigation

- *Mitigation Measure BIO-1: Bank Swallow* - The following measure will be implemented to avoid and minimize impacts on bank swallow individuals, colonies, current and potential habitat (i.e., natural banks), and, if feasible, to river processes. This applies to activities year-round, whether bank swallows are present or not.

- Prevent Impacts on Individuals, Colonies, and Habitat - Develop flow criteria and consideration within real-time groups that avoid impacts of high water flows by limiting frequency and duration of peak flows over 14,000 cfs (Sacramento River) or rapid draw-downs to nesting bank swallow habitat during the breeding season (April 1 through August 31); this includes downstream tributary flows when timing water releases (Bank Swallow Technical Advisory Committee 2013).

- *Mitigation Measure BIO-2: Foothill Yellow-Legged Frog* - Species-specific mitigation for foothill yellow-legged frog will only be required when substantial flow changes (greater than 5% increase or greater than 5% decrease) occur within or adjacent to suitable habitat as identified by habitat assessments conducted during the year. A qualified biologist will conduct a field evaluation for foothill yellow-legged frog for all flow operations which substantially change flow regimes within suitable habitat or river processes which could affect necessary aquatic habitat elements to inform real-time groups to minimize impacts to terrestrial biological resources for operational decisions.

- *Mitigation Measure BIO-3: Northwestern Pond Turtle* - Species-specific mitigation for northwestern pond turtle will be required when substantial flow changes (greater than 5% increase or greater than 5% decrease) occur within or adjacent to suitable habitat as identified by assessments conducted during the project component planning phase.

  Reclamation, with input from USFWS, through coordination with the SHOT, will implement measures as appropriate. SHOT may consider programs as described here.

  Movement corridors for northwestern pond turtle include major irrigation and drainage canals. Adequate water will be kept in major irrigation and drainage canals. Canal water depths should be similar to years when transfers do not occur or, where information on existing water depths is limited, at least two feet of water will be considered sufficient.

  If proposed flow changes do not fully avoid adverse effects on suitable aquatic habitat, the following measures may occur:

  A qualified biologist would conduct a field evaluation of suitable aquatic habitat for northwestern pond turtles where substantial flow changes are proposed to occur. If possible, field surveys will be timed to coincide with the time of day and year when turtles are most likely to be basking and visible (during the cooler part of the day, 8:00 a.m. to 12:00 p.m., during spring, summer, and late summer). Prior to conducting presence/absence surveys the biologist will locate the microhabitats for turtle basking (logs, rocks, brush thickets) and determine a location to quietly observe turtles.

  Each survey will include a 30-minute wait time after arriving at the site to allow startled turtles to return to open basking areas. The survey will consist of a minimum 15-minute observation time per area where turtles could be observed. If field surveys observe occupied or predicted occupied northwestern pond turtle habitat, then compensation in the form of mitigation will be required.

D.11.1.3 Independent but Related Programs

No Independent but Related Actions have been identified.

D.11.2 Alternative 2

D.11.2.1 Avoidance and Minimization Measures

Same as Alternative 1.

D.11.2.2 Additional Mitigation

Same as Alternative 1.

D.11.2.3 Independent but Related Programs

Same as Alternative 1.

D.11.3 Alternative 3

D.11.3.1 Avoidance and Minimization Measures

Same as Alternative 1.

D.11.3.2 Additional Mitigation

Same as Alternative 1.

D.11.3.3 Independent but Related Programs

Same as Alternative 1.

D.11.4 Alternative 4

D.11.4.1 Avoidance and Minimization Measures

Same as Alternative 1.

D.11.4.2 Additional Mitigation

Same as Alternative 1.

D.11.4.3 Independent but Related Programs

Same as Alternative 1.

D.12 Regional Economics

D.12.1 Alternative 1-4

D.12.1.1 Avoidance and Minimization Measures

No Avoidance and Minimization Measures have been identified.

D.12.1.2 Additional Mitigation

No Mitigation Measures have been identified.

D.12.1.3 Independent but Related Programs

No Independent but Related Actions have been identified.

D.13 Land Use and Agricultural Resources

D.13.1 Alternative 1

D.13.1.1 Avoidance and Minimization Measures

No Avoidance and Minimization Measures have been identified.

D.13.1.2 Additional Mitigation

The mitigation measure below relies on entities other than Reclamation to implement the measures. Because Reclamation does not have authority to implement this measure, Reclamation cannot ensure that it will be implemented. If it is implemented, it will reduce impacts on agricultural land.

