# Attachment 1
# List of Acronyms and Terms

| | |
|---|---|
| °C | degrees Celsius |
| °F | degrees Fahrenheit |
| 2018 COA Addendum | 2018 amended Coordinated Operations Agreement between the federal government and the State of California |
| 2019 NMFS BO | National Marine Fisheries Service Biological Opinion on Long-term Operations of the Central Valley Project and State Water Project (Biological Opinion No. WCRO-2016-0069) |
| 2019 USFWS BO | United States Fish and Wildlife Service Biological Opinion for the Reinitiation of Consultation on Long-term Operations of the Central Valley Project and State Water Project (Biological Opinion No. 08FBTD00-2019-F-0164) |
| a.m. | ante meridiem, before noon |
| AF | acre-feet |
| Agencies | Collectively DWR, CDFW, Reclamation, USFWS, and NMFS in terms of implementing SWP and CVP Governance |
| AMP | Adaptive Management Program |
| AMSC | Adaptive Management Steering Committee |
| ASR | Annual Status Report |
| Banks Pumping Plant | Harvey O. Banks Pumping Plant |
| Bay-Delta Plan | Bay-Delta Water Quality Control Plan |
| BSPP | Barker Slough Pumping Plant |
| Cal. Code Regs. | California Code of Regulations |
| CASS SC | Culture and Supplementation of Smelt Steering Committee |
| CCF | Clifton Court Forebay |
| CD | Consistency Determination |
| CDEC | California Data Exchange Center |
| CDFW | California Department of Fish and Wildlife |
| CEQA | California Environmental Quality Act |
| CESA | California Endangered Species Act |
| cfs | cubic feet per second |
| CHNSR | spring-run Chinook Salmon |
| CHNSR JPE | spring-run Chinook Salmon juvenile production estimate |

# Attachment 1
# List of Acronyms and Terms

| | |
|---|---|
| CHNSR LCM | spring-run Chinook Salmon Life Cycle Model |
| CHNSR LCM Management Team | spring-run Chinook Salmon Life Cycle Model interagency management team |
| CHNWR | winter-run Chinook Salmon |
| CLC | Clifton Court Forebay CDEC station |
| cm | centimeter(s) |
| cm/sec | centimeter(s) per second |
| CNDDB | California Natural Diversity Database |
| COA | Coordinated Operation Agreement between the Federal Government and the State of California |
| CVP | Central Valley Project |
| CVP Contractors | Entities holding water supply contracts with the U.S. Bureau of Reclamation |
| Covered Activities | activities expected to result in incidental take of individuals of the Covered Species |
| Covered Species | species subject to take authorization by the Incidental Take Permit |
| CVPIA | Central Valley Project Improvement Act |
| CWT | coded-wire tag |
| D-1641 | State Water Resources Control Board Water Rights Decision 1641 |
| DCG | Delta Coordination Group |
| DCI | Delta-Mendota Canal/California Aqueduct Intertie |
| Delta | Sacramento-San Joaquin Delta |
| DGL | Doughty Cut above Grant Line Canal CDEC station |
| DJFMP | Juvenile Salmon Emigration Real Time Monitoring Program |
| DMC | Delta-Mendota Canal |
| DMW | Delta Monitoring Working Group |
| DRY Team | Drought Relief Year Team |
| DS | Delta Smelt |
| ECO-PTM | Ecological Particle Tracking Model |
| EDI | Environmental Data Initiative |

## Attachment 1
## List of Acronyms and Terms

| | |
|---|---|
| Endowment | long-term management fund for mitigation property |
| ESA | Endangered Species Act |
| FLaSH | Synthesis of Studies in the Fall Low-Salinity Zone of theSan Francisco Estuary, September-December 2011 |
| FNU | Formazin Nephelometric Units |
| FPT | Freeport CDEC station |
| ft/sec | foot (feet) per second |
| GIS | Geographic Information Systems |
| GYSO | Goodyear Slough Outfall |
| HM | Habitat Management |
| HOL | Holland Cut CDEC station |
| HRL | Healthy Rivers and Landscapes Program |
| IEP | Interagency Ecological Program |
| Implementing Entities | Collectively DWR, CDFW, Reclamation, USFWS, NMFS in terms of implementing Adaptive Management |
| ITAG | Interagency Telemetry Advisory Group |
| ITP | Incidental Take Permit |
| Jones Pumping Plant | C.W. Bill Jones Pumping Plant |
| JPE | juvenile production estimate |
| JPOD | Joint Point of Diversion |
| km | kilometer(s) |
| LFS | Longfin Smelt |
| LFSSP | 2020 Longfin Smelt Science Plan |
| LSNFH | Livingston Stone National Fish Hatchery |
| m | meter(s) |
| M&I | municipal and industrial |
| MAF | million acre-feet |
| MHR | Middle River near the Howard Road Bridge CDEC station |
| MIDS | Morrow Island Distribution System |
| mm | millimeter(s) |

# Attachment 1
# List of Acronyms and Terms

| | |
|---|---|
| MMRP | Mitigation Monitoring and Reporting Program |
| mph | miles per hour |
| MSD | Mossdale CDEC station |
| NAVD88 | North American Vertical Datum of 1988 |
| NBA | North Bay Aqueduct |
| NMFS | National Marine Fisheries Service |
| NOAA ERDDAP | National Oceanic Atmosphere Administration Environmental Research Division Data Access Program |
| NPDES | National Pollutant Discharge Elimination System |
| OBI | Old River at Bacon Island CDEC station |
| OLD | Old River near Tracy CDEC station |
| OMR | Old and Middle River |
| OSJ | Old River at Franks Tract near Terminous CDEC station |
| PAR | Property Analysis Record |
| Permittee | California Department of Water Resources |
| PIT | passive integrated transponder |
| ppm | parts per million |
| PPT | Prisoner's Point CDEC station |
| ppt | parts per thousand |
| Project | Long-term Operation of the State Water Project in the Sacramento-San Joaquin Delta |
| Proposed Action | Reclamation's proposal for Long-term Operation of the Central Valley Project and State Water Project |
| psu | practical salinity units |
| Reclamation | United States Bureau of Reclamation |
| ROD | Record of Decision |
| RRDS | Roaring River Distribution System |
| SaMT | Salmon Monitoring Team |
| SCH No. | State Clearinghouse Number |
| SDM | structured decision-making |

## Attachment 1
## List of Acronyms and Terms

| | |
|---|---|
| sDPS | Southern Distinct Population Segment |
| SHOT | Shasta Operations Team |
| Skinner Fish Facility | John E. Skinner Delta Fish Protective Facility |
| SLS | Smelt Larval Survey |
| SMPA | Suisun Marsh Preservation Agreement |
| SMSCG | Suisun Marsh Salinity Control Gates |
| SMT | Smelt Monitoring Team |
| SPK | USACE Sacramento District |
| State Water Board | State Water Resources Control Board |
| Summer-Fall Action Plan | plan to achieve Summer-Fall Habitat Action operational requirements |
| SWP | State Water Project |
| SWP Contractors | Public water agencies that hold long-term water service contracts with the California Department of Water Resources |
| TAF | thousand acre-feet |
| USACE | United States Army Corp of Engineers |
| USFWS | United States Fish and Wildlife Service |
| USGS | United States Geological Survey |
| WOMT | Water Operations Management Team |
| WS | White Sturgeon |
| WSMT | White Sturgeon Monitoring Team |
| X2 | Distance (km) up the axis of the estuary measured from the Golden Gate Bridge where the near-bottom daily average salinity is 2 practical salinity units (psu) |
| YBFMP | Yolo Bypass Fish Monitoring Program |

# Appendix F
# Winter-run Chinook Salmon Juvenile Production Estimates

This document provides background information about the winter-run Chinook Salmon Juvenile Production Estimate (JPE) and describes how it is calculated, the process for producing an annual JPE, and how it will be utilized to manage Long-term Operations of the State Water Project (SWP) and Central Valley Project (CVP).

## F.1 Background

The winter-run JPE is a forecast of the number of winter-run Chinook Salmon (winter-run) juveniles expected to reach the Sacramento–San Joaquin Delta (Delta) each year. It is used to set loss thresholds that will adjust flow management in Old and Middle River (OMR) to minimize impacts of the State and Federal water project pumping facilities on outmigrating winter-run.

Using a JPE to scale allowable take was first introduced in the 1993 National Marine Fisheries Service (NMFS) Biological Opinion for Long-term Operations of the CVP and SWP, and was used to reduce take. JPE letters are available on the NMFS website.

### F.1.1 Early JPE Methods

The winter-run JPE has been calculated several different ways since its inception, based on the best information available to make an estimate at that time. When new or better information was available to calculate a JPE, the method and/or inputs were updated. Early JPE methods all had a similar structure, starting with estimates of female spawners and fecundity and including various survival factors to account for mortality between the egg and smolt stages. Below is a timeline of changes made to the JPE inputs and calculations since 1993 (years shown are BYs), summarized from annual JPE letters:

- 1993: The first JPE was issued. Escapement was estimated based on counts at the fish ladder at Red Bluff Diversion Dam (RBDD). Pre-spawn mortality (5%), sex ratio (50:50), and fecundity (3,353–3,859) were estimated from literature or best professional judgement. Egg mortality due to temperature and dewatering were estimated using a linear regression temperature model and aerial redd surveys. Egg-to-fry survival (25%) was assumed based on U.S. Fish and Wildlife Service (USFWS) studies in the Tehama–Colusa spawning channel from 1975–1980, and fry-to smolt survival (59%) was assumed based on Hallock (undated). The number of smolts released from the Livingston Stone National Fish Hatchery (LSNFH) was added to the JPE without differentiation from natural production. There was not a separate factor for survival to the Delta.
- **2000:** Fecundity was estimated from winter-run females spawned at LSNFH. No other factors changed.

- **2001:** Escapement, number of females, and pre-spawn mortality were estimated by carcass surveys, using the Jolly-Seber model. A factor was added to estimate smolt survival between RBDD and the Delta (52–56%) for natural-origin juveniles; this factor is based on average differential ocean recovery rates of paired releases of coded-wire-tagged late-fall-run Chinook Salmon in Battle Creek and the Delta and was updated with new data when available.
- **2002:** NMFS began developing separate JPE forecasts for hatchery-origin and natural-origin winter-run. The same smolt survival term (52-56%) was applied to releases of winter-run smolts from LSNFH to account for survival between release and the Delta.
- **2010:** Egg-to-fry survival was based on the long term average juvenile passage estimate, calculated at the juvenile monitoring stations at RBDD, divided by female spawners, calculated from carcass surveys.
- **2013:** Smolt survival rates were estimated using the weighted average of late-fall-run and winter-run acoustic tag studies for natural-origin smolts, and winter-run acoustic tag studies for hatchery-origin smolts.
- **2014:** Shift to the JPI Method, which calculated the JPE from estimates of juvenile production from monitoring at RBDD, rather than carcass surveys (see section below).

## F.1.2 JPI-based JPE Method (BY 2014-2018)

The method for calculating the JPE shifted in BY 2014, after a review by the Interagency Ecological Program's winter-run Chinook Salmon Project Work Team (Winter-run PWT) found that the previous method overestimated the number of juveniles entering the Delta on average by 400 percent (National Marine Fisheries Service 2014). The Winter-run PWT also recommended that the JPE be revisited annually and updated as needed with any new or improved information. The equation for calculating the JPE using the JPI-based method is shown in Equation 2C-1.

From BY 2014–2019, the JPE calculation was calculated using estimates of the number of "fry equivalents" passing RBDD (Juvenile Production Index or $JPI_{Fry}$), an estimated fry-to-smolt survival rate of 0.59 (Hallock, undated), and an estimated smolt migration survival rate based on average survival from acoustic tagged smolts from LSNFH (Figure 2C-1). By starting with an estimate of fry production rather than female spawners, this method reduced uncertainty related to the large number of survival factors that need to be estimated. It also better represented survival differences due to environmental conditions during spawning, egg incubation, and rearing upstream of RBDD.

## F.1.3 Current "Method 2" JPI-based JPE Calculation Method (BY 2019-present)

Since BY 2019 (JPE applied in water year 2020), the winter-run JPE has consistently been calculated using the same method, although the factors used to calculate it are updated each year to include new available data. Described in O'Farrell et al. (2018) as "Method 2," this JPE method (Equation 2C-1) has a similar structure to the method used from 2014-2018, but it uses different methods to estimate survival rates for fry-to-smolt ($Survival_{Fry\text{-}to\text{-}Smolt}$) and smolt migration ($Survival_{Smolt}$).

**Equation 2C-1:**

$$JPE_{Natural} = JPI_{Fry} \times Survival_{Fry-to-Smolt} \times Survival_{Smolt}$$

The Juvenile Production Index ($JPI_{Fry}$) is an estimate of the number of juveniles passing the monitoring stations at RBDD, extrapolated for the remainder of the season and converted to "fry equivalents" to account for mortality between the fry and smolt stage. The fry-to-smolt survival rate ($Survival_{Fry\text{-}to\text{-}Smolt}$) is the estimated slope of a zero-intercept linear model fitted to estimates of hatchery-origin juvenile survival rates and natural-origin juvenile survival rates (O'Farrell et al. 2018). $Survival_{Fry\text{-}to\text{-}Smolt}$ is also the factor used to convert juvenile passage estimates at RBDD to "fry equivalents" for $JPI_{Fry}$, based on the peak of fry catch (generally in October) and the smolt life-stage for natural-origin winter-run at RBDD. The survival rate for smolt migration ($Survival_{Smolt}$) from RBDD to the Delta (i.e., Sacramento at the I-80/I-50 Bridge) is estimated using the variance-weighted mean of survival estimates from acoustic tagged LSNFH smolts released (2013-present) and uses the Cormack-Jolly-Seber model which accounts for variation in detection probabilities. Both survival parameters ($Survival_{Fry\text{-}to\text{-}Smolt}$ and $Survival_{Smolt}$) are updated annually to incorporate new data collected since the previous year (Table 2C-1).

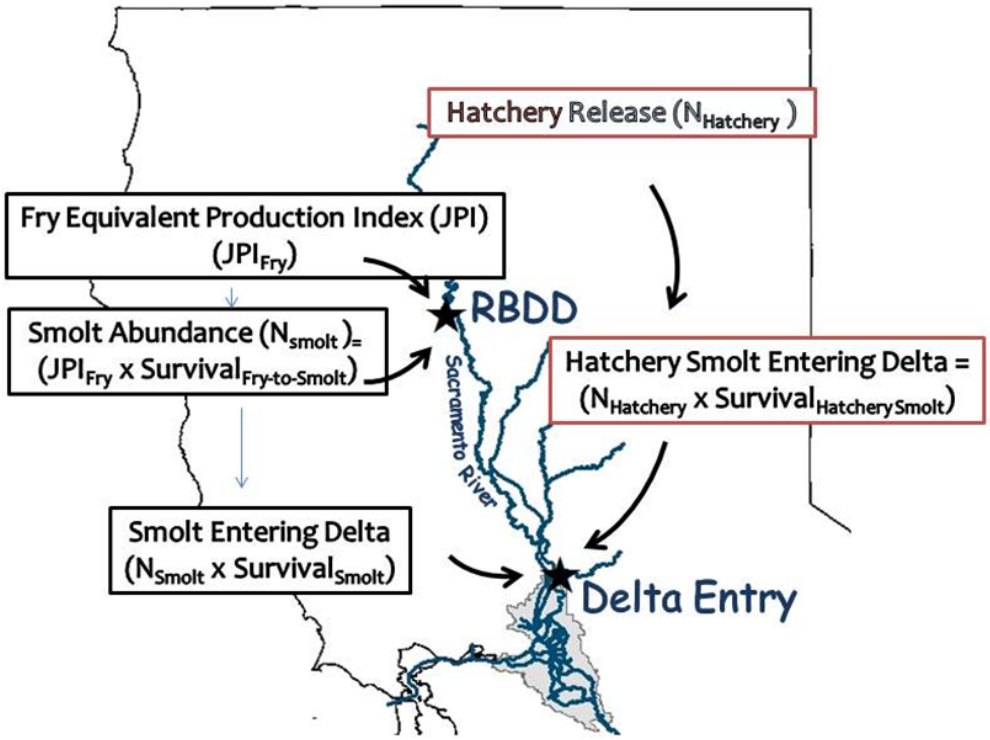


**Figure 2C-1. Location and formulas used to calculate the Juvenile Production Estimate from 2014-present**

A similar calculation is used to forecast the number of hatchery-origin winter-run Chinook Salmon entering the Delta each year, although it requires fewer parameters because the release numbers are known ($N_{Hatchery}$) and fish are released as smolts. Survival of hatchery smolts from release to the Delta ($Survival_{HatcherySmolt}$) is estimated by the variance-weighted mean of survival rates from LSNFH release to the Delta (2013-present). Separate JPEs are calculated for different release groups and accounted for separately in tracking.

**Equation 2C-2:**

$$JPE_{Hatchery} = N_{Hatchery} \times Survival_{HatcherySmolt}$$

Beginning in 2019, the Winter-run PWT has also calculated a JPE for hatchery-origin winter-run smolts released in Battle Creek as part of the "Jumpstart" reintroduction. Although there was also natural spawning in Battle Creek, the JPE has not differentiated natural-origin juveniles from Battle Creek from Sacramento River juveniles. As reintroduction efforts continue in Battle Creek and the McCloud River and populations become established, differentiating production sources is expected to become more relevant. Under the current method, unmarked winter-run Chinook Salmon from Battle Creek and the McCloud River are included in JPI estimates and therefore in $JPE_{Natural}$.

**Table 2C-1. Parameters used in calculating the winter-run JPEs for brood years 2019-2022. Survival parameters were generated as described in in O'Farrell et al. (2018), Method 2, and updated annually to include the previous year of monitoring data.**

| Estimate | Parameter | BY 2019 | BY 2020 | BY 2021 | BY 2022 |
|---|---|---|---|---|---|
| Fry Production [a] | $JPI_{Fry}$ | 4,762,142 | 2,232,811 | 796,403 | 311,058 |
| Fry-to-Smolt Survival [b] | $Survival_{Fry\text{-}to\text{-}Smolt}$ | 0.4651 | 0.4475 | 0.4429 | 0.4946 |
| | Data for Fry-to-Smolt Survival | 1998–2014 | 1998–2015 | 1998–2016 | 1998–2017 |
| Natural Smolt Survival, RBDD to Delta [c] | $Survival_{Smolt}$ | 0.3860 | 0.3304 | 0.3537 | 0.3245 |
| | Data for Smolt Survival | 2013–2019 | 2013–2020 | 2013–2021 | 2013–2022 |
| Hatchery Smolt Survival, LSNFH release to Delta [c] | $Survival_{HatcherySmolt}$ | 0.3687 | 0.3148 | 0.2818 | 0.2577 |
| Hatchery Smolt Survival, Battle Creek to Delta [d] | $Survival_{BCJumpstart}$ | NA | 0.1570 | 0.0519 | 0.0206 |
| Juvenile Production Estimate | $JPE_{Natural}$ | 854,941 | 330,130 | 124,760 | 49,924 |
| JPE Confidence Interval (C.I.)2 | 95% C.I. | 301,002–1,408,880 | 145,088–515,172 | 58,840–190,679 | 32,298–67,550 |

[a] Estimated juvenile passage at juvenile monitoring stations at Red Bluff Diversion Dam (RBDD), converted to "fry equivalents" using the fry-to-smolt survival factor for smolt-sized juveniles. This estimate includes an interpolation to account for the remainder of passage for the brood year.

[b] Estimate of fry-to-smolt survival is calculated using estimated slope of a zero-intercept linear model fitted to estimates of hatchery-origin juvenile survival rates and natural-origin juvenile survival rates (O'Farrell et al. 2018).

[c] Variance-weighted mean survival rate of acoustically tagged hatchery winter-run Chinook Salmon between RBDD and I-80/Tower Bridge in Sacramento (based on O'Farrell et al. 2018). Survival is estimated from the release location for hatchery-origin smolts, and from the Salt Creek receiver site, located 3 miles downstream of RBDD, to estimate survival from RBDD for natural-origin smolts.

[d] Variance-weighted mean survival rate of acoustically tagged hatchery winter-run Chinook Salmon between the release location in North Fork Battle Creek and I-80/Tower Bridge in Sacramento (based on O'Farrell et al. 2018). The survival rate of 64 fish on released on May 18, 2020 was not included because fish size and environmental conditions were not consistent with expected conditions during planned releases.

# F.2 Annual JPE Development Process

After the Record of Decision is finalized, the JPE will be developed by the JPE Subteam, consisting of technical representatives from the U.S. Bureau of Reclamation, California Department of Water Resources, NMFS, USFWS, and California Department of Fish and Wildlife. Annual JPE Development

will begin in November, and the JPE Subteam will issue the JPE Memo to the Shasta Operations Team (SHOT) by December 31 of the same year. The objective of the JPE Subteam will be to use best available science and work collaboratively to produce JPE forecasts that are transparent, defensible, and unbiased.

### F.2.1 Annual JPE Parameter Updates

During annual JPE development, the JPE Subteam will evaluate and incorporate any new data they agree will improve estimates of $JPI_{Fry}$, $Survival_{Fry\text{-}to\text{-}Smolt}$, $Survival_{Smolt}$, and $Survival_{HatcherySmolt}$ for the purposes of generating JPEs for natural-origin and hatchery-origin winter-run Chinook Salmon. This has occurred annually since the current JPE method was adopted in 2019, and is consistent with O'Farrell et al. (2018).

### F.2.2 Potential JPE Calculation Method Updates

Since 2014, the JPE development process has included an annual technical review to determine if there is new or improved information that should be incorporated. Additional years of monitoring data, additional data on fry and smolt survival, and better statistical models could increase accuracy and/or better capture uncertainty, resulting in better JPE forecasts (O'Farrell et al. 2018). If, after evaluation of the alternatives, the JPE Subteam determines that adjusting the method beyond updating parameter estimates for "Method 2" and Equation 2C-1 would improve the JPE forecast, the JPE Subteam will provide a technical memorandum to SHOT for consideration.

## F.3 Winter-run JPE Application

The Proposed Action for Long-term Operations of the SWP and CVP includes loss thresholds for natural- and hatchery-origin winter-run that are scaled to the Winter-run JPE. When triggered by winter-run loss observed in salvage, the loss thresholds require prescribed adjustments to OMR flow management through SWP and CVP exports in the Delta to protect outmigrating winter-run. The Proposed Action includes an annual loss threshold and weekly distributed loss thresholds for natural-origin winter-run and an annual loss threshold for hatchery-origin winter-run. The weekly distributed loss thresholds are calculated separately for early season (November through December) migrating juveniles and for mid- and late-season (January through June) migrating juveniles. The equations for calculating each loss threshold are provided in the Proposed Action and are explained further below.

### F.3.1 Annual Loss and Mid- and Late-Season Weekly Distributed Loss Thresholds

The winter-run JPE will be used as a factor in the equations to calculate thresholds for mid- and late-season weekly distributed loss and annual loss at the SWP and CVP during the OMR Management Season, as described in the Proposed Action. The JPE Subteam will coordinate with the Salmon Monitoring Team (SaMT) to ensure that SaMT is able to calculate thresholds using the JPE forecasts prior to the start of OMR Management Season for winter-run on January 1 each year.

## F.3.2 Early Season Migration Loss Threshold Multiplier (before a JPE is available)

The early season migration loss threshold is in effect in November and December, prior to development of $JPE_{Natural}$ for the BY. Weekly thresholds are calculated separately for November and December as the product of the cumulative biweekly winter-run passage estimates at RBDD and a Multiplier.[1] The Multiplier, applied to both November and December thresholds ($Multiplier_{Nov}$ and $Multiplier_{Dec}$, is the product of the estimated percent of winter-run juveniles present in the Delta for the given month[2] scaled to week (multiplied by 0.25), fry-to-smolt survival ($Survival_{Fry\text{-}to\text{-}Smolt}$), and smolt survival from RBDD to the Delta ($Survival_{Smolt}$).

Similarly to the JPE, $Survival_{Fry\text{-}to\text{-}Smolt}$ and $Survival_{Smolt}$ will be updated each year to include any new data that are available. If data are not yet available to update the parameters, the JPE Subteam will use the $Survival_{Fry\text{-}to\text{-}Smolt}$ and/or $Survival_{Smolt}$ estimates from the previous BY JPE calculation. Equations 2C-3 and 2C-4 show the calculations for the $Multiplier_{Nov}$ and $Multiplier_{Dec}$, and an example calculation for BY 2023 (as would be applied to water year 2024), which uses survival estimates from the BY 2022 JPE.

**Equation 2C-3:**

$$Multiplier_{Nov} = 0.0011 \times 0.25 \times Survival_{Fry-to-Smolt} \times Survival_{Smolt}$$

Example for BY 2023: $0.0044\% = 0.0011 \times 0.25 \times 0.4946 \times 0.3245$

**Equation 2C-4:**

$$Multiplier_{Dec} = 0.0021 \times 0.25 \times Survival_{Fry-to-Smolt} \times Survival_{Smolt}$$

Example for BY 2023: $0.0084\% = 0.0021 \times 0.25 \times 0.4946 \times 0.3245$

# F.4 Cited

National Marine Fisheries Service. 2014. Winter-run Chinook Salmon Juvenile Production Estimate for Water Year 2014. Letter to Mr. Ron Milligan, Operations Manager, Central Valley Project, U.S. Bureau of Reclamation from Marian Rea, Assistant Regional Administrator, California Central Valley Area Office.

[1] The November threshold is calculated using the seasonal passage to date from the second biweekly RBDD winter-run passage estimate in October. The December threshold is calculated using the seasonal passage to date from the second biweekly RBDD winter-run passage estimate in November.

[2] The November and December estimated percent of winter-run juveniles present in the Delta are based on Table 15 of the Proposed Action, which includes calculated values for the percent of winter-run present in the Sacramento Trawl (Sherwood Harbor; Delta entry) and the percent of winter-run present in Chipps Island Trawl (Delta exit), as determined by genetic analyses for water years 2017-2022. For the first week of January (January 1-7), Table 15 indicates that 0.32% of winter-run are historically present in the Delta (scaled to 100%; Column E). The November Multiplier assumes that one third of winter-run presence in the Delta by the first week of January occurred as early as November (one third of 0.32% = 0.0011). The December Multiplier assumes that two thirds of winter-run presence in the Delta by the first week of January occurred as early as December (two thirds of 0.32% = 0.0021).

O'Farrell M. R., W. H. Satterthwaite, A. N. Hendrix, and M. S. Mohr. 2018. Alternative Juvenile Production Estimate (JPE) forecast approaches for Sacramento River winter-run Chinook Salmon. *San Francisco Estuary & Watershed Science* 16(4):4.

# Attachment 3

## CALIFORNIA DEPARTMENT OF FISH AND WILDLIFE
## MITIGATION MONITORING AND REPORTING PROGRAM (MMRP)
## CALIFORNIA ENDANGERED SPECIES ACT

**INCIDENTAL TAKE PERMIT NO. 2081-2023-054-00**

**PERMITTEE:** **California Department of Water Resources**

**PROJECT:** **Long-term Operation of the State Water Project in the Sacramento-San Joaquin Delta**

## PURPOSE OF THE MMRP

The purpose of the MMRP is to ensure that the impact minimization and mitigation measures required by the Department of Fish and Wildlife (CDFW) for the above-referenced Project are properly implemented, and thereby to ensure compliance with section 2081(b) of the Fish and Game Code and section 21081.6 of the Public Resources Code. A table summarizing the mitigation measures required by CDFW is attached. This table is a tool for use in monitoring and reporting on implementation of mitigation measures, but the descriptions in the table do not supersede the mitigation measures set forth in the California Incidental Take Permit (ITP) and in attachments to the ITP, and the omission of a permit requirement from the attached table does not relieve the Permittee of the obligation to ensure the requirement is performed.

## OBLIGATIONS OF PERMITTEE

Mitigation measures must be implemented within the time periods indicated in the table that appears below. Permittee has the primary responsibility for monitoring compliance with all mitigation measures and for reporting to CDFW on the progress in implementing those measures. These monitoring and reporting requirements are set forth in the ITP itself and are summarized at the front of the attached table.

## VERIFICATION OF COMPLIANCE, EFFECTIVENESS

CDFW may, at its sole discretion, verify compliance with any mitigation measure or independently assess the effectiveness of any mitigation measure.

## TABLE OF MITIGATION MEASURES

| | Mitigation Measure | Source | Implementation Schedule | Responsible Party | Status/Date/ Initials |
|---|---|---|---|---|---|
| **GENERAL PROVISIONS** | | | | | |
| 1 | Designated Representative. Within 30 days of the effective date of this ITP, Permittee shall designate a representative (Designated Representative) responsible for communications with CDFW and overseeing compliance with this ITP. Permittee shall notify CDFW in writing within 30 days of the effective date of this ITP of the Designated Representative's name, business address, and contact information, and shall notify CDFW in writing if a substitute Designated Representative is selected or identified at any time during the term of this ITP. | ITP Condition # 6.1 | Within 30 days of the effective date of this ITP | Permittee | |
| 2 | Designated Biologist(s) and/or Biological Monitor(s). Permittee shall submit to CDFW in writing the name, qualifications, business address, and contact information of the Designated Biologist(s) and Biological Monitor(s) within 30 days of the effective date of this ITP. Permittee shall ensure that the Designated Biologist(s) and Biological Monitor(s) are knowledgeable and experienced in the biology and natural history of the Covered Species. The Designated Biologist(s) and Biological Monitor(s) shall be responsible for monitoring Covered Activities described in Condition of Approval 7.6 to help minimize and fully mitigate or avoid the incidental take of individual Covered Species and to minimize disturbance of Covered Species' habitat. Permittee shall obtain CDFW approval of the Designated Biologist(s) and Biological Monitor(s) in writing before starting Covered Activities described in Condition of Approval 7.6 and shall also obtain approval in advance, in writing, if the Designated Biologist(s) or Biological Monitor(s) must be changed. | ITP Condition # 6.2 | Within 30 days of the effective date of this ITP | Permittee | |
| 3 | Designated Biologist Authority. To ensure compliance with the Conditions of Approval of this ITP, the Designated Biologist shall immediately stop any activity that does not comply with this ITP and/or order any reasonable measure to avoid the unauthorized take of an individual of the Covered Species. Permittee shall provide unfettered access to the Project Site and otherwise facilitate the Designated Biologist in the performance of his/her duties. If the Designated Biologist is unable to comply with the ITP, then the Designated Biologist shall notify the CDFW Representative immediately. Permittee shall not enter into any agreement or contract of any kind, including but not limited to non-disclosure agreements and confidentiality agreements, with its contractors and/or the Designated Biologist that prohibit or impede open communication with CDFW, including but not limited to providing CDFW staff with the results of any surveys, reports, or studies or notifying CDFW of any non-compliance or take. Failure to notify CDFW of any non-compliance or take or injury of a Covered Species as a result of such agreement or contract may result in CDFW taking actions to prevent or remedy a violation of this ITP. | ITP Condition # 6.3 | Throughout the term of this ITP | Permittee | |

| | Mitigation Measure | Source | Implementation Schedule | Responsible Party | Status/Date/ Initials |
|---|---|---|---|---|---|
| 4 | Education Program. Permittee shall conduct an education program for all persons employed or otherwise working at the BSPP, CCF, SMSCG, and the Skinner Fish Facility before performing any work. The program shall consist of a presentation from the Designated Biologist that includes a discussion of the biology and general behavior of the Covered Species, information about the distribution and habitat needs of the Covered Species, sensitivity of the Covered Species to human activities, its status pursuant to CESA including legal protection, recovery efforts, penalties for violations and Project-specific protective measures described in this ITP. Permittee shall prepare and distribute wallet-sized cards or a fact sheet handout containing this information for workers to carry in the Project Area. Permittee shall provide interpretation for non-English speaking workers, and the same instruction shall be provided to any new workers before they are authorized to perform work in the Project Area. Upon completion of the program, employees shall sign a form stating they attended the program and understand all protection measures. This training shall be repeated at least once annually for long-term and/or permanent employees that will be conducting work in the Project Area. | ITP Condition # 6.4 | Throughout the term of this ITP | Permittee | |
| 5 | Covered Activities Training Documentation. The Designated Biologist(s) and Biological Monitor(s) shall maintain training documentation on-site in either hard copy or digital format throughout the term of the ITP at the BSPP, CCF, SMSCG, and Skinner Fish Facility. Documentation shall include a copy of this ITP with attachments and a list of signatures of all personnel who have successfully completed the education program. Permittee shall ensure a copy of the training documentation is available for review at each site upon request by CDFW. | ITP Condition # 6.5 | Throughout the term of this ITP | Permittee | |
| 6 | Trash Abatement. Permittee shall initiate a trash abatement program within six months of issuance of this ITP, and shall continue the program for the duration of the ITP. Permittee shall ensure that trash and food items are contained in animal-proof containers and removed, ideally at daily intervals but at least once a week, to avoid attracting opportunistic predators such as ravens, coyotes, and feral dogs. | ITP Condition # 6.6 | Within six months of the effective date of this ITP | Permittee | |
| 7 | Hazardous Waste. Permittee shall immediately stop and, pursuant to pertinent state and federal statutes and regulations, arrange for repair and clean up by qualified individuals of any fuel or hazardous waste leaks or spills at the time of occurrence, or as soon as it is safe to do so. Permittee shall properly contain and dispose of any unused or leftover hazardous products off-site. | ITP Condition # 6.7 | Throughout the term of this ITP | Permittee | |
| 8 | CDFW Access. Permittee shall provide CDFW staff with reasonable access to the Project and mitigation lands under Permittee control, and shall otherwise fully cooperate with CDFW efforts to verify compliance with or effectiveness of mitigation measures set forth in this ITP. | ITP Condition # 6.8 | Throughout the term of this ITP | Permittee | |

| | Mitigation Measure | Source | Implementation Schedule | Responsible Party | Status/Date/ Initials |
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| 9 | Refuse Removal. Upon completion of Covered Activities, Permittee shall remove and properly dispose of all weeds and sediment removed as a part of Project Activities. | ITP Condition # 6.9 | Throughout the term of this ITP | Permittee | |
| **MONITORING, NOTIFICATION, SCIENCE AND REPORTING PROVISIONS** | | | | | |
| 10 | Notification of Non-Compliance. The Designated Representative shall immediately notify CDFW if the Permittee is not in compliance with any Condition of Approval of this ITP, including but not limited to any actual or anticipated failure to implement measures within the time periods indicated in this ITP and/or the MMRP. The Designated Representative shall follow up within 24 hours with a written report to CDFW describing, in detail, any non-compliance with this ITP and suggested measures to remedy the situation. | ITP Condition # 7.1 | Throughout the term of this ITP | Permittee | |
| 11 | Annual Status Report. Permittee shall provide CDFW with an Annual Status Report (ASR) no later than December 1 of every year beginning with issuance of this ITP and continuing until CDFW accepts the Final Mitigation Report identified below. Each ASR shall summarize information from the prior water year October 1 through September 30 and include, at a minimum: (1) a copy of the table in the MMRP with notes showing the current implementation status of each Condition of Approval and mitigation measure; (2) a copy of all SWP and CVP salvage data collected from the prior water year; (3) reports of inspection and maintenance of fish protective equipment including equipment at Skinner Fish Facility, BSPP, and RRDS; (4) an assessment of the effectiveness of each completed or partially completed Condition of Approval in avoiding, minimizing, and mitigating Project impacts; (5) all available information about Project-related incidental take of the Covered Species; and (6) information about other Project impacts on the Covered Species. | ITP Condition # 7.2 | Throughout the term of this ITP | Permittee | |
| 12 | CNDDB Observations. The Designated Biologist shall submit all observations of Covered Species outside of SWP salvage operations to CDFW's California Natural Diversity Database (CNDDB) within 60 calendar days of the observation and the Designated Biologist shall include copies of the submitted forms with the next ASR. | ITP Condition # 7.3 | Throughout the term of this ITP | Permittee | |
| 13 | Final Mitigation Report. No later than 45 days after completion of all mitigation measures, Permittee shall provide CDFW with a Final Mitigation Report. The Designated Biologist shall prepare the Final Mitigation Report which shall include, at a minimum: (1) a summary of all ASRs; (2) a copy of the table in the MMRP with notes showing when each of the mitigation measures was implemented; (3) all available information about Project-related incidental take of the Covered Species; (4) information about other Project impacts on the Covered Species; (5) beginning and ending dates of Covered Activities; (6) an assessment of the effectiveness of this ITP's Conditions of Approval in minimizing and fully mitigating Project impacts of the taking on Covered Species; (7) recommendations on how mitigation | ITP Condition # 7.4 | No later than 45 days after completion of all mitigation measures | Permittee | |

| | Mitigation Measure | Source | Implementation Schedule | Responsible Party | Status/Date/ Initials |
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| | measures might be changed to more effectively minimize take and mitigate the impacts of future projects on the Covered Species; and (8) any other pertinent information. | | | | |
| 14 | Mitigation Status Report. Ninety days prior to the expiration of this ITP, Permittee shall provide CDFW with a Mitigation Status Report. The Designated Biologist shall prepare the Mitigation Status Report which shall include, at a minimum: (1) a summary of all ASRs; (2) a copy of the table in the MMRP with notes showing when each of the mitigation measures was implemented; (3) all available information about Project-related incidental take of the Covered Species; (4) information about other Project impacts on the Covered Species; (5) beginning and ending dates of Covered Activities; (6) an assessment of the effectiveness of this ITP's Conditions of Approval in minimizing and fully mitigating Project impacts of the taking on Covered Species; (7) recommendations on how mitigation measures might be changed to more effectively minimize take and mitigate the impacts of future projects on the Covered Species; and (8) any other pertinent information. This report may satisfy the Final Mitigation Report requirement of Condition of Approval 7.4 if all mitigation measures have been completed at the time of its submittal and approval by CDFW. | ITP Condition # 7.4.1 | 90 days prior to the expiration date of this ITP | Permittee | |
| **Skinner Fish Facility and Clifton Court Forebay Operations.** | | 7.5 | | | |
| 15 | Facility Outages and Reporting. To ensure long-term reliability of facility operations, Permittee may conduct annual full facility outages at the Banks Pumping Plant, Skinner Fish Facility, and CCF, consisting of up to one-week, anytime between the last week of April through mid-May (Spring Maintenance and Inspection; Condition of Approval 8.14.1), a one-week outage anytime between the last week of June through the first week of July (Herbicide and Algaecide Treatment; Condition of Approval 8.14.2), and a one-week outage anytime in October (fall herbicide treatment; Condition of Approval 8.14.2). Permittee shall submit an annual schedule to CDFW for review prior to any scheduled outages and notify CDFW two weeks prior to initiating any scheduled outages at the Banks Pumping Plant, Skinner Fish Facility, and CCF. Permittee shall work collaboratively with CDFW to address comments when developing a full facility outage plan.<br><br>If Permittee needs to deviate from the annual schedule, Permittee shall provide an updated schedule to CDFW for review and consideration 30 days prior to the planned outage. Following completion of the annual schedule, Permittee shall submit to CDFW written documentation describing compliance with the final schedule (Condition of Approval 7.2). | ITP Condition # 7.5.1 | Throughout the term of this ITP | Permittee | |
| 16 | Skinner Delta Fish Protective Facility Improvement Process. To refine the Skinner Fish Facility fish sampling procedures and infrastructure for improvements in accuracy and reliability of data and fish survival, Permittee shall submit a draft Debris Management Effectiveness Study Plan to CDFW for approval within one year of the effective date of this ITP. The Debris Management Effectiveness Study Plan shall include a timeline for study completion and shall be designed to monitor the continued implementation of fall herbicide | ITP Condition # 7.5.2 | Within one year of the effective date of this ITP | Permittee | |