- *Mitigation Measure AG-1: Diversify Water Portfolios* - Water agencies should diversify their water portfolios. Diversification could include the sustainable conjunctive use of groundwater and surface water, water transfers, water conservation and efficiency upgrades, and increased use of recycled water or water produced through desalination where available.

D.13.1.3 Independent but Related Programs

No Independent but Related Programs have been identified.

D.13.2 Alternative 2

D.13.2.1 Avoidance and Minimization Measures

Same as Alternative 1.

D.13.2.2 Additional Mitigation

Same as Alternative 1.

D.13.2.3 Independent but Related Programs

Same as Alternative 1.

D.13.3 Alternative 3

D.13.3.1 Avoidance and Minimization Measures

Same as Alternative 1.

D.13.3.2 Additional Mitigation

Same as Alternative 1.

D.13.3.3 Independent but Related Programs

Same as Alternative 1.

D.13.4 Alternative 4

D.13.4.1 Avoidance and Minimization Measures

Same as Alternative 1.

D.13.4.2 Additional Mitigation

Same as Alternative 1.

D.13.4.3 Independent but Related Programs

Same as Alternative 1.

D.14 Recreation

D.14.1 Alternative 1

D.14.1.1 Avoidance and Minimization Measures

No Avoidance and Minimization Measures have been identified.

D.14.1.2 Additional Mitigation

- *Mitigation Measure REC-1: Update Public Information on Changing Recreation Conditions* - Reclamation will facilitate updates to widely available information (websites or other sources) to inform the public when adverse changes in average water elevation, river flows, or seasonal fluctuations occur to recreation resources, depending on different factors such as the type of recreation and intensity of the activity (e.g., advanced whitewater rafting versus less-advanced rafting).

D.14.1.3 Independent but Related Programs

No Independent but Related Actions have been identified.

D.14.2 Alternative 2

D.14.2.1 Avoidance and Minimization Measures

Same as Alternative 1.

D.14.2.2 Additional Mitigation

Same as Alternative 1.

D.14.2.3 Independent but Related Programs

Same as Alternative 1.

D.14.3 Alternative 3

D.14.3.1 Avoidance and Minimization Measures

Same as Alternative 1.

D.14.3.2 Additional Mitigation

Same as Alternative 1.

D.14.3.3 Independent but Related Programs

Same as Alternative 1.

D.14.4 Alternative 4

D.14.4.1 Avoidance and Minimization Measures

Same as Alternative 1.

D.14.4.2 Additional Mitigation

Same as Alternative 1.

D.14.4.3 Independent but Related Programs

Same as Alternative 1.

D.15 Environmental Justice

D.15.1 Alternative 1

D.15.1.1 Avoidance and Minimization Measures

No Avoidance and Minimization Measures have been identified.

D.15.1.2 Additional Mitigation

- *Mitigation Measure EJ-1: Increasing Participation with Tribal, Minority, and Low-Income Populations* - During any ongoing coordination regarding LTO, Reclamation will, consistent with the Bipartisan Permitting Reform Implementation Rule, 89 Fed. Reg. 35,442 (May 1, 2024); U.S. Department of Interior Equity Action Plan (April 14, 2022); and Reclamation's Manual, Directives and Standard on Public Involvement in Bureau of Reclamation Activities (updated July 28, 2023):
    - Treat Indigenous Knowledge as high-quality information.
    - Consider the ability of affected persons and agencies to access electronic media and the primary language of affected persons when conducting research.

- Support priority actions in the DOE Equity Action Plan, Action 4, related to increasing opportunities to access public lands and prioritizing access to recreation areas and services in urban communities.
- Strive to reach and involve minority, low-income, reluctant or unknown publics who may be affected, using minority or special media, translated materials, or other means, as appropriate.

Reclamation will identify opportunities to gather Tribal Indigenous Knowledge for consideration in future Reclamation projects. Additionally, Reclamation will identify opportunities to include tribal interests and low-income/minority advocacy groups in affected communities to review and provide input on compliance documentation. For projects occurring in areas with a high proportion of Spanish speaking residents, Reclamation will continue to provide materials and resources in Spanish for a higher likelihood of participation from the affected population.

- *Mitigation Measure EJ-2: Reduce Effects of Employment Loss* - To assist in offsetting job losses in the agricultural sector, Reclamation will 1) identify opportunities to assist and support vocational training at schools in affected communities, and 2) develop internship program(s) and advertise in affected communities near the Reclamation offices.