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| | application to CCF and to evaluate its effectiveness on debris management procedures. The Debris Management Effectiveness Study Plan shall also include a structured decision-making (SDM) process with participation from Permittee, CDFW, USFWS, and NMFS to be used for alternatives development and design criteria development to further improve sampling procedures and infrastructure at the Skinner Fish Facility. Within 60 days of receiving CDFW review of the draft plan, Permittee shall address CDFW comments and finalize the Debris Management Effectiveness Study Plan for CDFW approval and implementation.<br><br>If the outcomes from the Debris Management Effectiveness Study Plan identify feasible additional improvements for sampling procedures or infrastructure that require further development and/or prioritization, Permittee shall implement the SDM process identified in the Debris Management Effectiveness Study Plan to develop requirements for additional improvements, including design criteria and/or procedures to implement the study recommendations (e.g. alternative methods of managing fish counts during periods of heavy debris and/or large numbers of fish). At the conclusion of the SDM process, Permittee shall submit the SDM recommendations to CDFW for review and approval. Permittee shall implement SDM recommendations within two years of CDFW's approval. In the interim, the historical count length reduction procedures for managing heavy debris and/or large numbers of fish will be used. | | | | |
| **Barker Slough Pumping Plant Maintenance.** | | 7.6 | | | |
| 17 | Biological Monitoring of Maintenance Activities. Permittee shall provide a Biological Monitor to observe and collect information on Covered Species during all maintenance Covered Activities associated with the BSPP. Biological Monitors are required for Conditions of Approval 7.6.2, 7.6.3, and 7.6.4 as further described in those conditions.<br><br>At a minimum, biological monitoring shall consist of (1) a collection of a water sample from the BSPP forebay within one day of scheduled maintenance activities (e.g., at the Barker Slough water quality station or in front of the BSPP fish screens) for later eDNA analysis, or (2) the inspection of the removed aquatic vegetation or sediment for Covered Species, or (3) both. Permittee shall provide the results of the eDNA analysis in the summary of the maintenance activities each year.<br><br>Permittee shall submit an annual summary report of data collected by the Biological Monitor(s) and shall include summaries of the maintenance activities conducted each year to CDFW in accordance with the ASR (Condition of Approval 7.2).<br><br>After the first annual reporting process, Permittee may meet with CDFW, USFWS, and NMFS to discuss continued monitoring of BSPP maintenance activities. Changes to the minimum requirements for biological monitoring shall be subject to CDFW approval. | ITP Condition # 7.6.1 | Throughout the term of this ITP | Permittee | |

| | Mitigation Measure | Source | Implementation Schedule | Responsible Party | Status/Date/ Initials |
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| 18 | Fish Screen Aquatic Weed Raking. Permittee may conduct aquatic weed management at the BSPP fish screens year-round using a weed rake, consisting of an aluminum frame with grappling hooks, lowered by a boom truck. Permittee shall have a CDFW approved Biological Monitor on site during weed raking activities to monitor for the presence of Covered Species when the volume of aquatic vegetation removed is more than 3 cubic yards per day and if either of the following conditions occur:<br>• A larval (< 25mm fork length) DS or LFS is detected in the most recent survey at 20-mm Survey station 720, or<br>• A juvenile Chinook Salmon or steelhead (as an indicator of Chinook salmon presence) is collected in Yolo Bypass Fish Monitoring Program (YBFMP) sampling, specifically:<br>o (November-December) Collection of juvenile Chinook Salmon or steelhead in the most recent seining at YBFMP sites BL 1-5 (located in the Lower Yolo Bypass toe drain). The YBFMP seining at sites BL 1-5 is conducted biweekly year-round;<br>o (January-June) Collection of juvenile Chinook Salmon or steelhead within the past five days in the YBFMP rotary screw trap (located in the Lower Yolo Bypass toe drain). The YBFMP rotary screw trap is operated on weekdays from January 1 through June 30. | ITP Condition # 7.6.2 | Throughout the term of this ITP | Permittee | |
| 19 | Aquatic Weed Harvesting. Permittee may conduct aquatic weed management in the BSPP forebay year-round using a boat-mounted aquatic weed harvester. Permittee shall have a CDFW approved Biological Monitor on site during weed harvesting activities to monitor for the presence of Covered Species when the volume of aquatic vegetation removed is more than 3 cubic yards per day and if the following condition occurs:<br>• A juvenile Chinook Salmon or steelhead (as an indicator of Chinook Salmon presence) is collected in YBFMP sampling, specifically:<br>o (November-December) Collection of juvenile Chinook Salmon or steelhead in the most recent seining at YBFMP sites BL 1-5 (located in the Lower Yolo Bypass toe drain). The YBFMP seining at sites BL 1-5 is conducted biweekly year-round;<br>o (January-June) Collection of juvenile Chinook Salmon or steelhead within the past five days in the YBFMP rotary screw trap (located in the Lower Yolo Bypass toe drain). The YBFMP rotary screw trap is operated on weekdays from January 1 through June 30. | ITP Condition # 7.6.3 | Throughout the term of this ITP | Permittee | |

| | Mitigation Measure | Source | Implementation Schedule | Responsible Party | Status/Date/ Initials |
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| 20 | Sediment Removal. Permittee may conduct sediment removal in the trap and concrete apron in front of the BSPP fish screens and in the pump wells behind the BSPP fish screens using a suction dredge. Sediment removal from within the pump wells may occur as needed, year-round. Permittee shall have a CDFW approved Biological Monitor onsite during BSPP sediment removal activities in the trap and concrete apron to monitor for the presence of Covered Species if either of the following conditions occur:<br>• A larval (< 25mm fork length) DS or LFS is detected in the most recent survey at 20-mm Survey station 720, or<br>• A juvenile Chinook Salmon or steelhead (as an indicator of Chinook Salmon presence) is collected in YBFMP sampling, specifically:<br>○ (November-December) Collection of juvenile Chinook Salmon or steelhead in the most recent seining at YBFMP sites BL 1-5 (located in the Lower Yolo Bypass toe drain). The YBFMP seining at sites BL 1-5 is conducted biweekly year-round;<br>○ (January-June) Collection of juvenile Chinook Salmon or steelhead within the past five days in the YBFMP rotary screw trap (located in the Lower Yolo Bypass toe drain). The YBFMP rotary screw trap is operated on weekdays from January 1 through June 30. | ITP Condition # 7.6.4 | Throughout the term of this ITP | Permittee | |
| 21 | South Delta Temporary Barriers Project Reporting. Permittee shall obtain written approval from CDFW prior to full operations of the South Delta Temporary Barriers Project each year. Full operations commence after the last of the flap gates at either the Middle River Barrier, Old River Barrier, or Grant Line Canal Barrier is untied and all flap gates of the barrier are tidally operated. If CDFW does not approve full operations, Permittee shall maintain intermediate operations of the barriers, leaving one flap gate on each barrier tied open and not subject to tidal operation.<br>Permittee shall not raise the weir elevation of the Middle River, Old River, or Grant Line Canal barriers for stage maintenance by one foot on or after June 15, unless approved by CDFW. | ITP Condition # 7.7 | Throughout the term of this ITP | Permittee | |
| **Longfin Smelt Monitoring and Science Requirements.** | | 7.8 | | | |
| 22 | Longfin Smelt Science Program. Permittee shall, in coordination with Reclamation, implement science activities identified in the 2020 LFS Science Plan (LFSSP) and this ITP through the term of this ITP; including the development of a mathematical life cycle model in addition to other identified science priorities. The LFS Technical Team will provide technical guidance regarding the LFS Science Program science activities as described in the LFSSP. Updates to the LFSSP shall be subject to CDFW approval before they are | ITP Condition # 7.8.1 | Throughout the term of this ITP | Permittee | |

| | Mitigation Measure | Source | Implementation Schedule | Responsible Party | Status/Date/ Initials |
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| | finalized and implemented.<br><br>The life cycle model will be used as a quantitative tool to characterize the effects of abiotic and biotic factors on LFS populations. Additional LFS science and monitoring informed by the life cycle modeling efforts will be implemented, as needed through the AMP (Attachment 4). | | | | |
| 23 | Winter- and Spring-run Chinook Salmon Monitoring and Science Requirements. To improve understanding of CHNWR and CHNSR population size, life history diversity, migration patterns, survival rates, habitat use, and impacts from water-operations related stressors, Permittee, as a part of the AMP (Attachment 4), shall initiate, fund, and implement new and ongoing monitoring and science. This new and ongoing monitoring and science shall include the elements identified in Conditions of Approval 7.9.1, 7.9.2, 7.9.3, 7.9.4, 7.9.5, 7.9.6, and 7.9.7 and shall be combined with existing surveys and data to: (1) continue to build knowledge regarding the biology, ecology, and life history of CHNSR and CHNWR; (2) better understand potential impacts of Project operations on CHNWR and CHNSR; (3) continue to refine the CHNWR juvenile production estimate (JPE); and (4) develop a CHNSR JPE and associated operational criteria that may be proposed to replace or augment Condition of Approval 8.4.5 as a part of the AMP (Attachment 4) and a subsequent amendment to this ITP. | ITP Condition # 7.9 | Throughout the term of this ITP | Permittee | |
| 24 | Alternative Loss Estimation Pilot Study. Permittee shall, as part of the AMP (Attachment 4) and in coordination with Reclamation, further refine the parameters of the Alternative Loss Equation software tool for estimating CHNWR and CHNSR loss at the SWP and CVP export facilities by developing an Alternative Loss Pilot Study Implementation Plan to implement the tool in parallel with current loss estimation methods (2018 CDFW loss equation; Attachment 8) and incorporate SDM principles to prioritize loss parameter studies and performance evaluation studies. The goal of the Alternative Loss Estimation Pilot Study is to provide a more accurate estimate of CHNWR and CHNSR loss, and loss parameters, at the SWP and CVP export facilities while understanding the utility of an alternative method relative to the existing method.<br><br>Within six months of the effective date of this ITP, Permittee shall, in collaboration with Reclamation, conduct a knowledge transfer and methods workshop for the Alternative Loss Equation software tool with participation from Permittee, CDFW, Reclamation, USFWS, NMFS, SWP Contractors, and CVP Contractors. Following the knowledge transfer and methods workshop, Permittee shall, in coordination with Reclamation, establish the Alternative Loss Equation Technical Team, a subteam of the Central Valley Fish Facility Review Team, including but not limited to representatives from Permittee, CDFW, Reclamation, USFWS, and NMFS.<br><br>Within six months of the knowledge transfer and methods workshop, Permittee shall, in coordination with the Alternative Loss Equation Technical Team, develop and submit a | ITP Condition # 7.9.1 | Within seven years of the effective date of this ITP | Permittee | |

| | Mitigation Measure | Source | Implementation Schedule | Responsible Party | Status/Date/ Initials |
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| | draft Alternative Loss Pilot Study Implementation Plan to the Alternative Loss Equation Technical Team for review and comment. The draft Alternative Loss Pilot Study Implementation Plan shall include: (1) pilot study design; (2) SDM process outline; (3) procedures and timelines for implementing the pilot study and SDM process; (4) target species including CHNWR and CHNSR; (5) interim, draft, and final reporting protocols and meeting schedules; and (6) an assessment of multiple parameters to account for loss including but not limited to, salvage facility outages during louver cleaning or mechanical failures and post-release survival studies for salvaged fish. Within four months of receiving Alternative Loss Equation Technical Team review, Permittee shall submit the final draft Alternative Loss Pilot Study Implementation Plan to the Central Valley Fish Facility Review Team, SaMT, and CDFW for review. Within one month of receiving Central Valley Fish Facility Review Team, SaMT, and CDFW review, Permittee shall finalize the Alternative Loss Pilot Study Implementation Plan for implementation and submit to CDFW for approval.<br><br>Permittee shall, in coordination with the Alternative Loss Equation Technical Team, implement the Alternative Loss Estimation Pilot Study and complete a prioritization of the pilot study recommendations, including assessments of multiple loss parameters, through SDM procedures, for further implementation. The Alternative Loss Equation Technical Team may utilize an independent peer review to support the SDM process. Within 18 months of CDFW approval of the final Alternative Loss Pilot Study Implementation Plan, Permittee shall, in coordination with Reclamation, implement the Alternative Estimate Pilot Study and submit the prioritized pilot study recommendations to the AMSC for approval.<br><br>Within seven years of the effective date of this ITP, Permittee shall complete the implementation of the prioritized pilot study recommendations to provide more accurate estimates of CHNWR and CHNSR loss at the SWP and CVP export facilities. Permittee shall, in coordination with Reclamation, update the loss estimation with refinements to the loss estimation parameters and obtain approval by CDFW. | | | | |
| 25 | Winter-run Chinook Salmon Machine Learning Model Development. Permittee shall, as part of the AMP (Attachment 4) and in coordination with Reclamation, support and fund the continued refinement of the Winter-run Chinook Salmon Machine Learning Model for use during real-time operations to inform the SaMT and implementation of this ITP. The continued refinement of the Winter-run Chinook Salmon Machine Learning Model will require the established Winter-run Chinook Machine Learning Interagency Team to incorporate genetic-based run-identification loss and monitoring data of CHNWR currently available. The Winter-run Chinook Machine Learning Interagency Team will also develop a CHNWR distribution model to explicitly predict daily juvenile CHNWR migration timing in the Delta using historical long-term monitoring data and environmental variables for SaMT to use by 2026 (Condition of Approval 8.1.2, Attachment 4).<br><br>The Winter-run Chinook Machine Learning Interagency Team shall develop a modeling | ITP Condition # 7.9.2 | Throughout the term of this ITP<br><br>Develop a CHNWR distribution model by 2026 | Permittee | |

| | Mitigation Measure | Source | Implementation Schedule | Responsible Party | Status/Date/ Initials |
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| | framework that integrates the CHNWR distribution model with particle tracking model outcomes (potentially Ecological Particle Tracking Model [ECO-PTM]), and considers the efficacy of the Georgiana Slough Migratory Barrier, to estimate the proportion of the juvenile CHNWR outmigrating population vulnerable to entrainment into the south Delta per day, the probability of juvenile CHNWR entrainment into the south Delta given current hydrologic conditions, and the travel time of juvenile CHNWR to the SWP and CVP export facilities.<br><br>In addition to the real-time assessment tool, the Winter-run Chinook Machine Learning Interagency Team shall also provide modeling outputs from the Winter-run Chinook Salmon Machine Learning Model and associated OMR Conversion Tool to SaMT for the implementation of Condition of Approval 8.4.4 to this ITP. | | | | |
| 26 | Spring-run Chinook Salmon Juvenile Production Estimate. Permittee shall, as part of the AMP (Attachment 4) and in coordination with Reclamation, support and fund the continued development of a CHNSR Juvenile Production Estimate (CHNSR JPE) framework for SWP and CVP tributaries and the Delta, and from the framework, propose a CHNSR JPE Plan by 2026 for implementation, including an approach for modeling a CHNSR JPE and the monitoring program to support that approach. The CHNSR JPE Plan shall incorporate independent peer review and will be the basis for consideration of any updated entrainment minimization measures described in Conditions of Approval 8.4.5 and 8.4.6 to this ITP. The process to develop the framework and CHNSR JPE Plan shall continue the ongoing effort to develop a CHNSR JPE initiated in 2020 and outlined in the CHNSR JPE Science Plan, the CHNSR JPE Interim Monitoring Plan, the CHNSR JPE Run Identification Research and Initial Monitoring Plan, the CHNSR JPE Data Management Strategy, and the CHNSR JPE Decision Charter.<br><br>In 2025, Permittee shall:<br>• In coordination with the CHNSR JPE Modeling Subteam and with guidance from the CHNSR JPE Core Team, develop a suite of initial CHNSR JPE models based on available CHNSR data and provide the models to the CHNSR JPE Core Team for review.<br>• Support the efforts of the CHNSR JPE Core Team to develop a CHNSR JPE framework, composed of the selected CHNSR JPE models and the monitoring program required to provide data to calculate an annual CHNSR JPE.<br>• Coordinate with the AMSC and the CHNSR JPE Core Team, to charter and convene an independent peer review panel to provide feedback on the CHNSR JPE Core Team's recommended CHNSR JPE framework.<br><br>In 2026 Permittee shall:<br>• Following the independent peer review, and in consideration of independent peer review feedback, prepare a draft CHNSR JPE Plan in collaboration with CDFW, | ITP Condition # 7.9.3 | Develop a CHNSR JPE framework by 2025<br><br>Submit final CHNSR JPE Plan to CDFW and NMFS by 2026<br><br>Provide an annual CHNSR JPE estimate and implement the final CHNSR JPE Plan by 2027<br><br>Evaluate and implement changes to the CHNSR JPE model suggested by independent peer review (if applicable) by 2030 | Permittee | |

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| | USFWS, and NMFS that describes the approach to calculating a CHNSR JPE and the monitoring and special studies needed to collect the data to calculate a CHNSR JPE annually. The draft CHNSR JPE Plan shall be guided by the CHNSR JPE Core Team SDM process and CHNSR JPE framework recommendation, and by the independent peer review panel's feedback on the CHNSR JPE framework.<br>• Submit the draft CHNSR JPE Plan to the CHNSR JPE Core Team for review and work collaboratively to incorporate CHNSR JPE Core Team comments into the final CHNSR JPE Plan.<br>• No later than six months after the independent peer review, Permittee shall, in coordination with Reclamation, submit the final CHNSR JPE Plan to CDFW and NMFS for review and approval.<br>• Convene the CHNSR JPE Core Team and subteams identified in the CHNSR JPE Science Plan to provide an annual CHNSR JPE estimate, implement the final CHNSR JPE Plan (including monitoring), and ensure all data obtained through long-term monitoring programs are stored in a publicly accessible repository.<br>• Support the efforts of the CHNSR JPE Core Team to evaluate the minimization provided by the Spring-run Chinook Salmon Protection Action and Surrogate Annual Loss Thresholds (Condition of Approval 8.4.5).<br>• Following the evaluation, Permittee, CDFW, Reclamation, and NMFS will meet to consider development of a new or modified Spring-Run Chinook Salmon Protection Action and Surrogate Annual Loss Thresholds (Condition of Approval 8.4.5). Such consideration will be informed by: 1) the final CHNSR JPE Plan 2) independent peer review panel feedback on the CHNSR JPE framework; 3)historical CHNSR monitoring data; 4)new data obtained from the monitoring and special studies needed to collect the data to calculate the CHNSR JPE: (5) CHNSR JPE Core Team review of Condition of Approval 8.4.5; and (6) other relevant information (e.g., implementation of Conditions of Approval 7.9.5 and 7.9.6).<br>Any new or modified CHNSR OMR minimization measure Permittee proposes shall:<br>• Take into account the limitations of the initial CHNSR JPE approach to calculate the CHNSR JPE;<br>• Be an interim approach to be refined as the CHNSR JPE approach evolves and the CHNSR Life Cycle Model (Condition of Approval 7.9.4) is completed;<br>• Anticipate future iterations and refinements of the CHNSR JPE approach; and<br>• Rely more on monitoring data than salvage data from the SWP and CVP export facilities.<br>In 2027, Permittee shall:<br>• In coordination with Reclamation, implement changes to monitoring if recommended through the SR-JPE Core Team SDM process, approved by | | | | |

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| | CDFW and NMFS through appropriate take authorization for monitoring activities, and informed by stakeholder participation from non-SWP or CVP tributaries.<br>• Support the SR JPE Modeling Subteam to continue to develop and refine the CHNSR JPE model by integrating new data once available and adjusting the modeling approach in collaboration with the CHNSR JPE Core Team and in response to SDM processes conducted by the CHNSR JPE Core Team. As changes are made to the CHNSR JPE Permittee shall consult with CDFW regarding the potential need for an amendment to this ITP (Conditions of Approval 5, 8.4.6).<br>In 2028, Permittee shall:<br>• Coordinate with the AMSC and the CHNSR JPE Core Team, to consider chartering and convening an independent peer review panel to provide feedback on the CHNSR JPE model.<br>In 2029 and 2030, if an independent peer review is convened pursuant to the AMP, Permittee shall:<br>• Convene the CHNSR JPE Core Team to review independent peer review panel feedback, and the CHNSR JPE Core Team will use SDM to evaluate and implement changes to the CHNSR JPE model. | | | | |
| 27 | Spring-run Chinook Salmon Life Cycle Model. Permittee shall, as part of the AMP (Attachment 4) and in coordination with Reclamation, support and fund the development of a CHNSR Life Cycle Model (CHNSR LCM) consistent with this Condition of Approval for the purpose of informing management actions to improve Central Valley CHNSR population status. Permittee shall, in coordination with Reclamation, establish an interagency management team (CHNSR LCM Management Team) including representatives from Permittee, CDFW, Reclamation, USFWS, and NMFS, to define the specific management issues and objectives to be addressed by the CHNSR LCM. The AMSC may serve in place of a distinct CHNSR LCM Management Team, if approved by CDFW and NMFS. Because of the close link between the CHNSR LCM and CHNSR JPE development through a shared use of historical and newly generated data, the CHNSR JPE Core Team will be responsible for guiding the development of the CHNSR LCM to address the management objectives. The CHNSR JPE Core Team will also be responsible for determining whether the required modeling can be accomplished through an update of one or more existing Central Valley Chinook Salmon modeling efforts, such as the CHNSR JPE, the NMFS CHNSR life cycle model, and the CVPIA Science Integration Team salmon life cycle models. The CHNSR JPE Core Team will use SDM principles when appropriate. The CHNSR JPE Core Team will develop and submit a CHNSR LCM Modeling Plan and timeline to the CHNSR LCM Management Team for approval, and guide implementation of the plan. To facilitate open communication between the lead life cycle modeler and agency | ITP Condition # 7.9.4 | Implement final modeling plan by 2027<br>Recommend an initial CHNSR LCM by 2028<br>Evaluate and implement changes to the initial CHNSR LCM suggested by independent peer review (if applicable) by 2030 | Permittee | |

| | Mitigation Measure | Source | Implementation Schedule | Responsible Party | Status/Date/ Initials |
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| | staff, Permittee shall establish a CHNSR LCM Modeling Subteam including, but not limited to, representatives from Permittee, CDFW, Reclamation, USFWS, and NMFS. Throughout the process to develop the CHNSR LCM and implement the CHNSR LCM Modeling Plan, the lead life cycle modeler will collaborate with the CHNSR LCM Modeling Subteam through regular meetings to solicit feedback and integrate that feedback into model development iteratively, in a manner similar to the CHNSR JPE Modeling Subteam described in Condition of Approval 7.9.3 to this ITP.<br><br>In 2025, Permittee shall, in coordination with Reclamation, assemble the CHNSR LCM Management Team and begin coordination with the CHNSR JPE Core Team on the development of the CHNSR LCM.<br><br>In 2026, Permittee shall, in coordination with the CHNSR JPE Core Team, develop and submit a draft CHNSR LCM Modeling Plan and timeline to the CHNSR LCM Management Team for approval, and guide implementation of the final, approved CHNSR LCM Modeling Plan. Also in 2026, Permittee shall, in coordination with Reclamation, establish the CHNSR LCM Modeling Subteam for coordination between the lead life cycle modeler and the CHNSR JPE Core Team.<br><br>In 2027, the CHNSR LCM Modeling Subteam shall convene regular meetings to implement the final CHNSR LCM Modeling Plan and to solicit and incorporate feedback on model development.<br><br>In 2028, CHNSR LCM Modeling Subteam will, under the guidance of the CHNSR LCM Management Team and CHNSR JPE Core Team, recommend an initial CHNSR LCM. Also in 2028, the AMSC will, in coordination with the CHNSR JPE Core Team and the CHNSR LCM Management Team, consider chartering and convening an independent peer review panel to provide feedback on the initial CHNSR LCM.<br><br>In 2029 and 2030, if an independent peer review is convened, the CHNSR JPE Core Team and the CHNSR LCM Modeling Subteam will review independent peer review panel feedback, and the CHNSR JPE Core Team will use SDM to evaluate and implement changes to the initial CHNSR LCM. | | | | |
| 28 | Salmon Delta Occupancy, Distribution, and Survival Studies. Enhanced monitoring of juvenile Chinook Salmon movement through the Delta, paired with environmental data, will provide a more comprehensive understanding of Delta occupancy and survival, including specific areas that may be more frequently utilized for rearing and contribute to higher survival rates. These data will inform real-time management of Project operations and will support elements of the AMP (Attachment 4), such as the development of a CHNSR LCM and a CHNWR migration model. Additionally, these data may aid in the development of habitat restoration projects focused on improving quality of and connectivity between juvenile Chinook Salmon rearing areas in the Delta. | ITP Condition # 7.9.5 | Submit draft study plan to CDFW within one year of the effective date of this ITP<br><br>Convene the working group quarterly | Permittee | |

| | Mitigation Measure | Source | Implementation Schedule | Responsible Party | Status/Date/ Initials |
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| | Permittee shall continue to implement annual regional juvenile Chinook Salmon survival studies within the Delta for the duration of this ITP including the Georgiana Slough Salmonid Migratory Barrier Effectiveness Studies (Condition of Approval 7.9.6) and studies associated with the Alternative Loss Estimation Pilot Study (Condition of Approval 7.9.1). This may also include Yolo Bypass salmonid studies, Sutter and Steamboat sloughs studies, and updates to ECO-PTM. The objective of these studies is to evaluate juvenile Chinook Salmon reach-specific survival, behavior, and route entrainment within the Sacramento River and Delta (including the south Delta). To continue to successfully implement these studies, Permittee shall:<br>• Secure an acoustic receiver network in the Sacramento River and Delta;<br>• Provide real-time and retrospective modeling of the data obtained from the receiver network;<br>• Secure a source of natural-origin or hatchery-origin Chinook Salmon from the Sacramento River basin and acoustically tag them prior to release in the Sacramento River; and<br>• Convene a new working group comprised of representatives from Permittee, CDFW, Reclamation, USFWS, and NMFS to expand the acoustic receiver network and prioritize co-location of physical and biological data collection with the goal of forecasting entrainment rates, Delta occupancy timing and distribution, and reach-specific survival based on a combination of real-time acoustic telemetry data, mark-recapture survival modeling, and predictions of through-Delta survival in specific anticipated environmental conditions, consistent with Advancement 3 of Johnson et al. (2017).<br>To support implementation and collaboration, the working group will:<br>• Collaborate with the Interagency Telemetry Advisory Group (ITAG) on the integration of new real-time acoustic receiver arrays into the current receiver network to optimize coordination of a system-wide acoustic telemetry system in the Sacramento-San Joaquin Delta;<br>• Investigate other ways to improve monitoring of juvenile Chinook Salmon rearing, routing, and through-Delta survival such as increased PIT tagging and monitoring. PIT tag monitoring could be incorporated for fish too small for acoustic tagging to better understand rearing and migration of fry through the Delta.<br>Within one year of the effective date of this ITP, Permittee shall, in coordination with the new working group, submit a draft study plan to CDFW for review and approval. Within four months of receiving CDFW review, Permittee shall, in coordination with the new working group, finalize the draft study plan and obtain CDFW's written approval for implementation. At a minimum, Permittee shall convene the new working group quarterly every year to review and revise annual study plans, discuss study progress, and review data gathered from occupancy, distribution, and survival studies. | | throughout the term of this ITP | | |

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| 29 | Georgiana Slough Salmonid Migratory Barrier Effectiveness Studies. Permittee shall, as part of the AMP (Attachment 4) and in coordination with the implementation of Condition of Approval 8.11.1 to this ITP, continue annual effectiveness studies through the duration of this ITP to refine the understanding of Georgiana Slough Salmonid Migratory Barrier efficiency and benefits to CHNWR and CHNSR. Permittee shall also consider the potential to gain information regarding impacts of barrier operations on adult CHNWR and CHNSR migration when designing studies. Studies shall be complimentary to, or integrated with, the WS Science Plan (Condition of Approval 7.10.1) to provide additional information regarding potential impacts to WS migration. At a minimum, Permittee shall convene the Guidance Structure Evaluation Working Group quarterly every year to continuously refine annual study plans, discuss study progress, and review data gathered from annual effectiveness studies. The Guidance Structure Evaluation Working Group shall include, but not be limited to, representatives from Permittee, CDFW, Reclamation, USFWS, and NMFS.<br><br>Within one month of the effective date of this ITP, Permittee shall provide CDFW and the Guidance Structure Evaluation Working Group the current water year annual study plan supporting the Georgiana Slough Salmonid Migratory Barrier Monitoring Plan. For each subsequent water year, Permittee shall provide CDFW and the Guidance Structure Evaluation Working Group with a draft annual study plan for review by February 1. Permittee shall work with CDFW and the Guidance Structure Evaluation Working Group to incorporate comments on the draft study plan and shall submit the final study plan to CDFW for approval no later than July 1. Permittee shall implement the finalized annual study plan the following water year. All modifications to the study plan shall be approved by CDFW.<br><br>Permittee shall provide data to CDFW and the Guidance Structure Evaluation Working Group as requested during the operation of the Georgiana Slough Salmonid Migratory Barrier to support real-time operations. Permittee shall provide data through the National Oceanic Atmosphere Administration Environmental Research Division Data Access Program (NOAA ERDDAP) data server or equivalent if approved by CDFW. Permittee shall present all data collected for effectiveness studies to the Guidance Structure Evaluation Working Group for review prior to its use in informing other Conditions of Approval to this ITP or the AMP (Attachment 4).<br><br>By October 1 each year (Condition of Approval 8.11.1), Permittee shall, in coordination with the Guidance Structure Evaluation Working Group, submit to CDFW annual reports documenting Georgiana Slough Salmonid Migratory Barrier operations and effectiveness studies, including available retrospective modeling of the data.<br><br>Permittee shall, in coordination with the Guidance Structure Evaluation Working Group, submit to CDFW and the Guidance Structure Evaluation Working Group a triennial report documenting Georgiana Slough Salmonid Migratory Barrier operations and effectiveness | ITP Condition # 7.9.6 | Throughout the term of this ITP | Permittee | |

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| | studies, including retrospective modeling of the data over different hydrologic conditions. | | | | |
| 30 | Rapid Genetics Support. Permittee shall fully fund one new CDFW Research Scientist 3 position and one half of an existing CDFW Environmental Scientist position to support genetic monitoring and science associated with SWP operations including:<br>• Continued collaboration on collection, interpretation, and application of genetic data to help inform the new CHNSR JPE and application of the CHNSR JPE;<br>• Verification of results obtained from laboratories conducting real-time salvage identifications;<br>• Collaboratively develop methods for identification of San Joaquin River Restoration Program Chinook Salmon juveniles collected at salvage facilities or in Bay-Delta monitoring programs;<br>• Genetic identification of Chinook Salmon across the diversity spectrum in the Central Valley and the development of collaborative strategies to protect life history diversity;<br>• Applications of parentage/kinship analysis for detection of unmarked, unfed hatchery-origin juvenile Chinook Salmon;<br>• Standardization of genetic methods across laboratories conducting Central Valley Chinook Salmon studies;<br>• Coordinate the collection, archiving, and dissemination of salmonid tissue samples; and<br>• Design studies, collect, and analyze data to assess population attributes of CHNSR.<br>This work will support implementation of real-time OMR minimization measures (Conditions of Approval 8.2.1, 8.4.3, 8.4.4, and 8.4.5) and CHNSR monitoring and science measures (Conditions of Approval 7.9.3 and 7.9.4). Funding for these positions shall be available no later than July 1 subsequent to the effective date of this ITP. Rapid genetic analyses for CHNWR currently rely primarily on GT-seq, however as science advances during the term of this ITP a new method may be used instead of GT-seq, if approved by CDFW. | ITP Condition # 7.9.7 | By July 1, 2025 | Permittee | |
| White Sturgeon Monitoring and Science Requirements. | | 7.10 | | | |
| 31 | White Sturgeon Science Program. Permittee shall continue to convene the WS Science Program. The WS Science Program shall include representatives from Permittee and CDFW and allow for participation by USFWS, NMFS, Reclamation, and SWP Contractors. A primary goal of this effort is to inform management of WS and to identify potential additional management actions that could improve its status. Permittee shall prepare a draft WS Science Plan, in collaboration with CDFW, that describes new science needed to | ITP Condition # 7.10.1 | Submit draft science plan by July 12, 2025 | Permittee | |

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| | improve the understanding of WS ecology, stressors, and impacts as a result of SWP operations and submit to CDFW for review by July 12, 2025. The WS Science Plan shall include, but is not limited to, the following science priorities:<br>• A schedule for implementation including deadlines for draft and final reports for each study required;<br>• A plan for development of a mathematical life cycle model for WS, verified with field data collection, as a quantitative tool to characterize the effects of abiotic and biotic factors on WS abundance and distribution, including major mortality events due to harmful algal blooms;<br>• New and ongoing monitoring that:<br>o Characterizes the distribution and abundance of adult, sub-adult, juvenile, and larval life stages;<br>o Collects necessary data to develop a future life cycle model including somatic growth as well as estimates of survival probabilities among life stages;<br>o Characterizes changes in abundance and distribution of life stages across a range of hydrologic conditions, including varying ranges of X2 and water year types;<br>o Considers revisions to existing IEP monitoring programs to expand the spatiotemporal distribution of sampling; and<br>o Addresses factors that influence WS catchability and gear efficiency;<br>• Improved understanding of WS spawning, egg development, and rearing habitat distribution and use in the spawning rivers, Delta, and Suisun Marsh;<br>• An entrainment and residency program to quantify WS entrainment and residency in CCF and to better understand factors that may contribute to WS entrainment and residency in CCF;<br>• A WS salvage prediction tool for generating a near-term forecast of the probability of future salvage designed to inform real-time operations; and<br>• Quantification of the lethal and sublethal impacts of harmful algal blooms on WS to support the WS life cycle model development.<br>The WS Science Plan may also include the following actions:<br>• Development of a genetic management plan to support the use of cultured WS fish for research purposes;<br>• Improved understanding of the genetic diversity within California WS; and<br>• WS-specific studies of fish screen efficiency at Skinner Fish Facility and loss within CCF.<br>Permittee shall work collaboratively with the WS Science Program and consider edits and comments on the draft WS Science Plan while preparing the final plan. The final WS | | | | |

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| | Science Plan shall be submitted to CDFW within one year following submission of the draft plan, for approval by CDFW. After the final plan is approved in writing by CDFW, Permittee shall fund and implement required monitoring and science according to the timelines specified in the final WS Science Plan. The final WS Science Plan may be periodically updated by Permittee or CDFW to reflect updated science priorities or new information, and the updated plan will be submitted to CDFW for approval. Permittee, in coordination with CDFW, will develop an annual funding plan for implementing science plan elements. At a minimum, Permittee shall convene the WS Science Program quarterly every year following initiation of the final WS Science Plan to:<br>• Review data obtained from new and ongoing monitoring programs;<br>• Review methods used to implement monitoring and recommend adjustments as they deem appropriate; and<br>• Review draft results from new and ongoing science.<br>Permittee shall make all raw data and modeling acquired as a part of the WS Science Plan available to members of the WS Science Program on a mutually agreeable timeline. | | | | |
| 32 | Larval White Sturgeon Salvage Monitoring and Reporting. Permittee shall implement larval WS monitoring in salvage at the Skinner Fish Facility to identify the presence of WS larvae > 20 mm. Larval WS salvage monitoring data shall be provided to CDFW according to existing methods of salvage data transmission for all other Covered Species. | ITP Condition # 7.10.2 | Throughout the term of this ITP | Permittee | |
| 33 | Notification of Take or Injury/Damage of White Sturgeon. Permittee shall immediately notify the Designated Biologist if a WS is otherwise found dead or injured within the vicinity of the Project. The Designated Biologist or Designated Representative shall provide initial notification to CDFW by contacting the CDFW Bay-Delta Region Stockton Office at (209) 234-3420. The initial notification to CDFW shall include information regarding the location, species, and number of WS found dead or injured and the ITP Number. Immediately following notification to CDFW, Permittee shall coordinate with Tracy Fish Collection Facility staff to explore the possibility of relocating the injured WS and rehabilitating it at the CVP facility. Following initial notification, Permittee shall send CDFW a written report within two calendar days. The report shall include the date and time of the finding or incident, location of the WS or carcass, and if possible, provide a photograph, explanation as to cause of death or injury, and any other pertinent information. | ITP Condition # 7.11 | Throughout the term of this ITP | Permittee | |
| 34 | Data Accessibility. Permittee shall provide CDFW with access to all raw data and associated analyses and reports for all monitoring required in Conditions of Approval 7, 8 and 9 of this ITP and described in the Project Description within 60 days of collection of data, processing of samples, or completion of analyses and reports, and otherwise upon request. | ITP Condition # 7.12 | Throughout the term of this ITP | Permittee | |

| | Mitigation Measure | Source | Implementation Schedule | Responsible Party | Status/Date/ Initials |
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| 35 | Independent Review Panels. In the event that an independent review panel is convened to review aspects of the Project or AMP (Attachment 4), Permittee shall provide drafts of (1) the list of potential panel participants, (2) the panel charges and associated review questions, and (3) the panel report and findings to CDFW for review at least 20 days before they are scheduled to be finalized. Permittee shall incorporate CDFW comments into the panel selection and panel charge before they are finalized. | ITP Condition # 7.13 | Throughout the term of this ITP | Permittee | |
| **Minimization Measures:** The following requirements are intended to ensure the minimization of incidental take of Covered Species and related impacts of the taking in the Project Area during Covered Activities. Permittee shall implement and adhere to the following conditions to minimize take of, and impacts of the taking on, Covered Species: | | | | | |
| 36 | Real-time Operations, Monitoring, and Technical Teams. Permittee shall monitor and manage Project operations in response to risk assessments conducted by collaborative real-time operations monitoring teams that include representatives from Permittee, CDFW, Reclamation, USFWS, NMFS, and the State Water Board. | ITP Condition # 8.1 | Throughout the term of this ITP | Permittee | |
| 37 | Smelt Monitoring Team. The purpose of SMT is to meet and review hydrologic, SWP and CVP operational, fishery, and water quality data, and provide opportunities for engagement and discussion among biologists and operators on relevant information and issues associated with the Project and risk assessments. SMT shall include representatives from Permittee, CDFW, Reclamation, USFWS, NMFS, and the State Water Board. Permittee shall make all raw data and modeling utilized as part of SMT available to CDFW within ten days of a request. | ITP Condition # 8.1.1 | Throughout the term of this ITP | Permittee | |
| 38 | Salmon Monitoring Team. The purpose of SaMT is to meet and review hydrologic, SWP and CVP operational, fishery, and water quality data, and provide opportunities for engagement and discussion among biologists and operators on relevant information and issues associated with the Project and risk assessments. SaMT shall include representatives from Permittee, CDFW, Reclamation, USFWS, NMFS, and the State Water Board. Permittee shall make all raw data and modeling utilized as part of SaMT available to CDFW within ten days of a request. | ITP Condition # 8.1.2 | Throughout the term of this ITP | Permittee | |
| 39 | White Sturgeon Monitoring Team. The purpose of WSMT is to meet and review hydrologic, SWP and CVP operational, fishery, and water quality data, and provide opportunities for engagement and discussion among biologists and operators on relevant information and issues associated with the Project and risk assessments. WSMT shall include representatives from Permittee and CDFW. Permittee shall make all raw data and modeling utilized as part of WSMT available to CDFW within ten days of a request. | ITP Condition # 8.1.3 | Throughout the term of this ITP | Permittee | |