D.15.1.3 Independent but Related Programs

No Independent but Related Actions have been identified.

D.15.2 Alternative 2

D.15.2.1 Avoidance and Minimization Measures

Same as Alternative 1.

D.15.2.2 Additional Mitigation

Same as Alternative 1.

D.15.2.3 Independent but Related Programs

Same as Alternative 1.

D.15.3 Alternative 3

D.15.3.1 Avoidance and Minimization Measures

Same as Alternative 1.

D.15.3.2 Additional Mitigation

Same as Alternative 1.

D.15.3.3 Independent but Related Programs

Same as Alternative 1.

D.15.4 Alternative 4

D.15.4.1 Avoidance and Minimization Measures

Same as Alternative 1.

D.15.4.2 Additional Mitigation

Same as Alternative 1.

D.15.4.3 Independent but Related Programs

Same as Alternative 1.

D.16 Power

D.16.1 Alternative 1

D.16.1.1 Avoidance and Minimization Measures

No Avoidance and Minimization Measures have been identified.

D.16.1.2 Additional Mitigation

No additional mitigation has been identified.

D.16.1.3 Independent but Related Programs

No Independent but Related Actions have been identified.

D.16.2 Alternative 2

D.16.2.1 Avoidance and Minimization Measures

Same as Alternative 1.

D.16.2.2 Additional Mitigation

Same as Alternative 1.

D.16.2.3 Independent but Related Programs

Same as Alternative 1.

D.16.3 Alternative 3

D.16.3.1 Avoidance and Minimization Measures

Same as Alternative 1.

D.16.3.2 Additional Mitigation

Same as Alternative 1.

D.16.3.3 Independent but Related Programs

Same as Alternative 1.

D.16.4 Alternative 4

D.16.4.1 Avoidance and Minimization Measures

Same as Alternative 1.

D.16.4.2 Additional Mitigation

Same as Alternative 1.

D.16.4.3 Independent but Related Programs

Same as Alternative 1.

D.17 Hazards and Hazardous Materials

D.17.1 Alternatives 1 - 4

D.17.1.1 Avoidance and Minimization Measures

No Avoidance and Minimization Measures have been identified.

D.17.1.2 Additional Mitigation

No Mitigation Measures have been identified.

D.17.1.3 Independent but Related Programs

No Independent but Related Actions have been identified.

D.18 Geology and Soils

D.18.1 Alternatives 1-4

D.18.1.1 Avoidance and Minimization Measures

No Avoidance and Minimization Measures have been identified.

D.18.1.2 Additional Mitigation

No Mitigation Measures have been identified.

D.18.1.3 Independent but Related Programs

- Geotechnical Studies - Reclamation's Geotechnical Design/Engineering Group provides geotechnical studies and analyses for embankment dams and a wide range of water resource projects. The group conducts geotechnical investigation to obtain geotechnical site data for characterization of liquefaction susceptibility, static and dynamic stability,

and seepage potential of the foundation soils at CVP facilities. Also, in the support of Reclamation's Dam Safety Program, the group performs dam safety evaluations, including probabilistic risk analysis, for over 300 high and significantly hazard embankment dams in Reclamation's current inventory. The group also provide design support services for dam safety modifications. Projects include:

- Embankment dams and foundations (geotechnical analysis and design of new and modifications to existing dams, construction support services, dam safety evaluations including probabilistic risk analysis, and security evaluations)
- Embankment dam risk analysis
- Emergency incident response
- Geotechnical analysis and design of foundations for concrete dams, pumping plants, powerplants, and other civil structures, canals, pipelines, and related features
- Stability analysis and improvement for natural soil and rock slope, including landslides
- Underground excavations, rock slopes, landslides, and other projects requiring the application of rock mechanics.

D.19 Public Health and Safety

D.19.1 Alternatives 1 - 4

D.19.1.1 Avoidance and Minimization Measures

No Avoidance and Minimization Measures have been identified.

D.19.1.2 Additional Mitigation

- *Mitigation Measure AG-1: Diversify Water Portfolios* - Water agencies should diversify their water portfolios. Diversification could include the sustainable conjunctive use of groundwater and surface water, water transfers, water conservation and efficiency upgrades, and increased use of recycled water or water produced through desalination where available.

D.19.1.3 Independent but Related Programs

No Independent but Related Actions have been identified.