| | Mitigation Measure | Source | Implementation Schedule | Responsible Party | Status/Date/ Initials |
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| 40 | Water Operations Management Team. WOMT will coordinate on overall SWP and CVP operations to oversee the implementation of various real-time provisions for the Project. The purpose of WOMT is to discuss and resolve SWP and CVP operational questions and technical issues, as requested or elevated from technical teams, and to elevate unresolved operational issues to the Directors of Permittee, Reclamation, CDFW, USFWS and NMFS. WOMT will develop a charter to describe membership and process. WOMT will coordinate with the SHOT as needed on operational issues and decisions that have implications for both of their respective purviews, including but not limited to Drought Toolkit implementation and the HRL asset management.<br><br>WOMT will meet weekly during the OMR flow management season (October–June), and otherwise as needed. Any agency can request a WOMT meeting outside of the OMR season for discussion or elevation items. For OMR Management, Permittee shall, in coordination with Reclamation, provide SWP and CVP operational outlooks and assessments on a weekly basis to WOMT, SMT, SaMT, and WSMT. Permittee shall provide WOMT the opportunity to review and discuss any applicable drought and dry year actions from the Drought Toolkit or other relevant drought planning documents. For all other assessments or elevation issues, supporting materials will be provided to WOMT by designated representatives of the applicable technical teams. | ITP Condition # 8.1.4 | Throughout the term of this ITP | Permittee | |
| 41 | Collaborative Approach to Real-time Decision Making. Beginning no later than October 1 through the end of OMR Management (Condition of Approval 8.6), SMT, SaMT, and WSMT shall meet as described in Conditions of Approval 8.3.1, 8.4.2, 8.4.3, 8.4.4, 8.4.5, 8.4.7, and 8.5 or more often as required, to consider survey data, salvage data, and other pertinent biotic and abiotic factors and provide input on risk assessments as described in Conditions of Approval 8.1.6.1, 8.1.6.2, and 8.1.6.3.<br><br>SMT, SaMT, and WSMT shall share and discuss all available biological, abiotic, and operational information to inform discussions in the WOMT as required by Conditions of Approval 8.3.1, 8.4.2, 8.4.3, 8.4.4, 8.4.5, 8.4.7, and 8.5. SMT, SaMT, and WSMT shall communicate the information shared and perspectives to WOMT as described in Conditions of Approval 8.3.1, 8.4.2, 8.4.3, 8.4.4, 8.4.5, 8.4.7, and 8.5. Permittee and CDFW SMT, SaMT, and WSMT staff may conclude different operations are warranted, in which case the difference shall be noted and elevated as described in this Condition of Approval and Condition of Approval 8.1.6. WOMT shall then confer and attempt to reach a resolution and agreed-upon Project operations. If a resolution is reached, Permittee shall operate consistent with the decision regarding Project operations from WOMT.<br><br>If WOMT does not reach a resolution, the Director of DWR, in coordination with the Regional Director of Reclamation as appropriate (proposing agency or agencies), shall confer with CDFW, USFWS, and NMFS Directors/Regional Administrators to determine if there is an alternative action that will be mutually agreeable. If consensus is reached, | ITP Condition # 8.1.5 | Throughout the term of this ITP | Permittee | |

| | Mitigation Measure | Source | Implementation Schedule | Responsible Party | Status/Date/ Initials |
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| | Permittee shall implement the alternative action. If the Directors do not reach a resolution on operations, Permittee shall meet and confer with Reclamation to prioritize alignment between the SWP and CVP operations, in consideration of operational and regulatory constraints affecting either project, and shall identify their recommended action within two days, providing a written explanation of the nature of the dispute. Any director may request a follow-up Directors' meeting if necessary.<br><br>Within two days after receiving the recommended action for SWP from Permittee, the CDFW Director may disagree with the action requested by DWR and require Permittee to implement an operational decision provided by CDFW in writing. Permittee shall implement CDFW's operational decision.<br><br>Once a decision has been resolved following any of the procedures described above, Permittee shall designate a representative or representatives to communicate the decision to regulatory and operating agencies, as well as other interested parties that have expressed interest in the decision. | | | | |
| 42 | Real-time Information Sharing Process. Permittee shall provide scheduling, SWP and CVP operations forecast, and relevant hydrologic monitoring and modeling information on Monday of each week to SMT, SaMT, and WSMT agency staff. SMT, SaMT, and WSMT shall convene as required by Conditions of Approval 8.3.1, 8.4.2, 8.4.3, 8.4.4, 8.4.5, 8.4.7, and 8.5, or as needed, for technical conversation prior to WOMT meeting and shall discuss all relevant data, including data that becomes available after the Monday distribution. All information intended for discussions in WOMT shall be provided and discussed in SMT, SaMT, and WSMT prior to discussion in WOMT. | ITP Condition # 8.1.6 | Throughout the term of this ITP | Permittee | |
| 43 | Smelt Monitoring Team Role. Agency team leads: (1) notify their agency's WOMT representative(s) if a Reclamation Proposed Action or ITP identified threshold or protective action is or will be met; (2) provide input on any risk assessment prepared by Reclamation and Permittee as required by Conditions of Approval 8.3.1, 8.4.2, and 8.5; and (3) discuss and document differing perspectives (i.e., non-consensus) on the relevant assessments and Conditions of Approval. If there is an operational issue that SMT cannot resolve, the agency representatives will compose an email to WOMT summarizing the elevation topic and any supporting information and recommendations. Each of the agency representatives are individually responsible for communicating the issues and any background information to their WOMT representative. | ITP Condition # 8.1.6.1 | Throughout the term of this ITP | Permittee | |
| 44 | Salmon Monitoring Team Role. Agency team leads: (1) notify their agency's WOMT representative(s) if a Reclamation Proposed Action or ITP identified threshold or protective action is or will be met; (2) provide input on any risk assessment prepared by Reclamation and Permittee as required by Conditions of Approval 8.4.3, 8.4.4, 8.4.5, and 8.5; and (3) discuss and document differing perspectives (i.e., non-consensus) on the relevant | ITP Condition # 8.1.6.2 | Throughout the term of this ITP | Permittee | |

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| | assessments and Conditions of Approval. If there is an operational issue that SaMT cannot resolve, the agency representatives will compose an email to WOMT summarizing the elevation topic and any supporting information and recommendations. Each of the agency representatives are individually responsible for communicating the issues and any background information to their WOMT representative. | | | | |
| 45 | White Sturgeon Monitoring Team Role. Agency team leads: (1) notify their agency's WOMT representative(s) if a trigger in Condition of Approval 8.4.7 is or will be met; (2) provide input on the risk assessment and advice developed to document the technical discussion; and (3) discuss and document differing perspectives (i.e., non-consensus). If there is an operational issue that WSMT cannot resolve, the agency representatives will compose an email to WOMT summarizing the elevation topic and any supporting information and recommendations as required by Condition of Approval 8.4.7. Each of the agency representatives are individually responsible for communicating the issues and any background information to their WOMT representative. | ITP Condition # 8.1.6.3 | Throughout the term of this ITP | Permittee | |
| 46 | Chartering Real-time Operations Teams. Permittee shall, in collaboration with Reclamation, develop charters for the SMT, SaMT, WSMT, and WOMT. Team membership, roles, and processes shall be described in team charters.<br><br>Some teams may already have charters in place which will continue to be followed until they are reviewed and replaced in the future. These charters may be supplemented by guidance documents which further elaborate roles, responsibilities, and processes for the SMT, SaMT, WSMT, and WOMT. Permittee shall update these guidance documents as needed by mutual agreement. Drafts of all team charters and guidance documents shall be submitted to CDFW for review. After CDFW comments are incorporated, final team charters and guidance documents shall be subject to CDFW approval. | ITP Condition # 8.1.6.4 | Throughout the term of this ITP | Permittee | |
| 47 | OMR Action Response Timing. Unless a more immediate response is required by a Condition of Approval in this ITP, Permittee shall adjust exports within three days of an event that requires an OMR index, to enable efficient power scheduling. Once an OMR action is triggered as a result of Conditions of Approval of this ITP, Permittee shall not increase exports, except as has been scheduled prior to the trigger's occurrence and with prior notice to WOMT, in a manner that would make projected OMR more negative. Permittee shall conduct export reductions to meet the requirements of the Conditions of Approval using the normal scheduling procedure. Combined projected exports, export scheduling, and OMR will be discussed at WOMT each week. The intent of this Condition of Approval is that combined project south Delta exports will not increase the risk to protected fish species after an OMR trigger is met. | ITP Condition # 8.1.7 | Throughout the term of this ITP | Permittee | |

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| 48 | OMR Index Calculation. Permittee shall calculate the OMR flow index that will be used to determine export limitations, as described in the sections below, using the equation provided in Hutton (2008). Permittee shall provide CDFW with the variables used to calculate OMR index changes as related to implementing Conditions of Approval of this ITP upon the request of CDFW. | ITP Condition # 8.1.8 | Throughout the term of this ITP | Permittee | |
| 49 | OMR Averaging Period. Permittee shall ensure the required average of the OMR Index is met by the last day of the averaging period included in any Condition of Approval that requires an action for a specified number of days, after initiating operational changes in response to the OMR trigger. | ITP Condition # 8.1.9 | Throughout the term of this ITP | Permittee | |
| **Early OMR Management.** | | 8.2 | | | |
| 50 | Natural-origin Winter-run Chinook Salmon Early Season Weekly Loss Thresholds. To minimize entrainment and loss of early-migrating natural-origin CHNWR, Permittee shall, in coordination with Reclamation, adjust south Delta exports to achieve a 7-day average of the OMR index no more negative than -5,000 cfs for seven consecutive days, when the genetically verified 7-day rolling sum of CHNWR loss, calculated daily, exceeds the following thresholds (see calculation details and survival variables in Attachments 2 and 6):<br>• From November 1 through November 30: Product of November Multiplier and the Red Bluff Diversion Dam juvenile CHNWR brood year passage total at the end of the second biweekly period in October, whereby the November Multiplier is:<br>November Multiplier = $0.0011 \times 0.25 \times Survival_{Fry\text{-}to\text{-}Smolt} \times Survival_{Smolt}$<br>• From December 1 through December 31: Produce of December Multiplier and the Red Bluff Diversion Dam juvenile CHNWR brood year passage total estimated at the end of the second biweekly period in November, whereby the December Multiplier is:<br>December Multiplier = $0.0021 \times 0.25 \times Survival_{Fry\text{-}to\text{-}Smolt} \times Survival_{Smolt}$<br>If the 7-day rolling sum of CHNWR loss, calculated daily, is exceeded during a period of reduced exports, Permittee shall, in coordination with Reclamation, continue to adjust south Delta exports to achieve a 7-day average of the OMR index no more negative than -5,000 cfs, until seven days after the most recent | ITP Condition # 8.2.1 | Throughout the term of this ITP | Permittee | |

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| | exceedance. Loss shall be calculated for the south Delta export facilities using the 2018 CDFW loss equation (Attachment 8).<br><br>Permittee shall, in coordination with Reclamation, initially adjust exports in response to meeting the thresholds above based on length-at-date identification of natural older juvenile Chinook Salmon. If genetic analysis of natural juvenile Chinook Salmon observed in salvage at the SWP or CVP subsequently indicates that any given Chinook Salmon is not a genetically confirmed CHNWR, that fish will not count toward the loss threshold exceedance, and continued export adjustments pursuant to the OMR limit may not be required. While a new, more rapid genetic method, SHERLOCK, undergoes field testing, both it and the current genetic method, GT-seq, shall be used to determine the final identification. In the event that SHERLOCK and GT-seq provide different run assignments, the results from the GT-seq method shall be used to determine the final run assignment for the purposes of implementing Condition of Approval 8.2.1. If a fish is not genetically identifiable or if genetic identification is pending, then the Delta model length-at-date criteria shall be used to classify the race of the juvenile Chinook Salmon in salvage for the purposes of implementing Condition of Approval 8.2.1. | | | | |
| 51 | Onset of OMR Management. The OMR Management season starts: 1) any time after December 1 after an Adult Longfin Smelt Entrainment Protection Action is implemented (Condition of Approval 8.3.2), 2) if Condition of Approval 8.3.1 is triggered (i.e., immediately following completion of the First Flush Action), or 3) any time after December 20 if the turbidity threshold in Condition of Approval 8.3.3 is reached. If neither Condition of Approval 8.3.1, nor Condition of Approval 8.3.2, nor Condition of Approval 8.3.3 initiates OMR Management season, the OMR Management season starts automatically on January 1. From the onset of OMR Management Permittee shall, in coordination with Reclamation, adjust south Delta exports to maintain the OMR index on a 14-day running average no more negative than -5,000 cfs until the end of the OMR Management (Condition of Approval 8.6) except during Storm Flex operations (Condition of Approval 8.5) or if a more positive OMR index or different averaging period is required. | ITP Condition # 8.3 | Throughout the term of this ITP | Permittee | |
| 52 | First Flush Action. To minimize SWP and CVP influence on the movement of DS and subsequent entrainment and salvage of adult DS, Permittee shall, in coordination with Reclamation, adjust south Delta exports for 14 consecutive days, anytime between December 1 and the last day of February, to maintain a 14-day average of the OMR index no more negative than -2,000 cfs within three days of when the following criteria are met:<br><br>• Three-day running average of daily flow at Freeport is ≥ 25,000 cfs, and<br>• Three-day running average of daily turbidity at Freeport is ≥ 50 Formazin Nephelometric Units (FNU). | ITP Condition # 8.3.1 | Throughout the term of this ITP | Permittee | |

| | Mitigation Measure | Source | Implementation Schedule | Responsible Party | Status/Date/ Initials |
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| | These criteria shall use data from the CDEC Sacramento River at Freeport station (FPT). The First Flush Action may only be initiated once each water year. The First Flush Action is exempt from the high-flow offramps as described in Condition of Approval 8.3.2.<br><br>Permittee and Reclamation, through WOMT, may prepare an assessment to initiate the First Flush Action early if real-time monitoring of abiotic and biotic factors and salvage prediction models indicate the First Flush Action is likely to be triggered (i.e., within two to three days) and DS salvage is possible.<br><br>Readings at individual turbidity sensors or localized groups of turbidity sensors can generate spurious results in real time. To avoid triggering an OMR flow action during a sensor error or a localized turbidity spike that might be caused by local flows or a wind-driven event, Permittee and Reclamation will consider and review data from other locations. In the event that the 3-day running average of daily turbidity at Freeport is ≥ 50 FNU, and Permittee and Reclamation believe that a First Flush Action is not warranted based on additional data sources, Permittee may, in coordination with Reclamation, provide the additional data to SMT and request they convene to confirm criteria will be met because of increased precipitation rather than sensor error or localized turbidity spike. If it is determined through WOMT that there is a sensor error or a localized turbidity spike, Permittee may, in coordination with Reclamation, take no additional action with CDFW approval and provide the supporting information to CDFW and USFWS within 24 hours. | | | | |
| 53 | Adult Delta Smelt Entrainment Protection Action. If, after a First Flush Action (Condition of Approval 8.3.1) or after December 20, whichever occurs first, the daily average turbidity remains at 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 SWP and CVP export facilities, Permittee shall, in coordination with Reclamation, adjust south Delta exports to achieve a 5-day average of the OMR index 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 bridge of turbidity. The three turbidity sensors applicable to this Condition of Approval are Old River at Franks Tract near Terminous (OSJ), Holland Cut (HOL), and Old River at Bacon Island (OBI).<br><br>If the three turbidity sensors remain over 12 FNU at the end of a High Flow Offramp (below) or any time after five consecutive days, then Permittee and Reclamation, through WOMT, may prepare an assessment to determine if another Adult Delta Smelt Entrainment Protection Action is warranted based on continued entrainment risk following the period of elevated flows and whether DS distribution has shifted downstream, as informed by available quantitative tools and real-time data.<br><br>The Adult Delta Smelt Entrainment Protection Action may be offramped when the daily average San Joaquin River flows at Vernalis are greater than 10,000 cfs. While offramped, the OMR index will be managed to no more negative than -5,000 cfs on a 14-day average. | ITP Condition # 8.3.2 | Throughout the term of this ITP | Permittee | |

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| | The Adult Delta Smelt Entrainment Protection Action shall be immediately reinstated when the daily average San Joaquin River flows at Vernalis drop below 8,000 cfs.<br><br>If the three turbidity sensors remain over 12 FNU at the end of a High Flow Offramp or any time after five consecutive days, then Permittee may, in coordination with Reclamation, through WOMT, prepare an assessment to determine if another Adult Delta Smelt Entrainment Protection Action is warranted. Any evaluation shall be based on continued entrainment risk following the period of elevated flows and whether DS distribution has shifted downstream, as informed by available quantitative tools and real-time data.<br><br>The Adult Delta Smelt Entrainment Protection Action ends when the 3-day continuous average water temperatures at Jersey Point or Rio Vista reach 53.6°F. | | | | |
| 54 | Adult Longfin Smelt Entrainment Protection Action. To minimize entrainment and salvage of adult LFS, Permittee shall, in coordination with Reclamation, adjust south Delta exports if cumulative water year salvage of LFS with fork length ≥ 60 mm at the SWP and CVP salvage facilities exceeds the salvage threshold calculated using the following formula:<br><br>Salvage threshold = (Age 1 + LFS Index/20) + 1<br><br>The Age 1 + LFS Index is calculated using age 1+ fish captured in the mid water trawl from the full San Francisco Bay Study sampling area . The Age 1 + LFS Index is additive for the months of August, September, October, November, and December. If December data are not available at the start of this action period, then the August to November threshold shall be used until the December data are available and the complete Age 1 + LFS Index is calculated.<br><br>If the above salvage threshold is exceeded between December 1 and the end of February then Permittee, in coordination with Reclamation, shall adjust south Delta exports to achieve one of the following requirements depending on when the salvage threshold was exceeded:<br><br>• From December 1 to the start of the OMR Management season, Permittee, in coordination with Reclamation, shall adjust south Delta exports to achieve an OMR index no more negative than -5,000 cfs on a 7-day average for seven consecutive days and then, initiate OMR Management Season. During the 7-day period, Permittee may request that WOMT convene and determine if initiation of OMR Management season is warranted. If WOMT determines initiating OMR Management season is not warranted, OMR Management season does not begin at the conclusion of the 7-day period. If salvage of Longfin Smelt ≥ 60 mm continues following the 7-day period when the OMR index is no more negative than -5,000 cfs, then Permittee and Reclamation, through WOMT, may prepare an assessment to determine if additional Longfin Smelt Entrainment Protection Action is warranted based on continued entrainment risk, as informed by available | ITP Condition # 8.3.3 | Throughout the term of this ITP | Permittee | |

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| | quantitative tools and real-time data. WOMT may determine if OMR Management Season should be initiated. If WOMT does not meet, then Permittee shall, in coordination with Reclamation, initiate OMR Management season.<br><br>• From the start of the OMR Management Season to the end of February, if OMR Management was initiated by a different Condition of Approval, Permittee shall, in coordination with Reclamation, adjust south Delta exports to achieve an OMR index no more negative than -3,500 cfs on a 7-day average for seven consecutive days. If there is additional salvage of LFS ≥ 60 mm following the 7-day period when the OMR index is no more negative than -3,500 cfs, then Permittee, in coordination with Reclamation, through WOMT, shall prepare an assessment to determine if additional Longfin Smelt Entrainment Protection Action is warranted based on continued entrainment risk, as informed by available quantitative tools and real-time data. | | | | |
| **Additional Real-time OMR Management.** | | 8.4 | | | |
| 55 | <u>Larval and Juvenile Delta Smelt Protection Action</u>. To minimize entrainment and salvage of larval and juvenile DS, the Larval and Juvenile Delta Smelt Protection Action starts upon the end of the Adult Delta Smelt Entrainment Protection Action (Condition of Approval 8.3.2). Permittee shall, in coordination with Reclamation, adjust south Delta exports to achieve a 7-day average of the OMR index no more negative than -5,000 cfs when the average Secchi disk depth in the most recent survey is > 1 meter. The Secchi disk depth shall be calculated as the average measurement from all sampled stations on the San Joaquin River upstream of Jersey Point and stations south of the lower San Joaquin River. If the average Secchi disk depth in the most recent survey is < 1 meter, Permittee shall, in coordination with Reclamation, adjust south Delta exports to achieve a 7-day average of the OMR index no more negative than -3,500 cfs until the average Secchi disk depth has increased to > 1 meter.<br><br>Permittee shall, in coordination with Reclamation, operate to the appropriate OMR index given the latest average Secchi disk depth until the end of OMR Management (Condition of Approval 8.6).<br><br>When the daily average Sacramento River flows at Rio Vista are > 55,000 cfs, or the daily average San Joaquin River flows at Vernalis are > 8,000 cfs, then the Larval and Juvenile Delta Smelt Protection Action is offramped. While offramped, Permittee shall, in coordination with Reclamation, manage south Delta exports to achieve an OMR index no more negative than -5,000 cfs on a 14-day average. Permittee shall, in coordination with Reclamation, immediately reinstate the Larval and Juvenile Delta Smelt Protection Action when either the daily average Sacramento River flows at Rio Vista is < 40,000 cfs or the daily average San Joaquin River flows at Vernalis is < 5,000 cfs. Rio Vista flows are | ITP Condition # 8.4.1 | Throughout the term of this ITP | Permittee | |

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| | calculated from the Dayflow equation and reported in the daily DWR Delta Hydrologic Conditions Report. | | | | |
| 56 | Larval and Juvenile Longfin Smelt Protection Action. From January 1 through the end of OMR Management (Condition of Approval 8.6), if:<br>• The seven-day average QWEST is < +1,500 cfs, and<br>• Larval and juvenile LFS catch in the most recent Smelt Larval Survey (SLS) or 20-mm Survey at stations 809 and 812 exceeds the catch threshold set by the age 1+ LFS Index (see Table 3 for catch thresholds)<br>Permittee, in coordination with Reclamation, shall adjust south Delta exports to achieve a 7-day average of the OMR index no more negative than -3,500 cfs for seven days to minimize entrainment and salvage of larval and juvenile LFS. Permittee, in coordination with Reclamation, through WOMT, may prepare an assessment to determine if the 7-day action can be adjusted or offramped based on larval and juvenile LFS entrainment risk, as informed by available quantitative tools and real-time data. If offramped, the Larval and Juvenile Longfin Smelt Protection Action shall later be retriggered if conditions warrant.<br>When the daily average Sacramento River flows at Rio Vista are > 55,000 cfs, or the daily average San Joaquin River flows at Vernalis are > 8,000 cfs, then the Larval and Juvenile Longfin Smelt Protection Action is offramped. While offramped, Permittee shall, in coordination with Reclamation, adjust south Delta exports to achieve an OMR index no more negative than -5,000 cfs on a 14-day average. Permittee shall, in coordination with Reclamation, immediately reinstate the Larval and Juvenile Longfin Smelt Protection Action when either the daily average Sacramento River flows at Rio Vista is < 40,000 cfs or the daily average San Joaquin River flows at Vernalis is < 5,000 cfs. Rio Vista flows are calculated from the Dayflow equation and reported in the daily DWR Delta Hydrologic Conditions Report.<br>If the water year cumulative juvenile LFS salvage at the SWP and CVP salvage facilities exceeds 50% of the average annual salvage observed from 2009 through the water year preceding the current water year, then Permittee shall, in coordination with Reclamation, adjust south Delta exports to achieve a 7-day average of the OMR index of -3,500 cfs for 14 days.<br>If the water year cumulative juvenile LFS salvage at the SWP and CVP salvage facilities exceeds 75% of the average annual salvage observed from 2009 through the water year preceding the current water year, then Permittee shall, in coordination with Reclamation, adjust south Delta exports to achieve a 7-day average of the OMR index of -2,500 cfs for 14 days. If salvage of larval and juvenile LFS continues following the 14-day period where the OMR index is no more negative than -2,500 cfs, then WOMT may request Permittee and Reclamation to prepare a risk assessment through the SMT on an appropriate OMR | ITP Condition # 8.4.2 | Throughout the term of this ITP | Permittee | |

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| | index through the end of OMR Management (Condition of Approval 8.6). Consideration of the inclusion of LFS abundance metrics in these salvage triggers will be addressed under the AMP (Attachment 4). | | | | |
| 57 | Winter-run Chinook Salmon Annual Loss Thresholds. To minimize entrainment and loss of juvenile CHNWR, Permittee shall, in coordination with Reclamation, adjust south Delta exports to manage the OMR index to avoid exceeding the following annual loss thresholds:<br>• Natural-origin CHNWR Loss Threshold: 0.5% of JPE<br>• Hatchery-origin CHNWR Loss Threshold: 0.12% of JPE<br>JPEs and annual loss thresholds will be calculated for natural-origin CHNWR, for hatchery-origin CHNWR from Livingston Stone National Fish Hatchery (LSNFH) released into the Sacramento River near Redding, and for LSNFH hatchery-origin CHNWR released into Battle Creek.<br>The JPE for natural and hatchery-origin CHNWR is calculated by the JPE Subteam annually, consistent with Attachment 2, and is described in the yearly recommendation letter produced by the JPE Subteam and transmitted to NMFS and CDFW. NMFS and CDFW issues an Annual JPE Letter, with the JPE Subteam recommendation included as an enclosure to the letter, to Permittee and Reclamation. Hatchery releases of CHNWR are tracked individually, and Permittee shall sum cumulative loss, confirmed by coded wire tag (CWT), across release groups with the same JPE and annual loss threshold. Permittee shall calculate loss for the south Delta export facilities using the 2018 CDFW loss equation (Attachment 8).<br>Permittee shall count annual loss of natural and hatchery-origin CHNWR at the SWP and CVP salvage facilities for each brood year, starting July 1 of the calendar year through June 30 of the following calendar year. If cumulative loss of either natural or hatchery-origin CHNWR in a brood year exceeds 50% of the annual loss thresholds, then Permittee shall, in coordination with Reclamation, adjust south Delta exports to achieve a 7-day average of the OMR index no more negative than -3,500 cfs for seven consecutive days. If a CHNWR is salvaged during the 7-day action, the action will be extended for another seven days. At the conclusion of the action, Permittee, in coordination with Reclamation shall revert to the weekly distributed loss threshold until the 75% threshold is reached or throughout the end of the OMR Management season (Condition of Approval 8.6).<br>If:<br>• The cumulative loss of either natural or hatchery-origin CHNWR in a brood year exceeds 75% of the annual loss thresholds, and<br>• The Winter-Run Chinook Salmon Machine Learning Model and associated OMR | ITP Condition # 8.4.3 | Throughout the term of this ITP | Permittee | |

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| | Conversion Tool predict that a change in the OMR index to -2,500 cfs will shift the model output to a classification of CHNWR absence with a minimum probability of absence prediction of 0.559 for 1 of 30 sub-models for any of the seven most recent prediction days. These prediction values are calculated based on historical detections of length-at-date CHNWR and will be updated once genetic analysis of CHNWR is fully adopted (Condition of Approval 7.9.2).<br><br>Then, Permittee shall, in coordination with Reclamation, adjust south Delta exports to maintain a 7-day average of the OMR index no more negative than the -2,500 cfs for seven consecutive days.<br><br>Once 75% of the annual loss threshold is exceeded, each CHNWR observed in salvage shall trigger another operation to a 7-day average OMR index no more negative than -2,500 cfs for seven consecutive days, if the Winter-Run Chinook Salmon Machine Learning Model and associated OMR Conversion Tool predict that a change in the OMR index to -2,500 cfs will shift the model output to a classification of CHNWR absence with a minimum probability of absence prediction of 0.559 for 1 of 30 sub-models for any of the seven most recent prediction days.<br><br>After May 1, Permittee, in coordination with Reclamation, through WOMT, may prepare an assessment to determine if the action is still warranted pending relevant biological and hydrological information.<br><br>If the cumulative loss of either natural or hatchery-origin CHNWR in a brood year exceeds 100% of the annual loss thresholds, then Permittee shall, in coordination with Reclamation, immediately convene SaMT to review recent fish distribution information and operations and provide advice regarding future planned SWP and CVP operations to minimize subsequent loss during that year. The SaMT shall report the results of this review and advice to WOMT (Condition of Approval 8.1.4). Operational decisions shall be made following the process described in Condition of Approval 8.1.5.<br><br>If either annual loss threshold is exceeded, Permittee shall, in coordination with Reclamation, also convene an independent panel to review SWP and CVP operations and the annual loss thresholds prior to November 1. The purpose of the independent panel is to review the actions and decisions contributing to the loss trajectory that led to an exceedance of an annual loss threshold, and make recommendations on modifications to SWP and CVP operations, or additional actions to be conducted to stay within the annual loss thresholds in subsequent years. Permittee shall convene such a panel within six months of the issuance of this ITP to review actions and conditions in water year 2024.<br><br>Permittee shall, in coordination with Reclamation, restrict south Delta exports in response to meeting the above thresholds based on the initial length-at-date identification of natural-origin older juvenile Chinook Salmon and the thresholds described above. If genetic analysis of natural-origin older juvenile Chinook Salmon observed in salvage at the SWP or CVP subsequently confirms that any given Chinook Salmon is not genetically identified as | | | | |

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| | a CHNWR, that fish will not count towards the loss threshold exceedance, and continued export restrictions pursuant to the OMR index limit may not be required. While the new rapid genetic method, SHERLOCK, undergoes field testing, both it and the current GT-seq method shall be used to determine the final identification. In the event that SHERLOCK and GT-seq provide different run assignments, the results from the GT-seq method shall be used to determine the final run assignment for the purposes of implementing Condition of Approval 8.4.3. If a fish is not genetically identifiable or if genetic identification is pending, then the Delta model length-at-date criteria shall be used to classify the race of the juvenile Chinook Salmon in salvage for the purposes of implementing Condition of Approval 8.4.3. | | | | |
| 58 | Natural-origin Winter-run Chinook Salmon Weekly Distributed Loss Thresholds. To minimize the potential for a disproportionate impact of entrainment and loss on any single week of natural-origin juvenile CHNWR present in the Delta, Permittee shall, in coordination with Reclamation, manage the OMR index based on a natural-origin CHNWR weekly distributed loss threshold. The natural-origin CHNWR weekly loss threshold is a product of the weekly percentage of natural-origin CHNWR present in the Delta, scaled to 100% (Table 4, Column E), and 50% of the natural-origin CHNWR annual loss threshold (Condition of Approval 8.4.3).<br><br>If the weekly distributed loss threshold is exceeded on any single day by the 7-day rolling sum of natural-origin CHNWR loss, then Permittee shall, in coordination with Reclamation, adjust south Delta exports to achieve a 7-day average of the OMR index no more negative than -3,500 cfs for seven consecutive days until seven days after the most recent exceedance. Permittee shall calculate loss for the south Delta export facilities using the 2018 CDFW loss equation (Attachment 8).<br><br>If the natural-origin CHNWR JPE is not available at the start of OMR Management season (Condition of Approval 8.3), then the Red Bluff Diversion Dam brood year total from the most recent bi-weekly period shall be used and applied as described for early season management (Condition of Approval 8.2.1) to the annual loss threshold until the final natural-origin CHNWR JPE is available. The CHNWR JPE surrogate is calculated using the following formula:<br><br>Natural-origin CHNWR JPE Surrogate = Red Bluff Diversion Dam juvenile CHNWR brood year passage total estimated from the most recent biweekly period x SurvivalFry-to-Smolt x SurvivalSmolt<br><br>Permittee shall, in coordination with Reclamation, adjust south Delta exports in response to meeting the below natural-origin CHNWR weekly thresholds based on the initial length-at-date identification of natural-origin older juvenile Chinook Salmon and the thresholds described below. If genetic analysis of natural-origin older juvenile Chinook Salmon observed in salvage at the SWP or CVP subsequently confirms that any given Chinook Salmon is not genetically identified as a CHNWR, that fish will not count towards the loss | ITP Condition # 8.4.4 | Throughout the term of this ITP | Permittee | |

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| | threshold exceedance, and continued export restrictions pursuant to the OMR index limit may not be required. While the new rapid genetic method, SHERLOCK, undergoes field testing, both it and the current GT-seq method shall be used to determine the final identification. In the event that SHERLOCK and GT-seq provide different run assignments, the results from the GT-seq method shall be used to determine the final run assignment for purposes of implementing Condition of Approval 8.4.4. If a fish is not genetically identifiable or if genetic identification is pending, then the length-at-date identification shall be used to classify the race of the juvenile Chinook Salmon in salvage for the purposes of implementing Condition of Approval 8.4.4.<br><br>Weekly thresholds shall be based on historical distribution (Table 4, Column E) of genetically identified CHNWR from water years 2017 through 2021 and will change every week (e.g., January 1-7, January 8-15). After the conclusion of the OMR Management season each summer, Permittee and Reclamation, through SaMT, shall compare weekly Delta entry and exit information to determine if the presence data were distributed similarly to the historical distribution data. The results of this review will be utilized as a part of the AMP to implement the Winter-run Old and Middle River Flows Management Adaptive Management Action (Attachment 4 and Condition of Approval 7.9.2).<br><br>Table 6. Historical (Water Years 2017 – 2021) presence of natural-origin CHNWR entering the Delta (Column B), exiting the Delta (Column C), present in the Delta (Column D = Column B - Column C), and present in the Delta scaled to 100% (Column E) for each week of OMR Management (Column A). | | | | |
| 59 | Spring-run Chinook Salmon Protection Action and Surrogate Annual Loss Thresholds. To minimize entrainment and loss of juvenile CHNSR, Permittee shall, in coordination with Reclamation, restrict exports based on the presence of hatchery-origin CHNSR and associated yearling late fall-run and young-of-year fall-run Chinook Salmon surrogate groups at the SWP and CVP salvage facilities. Permittee shall, in coordination with CDFW, Reclamation, USFWS, and NMFS through the SaMT, select CHNSR yearling and young-of-year surrogate groups. Yearling CHNSR surrogates shall be selected from late-fall Chinook Salmon in-river release groups from the Coleman National Fish Hatchery. Young-of-year CHNSR and associated surrogate groups shall be selected from fall- and spring-run Chinook Salmon in-river release groups from the Feather River Fish Hatchery and Coleman National Fish Hatchery.<br><br>From November 1 through the end of the OMR Management season (Condition of Approval 8.6) each water year:<br><br>1) if a cumulative loss threshold for a surrogate release group is exceeded in November or December, Permittee shall, in coordination with Reclamation, adjust south Delta exports to achieve a 7-day average of the OMR index no more negative than -5,000 cfs for seven consecutive days; and | ITP Condition # 8.4.5 | Throughout the term of this ITP | Permittee | |

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| | 2) if a cumulative loss threshold for a surrogate release group is exceeded after the onset of OMR Management (Condition of Approval 8.3), or on or after January 1 through the end of OMR Management or June 30, whichever comes first, Permittee shall, in coordination with Reclamation, adjust south Delta exports to achieve a 7-day average of the OMR index no more negative than -3,500 cfs for seven consecutive days.<br><br>The cumulative loss threshold for CWT CHNSR surrogate groups at the SWP and CVP salvage facilities is greater than 0.25% for each release group:<br><br>• Yearling CHNSR surrogates: WOMT, with input from SaMT, shall select three in-river releases of late fall-run Chinook Salmon from Coleman National Fish Hatchery from November through February to use as yearling CHNSR surrogates. Input from SaMT may include a proposal with several alternatives. If three in-river releases appropriately distributed from November through February are not achievable in a given year because of hatchery limitations, then an alternative plan shall be developed to ensure the adequate characterization and minimization of natural-origin yearling CHNSR can still be achieved that year. This plan shall be subject to CDFW approval.<br><br>• Young-of-year CHNSR surrogates: WOMT, with input from SaMT, shall select six in-river releases comprised of CHNSR and fall-run Chinook Salmon from the Feather River Fish Hatchery and fall-run Chinook Salmon from the Coleman National Fish Hatchery from March through May to use as young-of-year CHNSR surrogates. Input from SaMT may include a proposal with several alternatives. If six in-river releases appropriately distributed from March through May are not achievable in a given year because of hatchery limitations, then an alternative plan shall be developed to ensure the adequate characterization and minimization of natural-origin young-of-year CHNSR can still be achieved that year. This plan shall be subject to CDFW approval.<br><br>Loss shall be calculated for the south Delta export facilities using the 2018 CDFW loss equation (Attachment 8). The surrogate methods are intended to be an interim measure that may be replaced with a measure as described in Condition of Approval 7.9.3 and the AMP (Attachment 4) for natural-origin and hatchery-origin CHNSR.<br><br>Permittee shall, in coordination with Reclamation and SaMT, use real-time monitoring data, relevant tools, and new science gained through ongoing efforts to develop a CHNSR JPE and LCM to inform weekly risk assessments (October through June) for natural-origin juvenile CHNSR. If the risk assessment or WOMT representatives identifies a more positive OMR flow may be needed to minimize take of natural-origin juvenile CHNSR, WOMT may consider a more positive OMR flow requirement. | | | | |

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| 60 | Improve Salmon Entrainment Forecasting During Real-time OMR Management. By 2028, Permittee shall, in coordination with CDFW, Reclamation, and NMFS, use best available science and information gained from the application of the Winter-run Chinook Salmon Machine Learning Model (Condition of Approval 7.9.2), new data (e.g., SR JPE monitoring, Winter-run Action Plan), population information, non-physical barrier effectiveness, and other tools to develop a CHNWR minimization measure for SWP and CVP export facilities that relies on improved forecasts of entrainment risk, while providing the same or better levels of protection as Conditions of Approval 8.2.1, 8.4.3, and 8.4.4 of this ITP. Permittee shall consult with CDFW regarding the need for an amendment to the ITP (Condition of Approval 5) to modify or replace Conditions of Approval 8.2.1, 8.4.3, and 8.4.4 with CHNWR minimization actions that do not solely rely on salvage, based on results from this effort and the AMP (Attachment 4).<br><br>In 2026, consistent with Condition of Approval 7.9.3 to this ITP, Permittee shall, in coordination with CDFW, Reclamation, and NMFS, use best available science and information gained from the development of the initial CHNSR JPE to develop a new minimization measure for SWP and CVP export facilities that relies on improved forecasts of entrainment risk, while providing the same level of protection as Condition of Approval 8.4.5 of this ITP. Permittee shall consult with CDFW regarding the need for an amendment to the ITP (Condition of Approval 5) to modify or replace Condition of Approval 8.4.5 with CHNSR minimization actions that do not solely rely on salvage, based on results from this effort and the AMP (Attachment 4). | ITP Condition # 8.4.6 | Develop a new CHNSR minimization measure by 2026<br><br>Develop a new CHNWR minimization measure by 2028 | Permittee | |
| 61 | White Sturgeon Entrainment Protection Action. To minimize entrainment and salvage of WS, Permittee shall convene WSMT the following business day if the following conditions are observed:<br><br>• Young of year WS have been detected in at least one of the following north or central Delta survey stations in the last 90 days: 20mm Survey stations 705, 707, 711, or 716, or Bay Study Survey stations 751, 760, or 761, and<br><br>• The mean total exports over the last 90 days are greater than, or equal to, the exports defined by the following equation:<br><br>$Exports_{90-day\ average} = 14{,}296.76 + \ -0.41 Vernalis\ Flow_{90-day\ average}$<br><br>Upon convening, WSMT will review all available information to develop an assessment of the risk of further entrainment and salvage of WS including:<br><br>• Data from new and ongoing science and monitoring;<br><br>• Biological modeling and data analysis; | ITP Condition # 8.4.7 | Throughout the term of this ITP | Permittee | |

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| | • Hydrologic data, SWP and CVP exports and operations, and hydrologic model outputs; and<br>• Available information to estimate residence time in CCF.<br>Within WSMT, Permittee and CDFW shall jointly develop the risk assessment and supporting documentation to inform discussions and considerations of operational actions in WOMT. Input from all Permittee and CDFW WSMT members shall be included in the risk assessment, and any potential differences shall be noted and elevated as described in Conditions of Approval 8.1.3, 8.1.4, 8.1.5, and 8.1.6.3. If a risk assessment conducted by the WSMT, or Permittee or CDFW WOMT representatives, determines that an action is needed to minimize take of WS, operational decisions shall be made following the process described in Condition of Approval 8.1.5. The WSMT shall convene as necessary throughout the water year. | | | | |
| 63 | Evaluate and Develop Alternative White Sturgeon Entrainment Minimization During Real-time OMR Management. By 2027, Permittee shall, in coordination with CDFW, use best available science and information gained from the WS Science Program (Condition of Approval 7.10.1) to develop an alternative approach to minimizing WS entrainment and salvage at the SWP and CVP export facilities that refines Condition of Approval 8.4.7 based on new knowledge and understanding of WS. This alternative approach shall incorporate estimates of WS loss in CCF as informed by the WS Science Plan (Condition of Approval 7.1o.1). Permittee shall consult with CDFW regarding the need for an amendment to the ITP (Condition of Approval 5) to modify or replace Condition of Approval 8.4.6 with WS minimization actions that do not solely rely on salvage, based on results from the WS Science Plan (Condition of Approval 7.10.1) and the AMP (Attachment 4). | ITP Condition # 8.4.8 | Throughout the term of this ITP | Permittee | |
| 63 | Storm Flex. During OMR Management, Permittee may, in coordination with Reclamation, through WOMT, prepare an assessment to evaluate operating to a daily average OMR index no more negative than -6,250 cfs, to capture peak flows during storm-related events. Such operations may be requested to occur between the start of OMR Management, and either the Larval and Juvenile Delta Smelt Protection Action onramp (Condition of Approval 8.4.1) or the last day of February, whichever occurs first, to capture peak flows during storm-related events when:<br>1. The Delta is in excess conditions as defined in the COA; and<br>2. QWEST is greater than +1,500 cfs; and<br>3. X2 is < 81 km; and<br>4. The daily average turbidity at OSJ, HOL, and OBI sensors are < 12 FNU at each | ITP Condition # 8.5 | Throughout the term of this ITP | Permittee | |

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| | station; and<br><br>5. A measurable precipitation event has occurred in the Central Valley; and<br><br>6. Permittee, in coordination with Reclamation, determines that the net Delta outflow index indicates a higher level of outflow available for diversion due to peak storm flows; and<br><br>7. None of the following Conditions or Approval are controlling SWP and CVP operations: Conditions of Approval 8.2.1, 8.3.1, 8.3.2, 8.3.3, 8.4.2, 8.4.3, 8.4.4, 8.4.5, and 8.4.7; and<br><br>8. Cumulative loss at the SWP and CVP export facilities of yearling Coleman National Fish Hatchery late fall-run Chinook Salmon (as yearling CHNSR surrogates under Condition of Approval 8.4.5) is less than 0.5% within any of the release groups.<br><br>If the criteria above are met, WOMT shall decide whether to request that Permittee and Reclamation use estimates of the real-time distribution of Covered Species from SMT, SaMT, and WSMT, as well as particle tracking modeling and prediction tool output to assess potential Covered Species entrainment risk differences under OMR index scenarios of -5,000 and -6,250 cfs. If the assessment indicates that no additional Conditions of Approval for the upcoming week are likely to be triggered, Permittee may, in coordination with Reclamation, bring a request back to WOMT for approval to operate to an OMR index no more negative than -6,250 cfs. Permittee, in coordination with Reclamation, shall update the assessment no less than weekly.<br><br>If, during approved operations of Storm Flex, conditions indicate a Condition of Approval is likely to be triggered, Permittee shall, in coordination with Reclamation, adjust south Delta exports to achieve a 14-day average of the OMR index no more negative than -5,000 cfs, unless a further reduction in exports is required by another Condition of Approval. If a Condition of Approval is triggered, Permittee shall, in coordination with Reclamation, cease Storm Flex operations and implement the controlling Condition of Approval within 48 hours. WOMT shall re-evaluate Storm Flex decisions weekly. | | | | |
| 64 | End of OMR Management. Permittee shall, in coordination with Reclamation, meet the requirements included in Conditions of Approval 8.2.1, 8.3, 8.3.1, 8.3.2, 8.3.3, 8.4.1, 8.4.2, 8.4.3, 8.4.4, 8.4.5, and 8.4.7 to ensure that entrainment and take of Covered | ITP Condition # 8.6 | Throughout the term of this ITP | Permittee | |

| | Mitigation Measure | Source | Implementation Schedule | Responsible Party | Status/Date/ Initials |
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| | Species is minimized during OMR Management through June 30, or until the following species-specific thresholds occur:<br>• DS and LFS:<br>o Daily mean water temperature at CCF (CDEC station CLC) is ≥ 25°C for three consecutive days.<br>• CHNWR and CHNSR:<br>o Daily mean water temperature at Mossdale (CDEC station MSD) is > 22.2°C for seven days (does not have to be consecutive) in June; and<br>o Daily mean water temperature at Prisoner's Point (CDEC station PPT) is > 22.2°C for seven days (does not have to be consecutive) in June. | | | | |
| 65 | SWP Proportional Share. Due to the historically coordinated operations of the SWP and CVP, joint operational criteria related to OMR flows and south Delta export restrictions have been developed for SWP and CVP that assume coordinated implementation by Permittee and Reclamation. Conditions of Approval 8.2.1, 8.3, 8.3.1, 8.3.2, 8.3.3, 8.4.1, 8.4.2, 8.4.3, 8.4.4, 8.4.5, 8.5, and 8.6 set out such operational criteria that assume coordination by Permittee and Reclamation to meet the criteria and that are subject to the process set out in this Condition of Approval.<br>During the term of this ITP there may be instances when operational requirements stated in or determined by the Conditions of Approval listed above or Conditions of Approval 8.4.7 and 8.12 are different from operational requirements of the applicable ESA authorizations, which govern operations at the CVP as well as the SWP. If an operational restriction required by this ITP, pursuant to one or more of the Conditions of Approval listed above including Conditions of Approval 8.4.7 and 8.12, is more restrictive than the then-controlling operations required by the applicable ESA authorizations, Permittee shall take the following steps to meet its proportional share of the operational criteria stated or determined by the Condition of Approval(s) at issue:<br>1) Permittee is legally bound, both statutorily and through agreements with Reclamation, not to utilize state facilities (including the CCF, Banks Pumping Plant, the California Aqueduct, and the SWP share of San Luis Reservoir) or allow third parties (including the CVP) to use state facilities in a manner that would result in a violation of law, including the operational criteria stated in or determined by Conditions of Approval 8.2.1, 8.3, 8.3.1, 8.3.2, 8.3.3, 8.4.1, 8.4.2, 8.4.3, 8.4.4, 8.4.5, 8.4.7, 8.5, 8.6, and 8.12 of this ITP.<br>2) If prohibiting the use of state facilities for CVP purposes will not result in conditions that meet the operational criteria stated in or determined by the Condition(s) of | ITP Condition # 8.7 | Throughout the term of this ITP | Permittee | |

| | Mitigation Measure | Source | Implementation Schedule | Responsible Party | Status/Date/ Initials |
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| | Approval at issue, Permittee shall provide CDFW with a written estimate of the total allowed exports at both the SWP and CVP facilities that would be required to meet the operational criteria stated in or determined by the Condition(s) of Approval at issue.<br>3) Under Excess Conditions: Based on the written estimate prepared under paragraph 2 of this condition, Permittee shall reduce exports at the Banks Pumping Plant to 40% of the estimated total allowed exports that would be allowed if both the SWP and CVP were operating to meet the requirement stated in or determined by the Condition(s) of Approval at issue.<br>4) Under Balanced Conditions: Based on the written estimate prepared under paragraph 2 of this condition, Permittee shall reduce exports at the Banks Pumping Plant to 35% of the estimated total allowed exports that would be allowed if both the SWP and CVP were operating to meet the requirement stated in or determined by the Condition(s) of Approval at issue.<br>Excess and balanced conditions are defined in Section 1.4 of the Project Description. The SWP shares of allowable exports are defined based on the SWP share of exports during excess and balanced conditions described in the 2018 COA Addendum. This Condition of Approval in combination with other Conditions of Approval required by this ITP are intended to further satisfy Permittee's obligations pursuant to CESA. If the 1986 COA as amended in 2018 is revised after the effective date of this ITP, Permittee shall notify CDFW per Condition of Approval 5.<br>Permittee shall not be required to reduce exports below the SWP COA share of combined SWP and CVP exports of 1,500 cfs, the minimum required to meet health and safety standards. Based on the 2018 COA addendum the Permittee identified its minimum exports as 600 cfs. | | | | |
| 66 | Water Year Type Definition. All references to water year type in this ITP shall be defined based on the Sacramento Valley "40-30-30" water year hydrologic classification index as defined in the Bay-Delta Plan, unless otherwise noted. | ITP Condition # 8.8 | Throughout the term of this ITP | Permittee | |
| 67 | Ongoing Comparison of OMR Index to Tidally Filtered OMR. The United States Geological Survey (USGS) Tidally Filtered Method to calculate OMR flow is defined in the 2009 NMFS Biological Opinion and Conference Opinion Long-term Operations of the Central Valley Project and State Water Project and uses values reported by the USGS for the Old River at Bacon Island and Middle River at Middle River monitoring stations. Permittee shall continue to calculate and report OMR as estimated using the USGS Tidally Filtered Method in all reports as a part of SMT, SaMT, and WSMT and reported to WOMT, in addition to OMR flows as calculated using the OMR Index. Permittee shall provide CDFW raw data for the daily OMR Index and USGS Tidally Filtered OMR and a report comparing | ITP Condition # 8.9 | Throughout the term of this ITP | Permittee | |

| | Mitigation Measure | Source | Implementation Schedule | Responsible Party | Status/Date/ Initials |
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| | the estimates over the prior water year annually as a part of the ASR (Condition of Approval 7.2).<br><br>Permittee shall, in coordination with CDFW, convene a technical team, including but not limited to representatives from Permittee, CDFW, Reclamation, USFWS, NMFS, and the State Water Board to review both the USGS Tidally Filtered Method and the OMR Index calculation to determine if improvements are needed to better quantify OMR flow. If Permittee and CDFW agree on an improved method for calculating OMR flow, Permittee may request an amendment to the ITP to modify or replace the existing OMR Index used in real-time OMR Management. | | | | |
| **Barker Slough Pumping Plant Delta Smelt and Longfin Smelt Protections.** | | 8.10 | | | |
| 68 | Barker Slough Pumping Plant Larval Delta Smelt Protection. Permittee shall operate the BSPP to protect larval DS from March 1 to June 30 of dry and critical water years according to the details below. If the water year type changes after March 1 to below normal, above normal, or wet, this Condition of Approval will no longer be in effect. If the water year type changes after March 1 to dry or critical, Permittee shall operate according to this Condition of Approval.<br><br>From March 1 to April 30 of dry and critical water years, if catch of larval DS (<25 mm fork length) in the 20-mm Survey at station 718 exceeds 14% of the total catch of larval DS across the Cache Slough area of the north Delta (20-mm Survey stations 716, 718, 719, 720, 723, 724, and 726), then Permittee shall operate to a maximum 7-day average diversion rate at BSPP less than 60 cfs.<br><br>From May 1 to June 30 of dry and critical water years, if catch of larval DS (<25 mm fork length) in the 20-mm Survey at station 716 exceeds 5% of the total catch of larval DS across the Cache Slough area of the north Delta (20-mm Survey stations 716, 718, 719, 720, 723, 724, and 726), then Permittee shall operate to a maximum 7-day average diversion rate at BSPP less than 100 cfs. | ITP Condition # 8.10.1 | Throughout the term of this ITP | Permittee | |
| 69 | Barker Slough Pumping Plant Larval Longfin Smelt Protection. Permittee shall operate the BSPP to a maximum 7-day average diversion rate at BSPP less than 100 cfs to minimize entrainment of larval LFS from January 1 to March 31 of dry and critical water years. If the water year type changes after January 1 to below normal, above normal, or wet, this Condition of Approval will off-ramp. If the water year type changes after January 1 to dry or critical, Permittee shall operate according to this Condition of Approval. | ITP Condition # 8.10.2 | Throughout the term of this ITP | Permittee | |
| **Minimization of Winter- and Spring-run Migration into the Interior and South Delta.** | | 8.11 | | | |

| | Mitigation Measure | Source | Implementation Schedule | Responsible Party | Status/Date/ Initials |
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| 70 | Install and Operate the Georgiana Slough Salmonid Migratory Barrier. Permittee shall continue the annual installation and operation the Georgiana Slough Salmonid Migratory Barrier at Georgiana Slough in accordance with this Condition of Approval, the CDFW approved Georgiana Slough Salmonid Migratory Barrier Operations Plan, the AMP (Attachment 4), and 2022 ITP for the Georgiana Slough Salmonid Migratory Barrier Project (ITP No. 2081-2021-102-03) for the duration of this ITP. A salmonid migratory barrier at Georgiana Slough is expected to provide a higher probability of survival for emigrating juvenile CHNWR and CHNSR that encounter the Sacramento River-Georgiana Slough junction and reduce entrainment of emigrating CHNWR and CHNSR into the interior and south Delta.<br><br>From November 1 through November 15, Permittee shall conduct testing and commissioning of the Georgiana Slough Salmonid Migratory Barrier. If in a given year Permittee provides requests to not conduct testing and commissioning of the barrier from November 1 through November 15 to preserve the integrity of the barrier, Permittee shall submit a justification to CDFW by October 31, for CDFW's written approval.<br><br>From November 16 through November 30, Permittee shall operate the Georgiana Slough Salmonid Migratory Barrier annually when the daily Knights landing Catch Index or Sacramento Catch Index is greater than or equal to 3.0 older juvenile Chinook Salmon. Permittee may suspend operations after three days of operation if the daily catch index at both the Knights Landing and Sacramento monitoring sites is less than 3.0 older juvenile Chinook Salmon for two consecutive days.<br><br>From December 1 through April 30, Permittee shall operate the Georgiana Slough Salmonid Migratory Barrier.<br><br>From May 1 through May 31, Permittee shall operate the Georgiana Slough Salmonid Migratory Barrier, unless Permittee provides annual justification for not operating the barrier given juvenile CHNWR and CHNSR outmigration timing patterns and CDFW approves in writing.<br><br>During annual operations, Permittee may interrupt operations temporarily for maintenance or monitoring studies if approved in writing by CDFW. During annual operations, if an unplanned outage occurs Permittee shall submit a notification and schedule for resolution of the outage in writing to CDFW within 24 hours of the outage. Permittee shall submit any modifications to the Georgiana Slough Salmonid Migratory Barrier Operations Plan to CDFW for review and written approval. | ITP Condition # 8.11.1 | Throughout the term of this ITP | Permittee | |
| 71 | Evaluate Benefits of Salmonid Guidance Structures at Sutter and Steamboat Sloughs. Permittee, in collaboration with the Guidance Structure Evaluation Working Group, conducted a preliminary evaluation of the potential benefits of salmonid guidance structures at Sutter and Steamboat sloughs to improve through-Delta survival as a | ITP Condition # 8.11.2 | Re-convene the working group within six months | Permittee | |

| | Mitigation Measure | Source | Implementation Schedule | Responsible Party | Status/Date/ Initials |
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| | requirement of the 2020 ITP for the Long-term Operation of the SWP in the Sacramento-San Joaquin Delta (ITP No. 2081-2019-066-00). Under Condition of Approval 7.9.5 to this ITP, Permittee shall implement regional survival studies within the Delta to evaluate Chinook Salmon survival, behavior, and route entrainment. Permittee shall use information gained from Condition of Approval 7.9.5 to this ITP and feedback from the Guidance Structure Evaluation Working Group to continue developing tools to assess further actions to improve Chinook Salmon through-Delta survival.<br><br>Within six months of the effective date of this ITP, Permittee shall re-convene the Guidance Structure Evaluation Working Group, including representatives from Permittee, CDFW, Reclamation, USFWS, NMFS, and SWP Contractors. With support from the Guidance Structure Evaluation Working Group, Permittee shall address CDFW's comments and initiate and complete sensitivity analyses defined by CDFW in its comments to the draft Sutter and Steamboat Slough Guidance Structure Evaluation Report.<br><br>Within two years of the effective date of this ITP, Permittee shall submit an updated draft Sutter and Steamboat Slough Guidance Structure Evaluation Report to CDFW for review. Within four months of receiving CDFW's review, Permittee shall update the evaluation report and submit the final Sutter and Steamboat Slough Guidance Structure Evaluation Report to CDFW for approval.<br><br>Within one year of finalizing the evaluation report, Permittee shall reassess actions to improve Chinook Salmon through-Delta survival (potentially through increased routing into Steamboat Slough) using tools developed and refined through the Sutter and Steamboat sloughs evaluation effort and propose actions for CDFW's approval. Consideration shall be given to actions that will complement the Georgiana Slough Salmonid Migratory Barrier, including flexibility in utilizing the Georgiana Slough barrier at upstream locations dependent on hydrologic conditions. | | of the effective date of this ITP<br><br>Submit an updated draft report to CDFW within two years of the effective date of this ITP | | |
| 72 | Spring Delta Outflow Implementation. This condition of Approval is intended to augment Delta outflow during a critical time in the life history of all five Covered Species. When March, April and May Delta outflow is augmented, salinity in Suisun Bay is reduced and central Delta productivity is dispersed westward, improving habitat for both DS and LFS. At the upper end of managed flows when X2 is in San Pablo Bay, reservoir releases and export curtailments help maintain this favorable location and sustain food web productivity and other conditions for improved LFS recruitment in San Pablo Bay. Reductions in outflow during such conditions could restrict LFS nursery habitat upstream to less favorable habitat in Carquinez Strait. Augmenting spring Delta outflow through a combination of increased releases from reservoirs and export curtailments improves migratory conditions for CHNWR, CHNSR, and WS by reducing Covered Activities' impacts on routing and through-Delta survival. Reducing exports during this time period to maintain a higher Delta outflow will also provide a proactive approach to entrainment minimization that is expected to reduce CHNWR, CHNSR, and WS routing into the central and south Delta and minimize | ITP Condition # 8.12 | Throughout the term of this ITP | Permittee | |

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| | loss of all Covered Species at the SWP export facility. Additionally, increases in spring Delta outflow are associated with increased food web transport to, and productivity in, Suisun Bay.<br><br>Permittee shall provide spring Delta outflow to minimize impacts to Covered Species as a result of Project operations. Permittee shall implement Condition of Approval 8.12.1 as a continuation of the existing spring export curtailment as accounted for in the ratio of Vernalis flows (cfs) to combined SWP and CVP south Delta exports (cfs) during water years when the HRL is not implemented. Permittee shall implement Conditions of Approval 8.12.2 and 8.12.3 during water years when the HRL is implemented consistent with those Conditions of Approval. If the State Water Board adopts a final HRL, Permittee and CDFW will immediately meet and confer to review the Project in light of the final form of the HRL (Condition of Approval 5). | | | | |
| 73 | Spring Delta Outflow Via Export Curtailments. The following shall be implemented by Permittee during any water year in which SWP export reductions and flow purchases pursuant to the HRL are not identified and conducted as described in Condition of Approval 8.12.2. Permittee shall operate the Project during the spring each year to restrict exports and enhance Delta outflow.<br><br>Permittee shall reduce exports from April 1 to May 31 each year to achieve the SWP proportional share (Condition of Approval 8.7) of export reductions established by the ratio of Vernalis flow (cfs) to combined SWP and CVP exports, scaled by water year type, to provide incidental spring outflow. In a critical year, the ratio of Vernalis flow to SWP and CVP combined exports shall be 1 to 1. In a dry year, the ratio of Vernalis flow to SWP and CVP combined exports shall be 2 to 1. In a below normal year, the ratio of Vernalis flow to SWP and CVP combined exports shall be 3 to 1. In an above normal or wet year, the ratio of Vernalis flow to SWP and CVP combined exports shall be 4 to 1. In wet years SWP export curtailments required by this Condition of Approval for spring outflow in April and May are limited to 150 TAF. The ratio of Vernalis flows to export reductions is intended to serve as an operational mechanism to achieve the Delta outflow required by this Condition of Approval for minimization of the Covered Activities' impacts to Covered Species.<br><br>For purposes of this Condition of Approval only, the San Joaquin Valley "60-20-20" water year hydrologic classification and indicator as defined in the Bay-Delta Plan (SWRCB 2006) is used.<br><br>Permittee shall not be required to restrict operations as described above under either of the following circumstances:<br><br>• If the 3-day average Delta outflow is greater than 44,500 cfs, then Project operations shall not be controlled by this Condition of Approval until the flows drop below 44,500 cfs on a 3-day average. | ITP Condition # 8.12.1 | Throughout the term of this ITP | Permittee | |

| | Mitigation Measure | Source | Implementation Schedule | Responsible Party | Status/Date/ Initials |
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| | • Permittee shall not be required by this Condition of Approval to restrict exports at the Banks Pumping Plant below its minimum health and safety exports of 600 cfs.<br><br>The ratios used to establish export restrictions by water year type are a tool that incorporates San Joaquin River inflows while also allowing for a high outflow offramp of 44,500 cfs, which is expected to be driven by inflow from the Sacramento River.<br><br>If HRL is approved by the State Water Board during the term of this ITP in a manner that is consistent with the requirements described in Condition of Approval 8.12.2, Permittee is not required to implement this Condition of Approval 8.12.1 in critically dry or wet years while HRL is being implemented. | | | | |
| 74 | Spring Delta Outflow Via the Healthy Rivers and Landscapes Program. As described in Sections 1.5 and 3.3 of the Project Description, Permittee and its SWP Contractors propose a reduction in SWP south Delta exports to protect and augment Delta outflows between March through May of dry, below normal, and above normal water year types. Additionally, Permittee shall provide 50 TAF of Delta inflow that is dedicated to Delta outflow in March of dry, below normal, and above normal water years. Permittee shall make these flows available, which Permittee may facilitate through upstream land fallowing, and resulting reservoir releases to be passed through for Delta outflow. Permittee may provide flows in April or May, if approved by CDFW. Permittee shall also provide SWP south Delta foregone exports in April and May of dry, below normal, and above normal water years. Water volume requirements are described in Table 5 below. Permittee may deploy a portion of the export reduction flows in March or June if approved by CDFW.<br><br>For purposes of implementation of this Condition of Approval, Permittee shall adhere to the 90% exceedance forecast in March, the 75% exceedance forecast in April, and the 50% exceedance forecast in May of the Sacramento Valley “40-30-30” water year hydrologic classification index as defined in the Bay-Delta Plan to determine the water year type and associated flow volume requirements (Table 5). SWP exports at Banks Pumping Plant are not required to be reduced below 600 cfs to implement this Condition of Approval. If Permittee has operated consistent with the CDFW approved Delta Operation Plan (Condition of Approval 8.12.3) and has not fully deployed the foregone export Delta outflow by May 31, Permittee shall continue to reduce SWP south Delta exports, to forego exports of any remaining unstored flows, to the maximum extent practicable on a daily basis to deploy the remaining Delta outflows by the end of June. | ITP Condition # 8.12.2 | Throughout the term of this ITP | Permittee | |
| 75 | Planning and Reporting Implementation of Spring Delta Outflow Via the Healthy Rivers and Landscapes Program. Condition of Approval 8.12.2 describes blocks of water that shall be made available to supplement spring Delta outflow as a part of the HRL, with seasonal timing at the discretion of CDFW, during years when the HRL is implemented. Each year | ITP Condition # 8.12.3 | Throughout the term of this ITP | Permittee | |

| | Mitigation Measure | Source | Implementation Schedule | Responsible Party | Status/Date/ Initials |
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| | the HRL is implemented, to facilitate the planning, accounting, and reporting of Condition of Approval 8.12.2, Permittee shall:<br><br>1) Develop and operate to a Spring Delta Outflow Operations Plan:<br><br>• Beginning no later than January 15, work collaboratively with CDFW to develop a draft Delta Outflow Operations Plan that describes:<br><br>o The timing and volume of water to be made available on a daily basis between March 1 and May 31 associated with the blocks of water in Table X (Condition of Approval 8.12.2).<br><br>o Anticipated Project operational actions (e.g. export restrictions and water made available through land fallowing and reservoir releases) that would be taken to ensure the available blocks of water supplement Delta outflow.<br><br>o An accounting of how and when each available block of water would be used to supplement Delta outflow in addition to water required to operate to other controlling operational criteria.<br><br>o Ongoing coordination with CDFW and the WOMT throughout deployment of the available blocks of water to evaluate operations relative to the requirements described in the Final Delta Operations Plan.<br><br>• Permittee shall work collaboratively with CDFW on an ongoing basis after January 15 to develop and update the draft Delta Outflow Operations Plan based on refinements in understanding of Covered Species status and distribution, Project operations, and hydrologic and temperature forecasts.<br><br>• Permittee shall submit the draft Delta Outflow Operations Plan to CDFW no less than 15 days prior to the start date of operational requirements described in the plan and incorporate CDFW comments and edits into the final plan no less than five days prior to the start of operational requirements described in the plan.<br><br>• Operate the Project consistent with the final CDFW-approved Delta Outflow Operations Plan.<br><br>• Upon implementation of the CDFW approved Spring Delta Operations Outflow Plan, each week DWR will provide a 7-day forecast of the daily volume of water that will contribute to the blocks of water defined in Condition of Approval 8.12.2. The actual volumes from the previous week's forecast will be trued up the following week. | | | | |

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| | 2) By October 31, submit to CDFW a draft Delta Outflow Operations Report that includes the following daily information throughout the duration of the implementation of the Delta<br>• Outflow Operations Plan that year:<br>• Delta outflow<br>• Total exports at Banks Pumping Plant<br>• Total exports at Jones Pumping Plant<br>• OMR index<br>• USGS Tidally Filtered OMR flow<br>• San Joaquin inflow<br>• Flow at Freeport<br>• Flow on the Feather River immediately below Thermalito<br>• State and federal share stored in San Luis Reservoir<br>• Releases from the following reservoirs:<br>  ○ Nimbus<br>  ○ Keswick<br>  ○ Oroville<br>  ○ Whiskeytown<br>• Jersey Point salinity<br>• Salinity at Belden's Landing<br>• Flow as measured at Lisbon Weir<br>• Delta outflow controlling factor each day and associated allowable SWP exports<br>• Minimum required Delta outflow that would be required to meet applicable controlling standards<br>• Documentation of the volume and timing of the blocks of water required to be deployed in Table 5<br>• Documentation of the reference operation including a depiction of operations that would have occurred during the timeframe outlined in the Delta Outflow Operations Plan for that water year if the available blocks of water had not been implemented. This depiction shall include estimates of all required hydrologic data points used to quantify actual operations during the same time period.<br>3) Incorporate CDFW comments and edits into the draft Delta Outflow Operations Report and submit it to CDFW for approval before December 1. | | | | |
| 76 | Consultation Regarding Deployment of Spring Outflow Via the Healthy Rivers and Landscapes Program. Permittee shall meet with CDFW at the beginning of each month (March, April, May, and June) to determine if HRL volume commitments met through export reductions and/or upstream releases match targets established in the Delta Outflow Operations Plan. In the event that actual flow deployments are under or above planned | ITP Condition # 8.12.4 | Throughout the term of this ITP | Permittee | |

| | Mitigation Measure | Source | Implementation Schedule | Responsible Party | Status/Date/ Initials |
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| | targets, CDFW will determine if the Delta Outflow Operations Plan may be adjusted in real-time to meet outflow volumes in Table 5.<br><br>Deployment of HRL Delta outflow via foregone exports of unstored flows in the spring shall occur between March and June each year. Initiating deployment of foregone exports of unstored flows in April results in conditions most consistent with baseline, however this approach has a risk of not fully deploying flows by the end of June each year. Initiating deployment of foregone exports of unstored flows in March is expected to create conditions in May different from baseline, but results in a reduce risk of not fully deploying flows by the end of May each year. Recognizing these tradeoffs, Conditions of Approval 8.12.2, 8.12.3, and 8.12.4 include requirements to conduct initial planning for flow deployment, and regular check ins throughout the spring season. In the event that flows required by Condition of Approval 8.12.2 are not deployed in full within the March – June time period Permittee shall meet and confer with CDFW before September 30 to develop a schedule for the deployment of remaining flows in the subsequent water year, or in the next water year with the same Sacramento Valley Index water year type as the year in which flows were not fully deployed. Permittee shall submit the draft schedule to CDFW for review and approval. Permittee shall implement the CDFW-approved schedule.<br><br>Before Condition of Approval 8.12.2 is implemented, CDFW and Permittee shall develop a plan and potential alternative approach, for CDFW approval, to address situations when the water year type is not identified for flows in HRL in March and April, then shifts to a water year type identified in HRL in May or June, and flow volumes required are not deployed in full. The plan shall consider 1) the reasons for the shortfall and 2) a comparison of HRL flow deployment to flow deployment that would have occurred under Condition of Approval 8.12.1 that spring. Permittee may propose alternative actions to subsequent deployment of remaining flows that achieve equivalent, or better, biological value to Covered Species after CDFW and Permittee meet and confer, for CDFW approval.<br><br>In addition to within-season and annual coordination with CDFW, Permittee shall meet and confer with CDFW every three years that Condition of Approval 8.12.2 is implemented to evaluate the deployment of the flow volume commitments in Table 5 above and compare them to the volumes of Delta outflow that would have been achieved by operating to Condition of Approval 8.12.1. If CDFW determines that the flow volumes achieved through deployment of Condition of Approval 8.12.2 are not equivalent to flow volumes that would have been generated through implementation of Condition of Approval 8.12.1, on average, Permittee will meet and confer with CDFW as described above to determine additional actions needed to compensate for associated impacts. | | | | |
| 77 | Skinner Fish Facility CDFW Staff. To support implementation of this ITP, Permittee shall continue to fully fund two existing CDFW Environmental Scientist positions and one existing CDFW Senior Environmental Scientist Specialist position to work collaboratively | ITP Condition # 8.13 | Throughout the term of this ITP | Permittee | |

| | Mitigation Measure | Source | Implementation Schedule | Responsible Party | Status/Date/ Initials |
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| | with DWR Skinner Fish Facility staff through the duration of this ITP. Permittee shall work collaboratively with these CDFW staff to ensure that they have the access and information needed to perform their duties and discuss roles and responsibilities relative to existing DWR facility staff. Permittee shall work cooperatively with CDFW to ensure CDFW staff has access and information to perform duties including but not limited to the following:<br>• Receive daily salvage data from the SWP and CVP fish salvage facilities,<br>• Conduct salvage data and database QA/QC,<br>• Monitor Skinner Fish Facility operations,<br>• Train DWR Skinner Fish Facility staff on fish identification,<br>• Work collaboratively with Permittee to develop and implement a revised written training curriculum for DWR Skinner Fish Facility staff,<br>• Work collaboratively with Permittee to annually review and update the revised Skinner Fish Facility Operations Manual (Section 3.5.2 of the Project Description),<br>• Review annual salvage reports from the SWP and CVP fish salvage facilities,<br>• Receive notifications and provide technical assistance regarding inspections or maintenance of fish protective equipment,<br>• Work collaboratively with Permittee to develop a new protocol which describes the decision-making process prior to reducing sampling times at Skinner Fish Facility,<br>• Engage in real-time decision making to determine whether reduce count times are needed and measures to ensure adequate detection of Covered Species during reducing count times at Skinner Fish Facility,<br>• Provide technical assistance at Permittee's request with heavy fish and/or debris load management at Skinner Fish Facility,<br>• Participate in the development and implementation of the Debris Management Effectiveness Study Plan to refine the Skinner Fish Facility fish sampling procedures and infrastructure for improvements in accuracy and reliability of data and fish survival (Condition of Approval 7.5.2), and<br>• Participate in the development and implementation of the Alternative Loss Pilot Study Implementation Plan to refine the parameters of the Alternative Loss Equation software tool for estimating CHNWR and CHNSR loss at the SWP and CVP export facilities (Condition of Approval 7.9.1).<br>Permittee shall provide reasonable access to the Skinner Fish Facility for the three CDFW staff identified in this Condition of Approval. | | | | |

| | Mitigation Measure | Source | Implementation Schedule | Responsible Party | Status/Date/ Initials |
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| **Clifton Court Forebay Maintenance, Outages, and Inspection Procedures.** | | 8.14 | | | |
| 78 | Spring Maintenance and Inspection. During spring maintenance and inspection, Permittee shall lower the water level in CCF by closing the radial gates and operating both the Banks Pumping Plant and the Skinner Fish Facility prior to the outage to salvage as many fish as practicable currently present in CCF. Permittee shall initiate the outage at both the Banks Pumping Plant and the Skinner Fish Facility once the minimum operating water level is achieved. During the outage, Permittee shall inspect the CCF cement liner and conduct all planned maintenance at the facilities. Once the CCF cement liner inspection is completed, Permittee shall raise the water level in CCF to the normal operating level by allowing allotments of water into CCF within the constraints of OMR requirements as described in Conditions of Approval in this ITP. Once the Banks Pumping Plant and the Skinner Fish Facility maintenance activities are complete and the CCF returns to the normal operating water level, Permittee shall resume normal Banks Pumping Plant and the Skinner Fish Facility operations. | ITP Condition # 8.14.1 | Throughout the term of this ITP | Permittee | |
| 79 | Herbicide and Algaecide Treatment. Permittee may conduct aquatic weed and algal bloom management in CCF by applying herbicide and algaecide treatments to CCF consisting of peroxide-based aquatic algaecides applied year-round and Aquathol K and copper-based aquatic compounds applied from June 28 through October 31.<br><br>Permittee may apply Aquathol K and copper-based aquatic compounds, if necessary, prior to June 28 or after October 31 if the average daily water temperature within the CCF is greater than or equal to 25°C, and if Covered Species are not at additional risk from the treatment, as confirmed by CDFW, USFWS, and NMFS. Before applying Aquathol K or copper-based aquatic compounds outside of the June 28 to October 31 time frame, Permittee shall notify and confer with CDFW, USFWS, and NMFS to determine whether ESA- or CESA-listed fish species are present and at risk from the proposed treatment.<br><br>Prior to herbicide or algaecide treatment, Permittee shall monitor the salvage of Covered Species at the Skinner Fish Facility. If salvage of Covered Species occurs, Permittee shall confer with CDFW prior to initiating herbicide or algaecide treatment. During herbicide or algaecide treatment, Permittee shall close the CCF radial gates for at least 24 hours prior to treatment to allow fish currently present in CCF to move out of the targeted treatment areas and towards the salvage facility and to minimize the possibility of aquatic herbicide or algaecide diffusing into the Delta.<br><br>Following herbicide or algaecide treatment using peroxide-based aquatic algaecides, Permittee may reopen the CCF radial gates immediately after treatment.<br><br>Following herbicide or algaecide treatment using Aquathol K and copper-based aquatic compounds, Permittee shall keep the CCF radial gates closed for a minimum of 12 and up to 75 hours after treatment to allow for the product-recommended duration of contact time | ITP Condition # 8.14.2 | Throughout the term of this ITP | Permittee | |

| | Mitigation Measure | Source | Implementation Schedule | Responsible Party | Status/Date/ Initials |
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| | between the aquatic herbicide or algaecide and the treated vegetation or cyanobacteria in CCF, and to reduce residual endothall concentration for drinking water compliance purposes. Permittee may open the CCF radial gates after a minimum of 36 hours (24 hours pre-treatment closure followed by a minimum of 12 hours post-treatment closure).<br><br>Permittee shall adhere to the following conditions for herbicide or algaecide treatment in CCF:<br>• Ensure that herbicide or algaecide treatments will be made by a licensed applicator under the supervision of a California Certified Pest Control Advisor and will follow label restrictions;<br>• Ensure herbicides and algaecides will be applied in a manner consistent with the label instructions, with a target concentration dependent upon target species and biomass, water volume and the depth of the CCF not to exceed the following concentrations:<br>o Peroxide-based aquatic algaecides applied up to 10.2 parts per million (ppm) hydrogen peroxide;<br>o Aquathol K applied up to 3 ppm; and<br>o Copper-based aquatic compounds applied up to 1 ppm;<br>• Restrict treatments to the smallest area possible (no more than 50% of the CCF at one time) that provides relief to SWP operations or water quality;<br>• Apply treatments by boat or aircraft;<br>• Apply treatments by boat using a subsurface injection system for liquid formulations and a boat-mounted hopper dispensing system or a helicopter for granular formulations. Applications shall start at the shoreline and move systematically farther offshore, enabling fish to move out of the treatment area;<br>• Apply treatments by aircraft only during times when wind speeds are less than 15 miles per hour (mph) to prevent spray drift;<br>• Collect water quality samples before, during and after treatment to ensure concentrations do not exceed the application limit, per National Pollutant Discharge Elimination System (NPDES) permit required procedures; and<br>• Develop and implement a spill prevention plan in the event of an accidental spill. | | | | |
| 80 | Clifton Court Forebay Aquatic Weed Harvesting. Permittee may conduct aquatic weed management in CCF year-round using a boat-mounted aquatic weed harvester. Prior to weed harvesting, Permittee shall ensure that all personnel on site participate in environmental awareness training for special-status species with the potential to occur in the project area. If any wildlife is observed within the aquatic weed removal and disposal areas, Permittee shall halt work immediately, and the wildlife are allowed to move out of the area on their own. Following weed harvesting, Permittee shall stockpile all harvested aquatic weeds on land for transport to a commercial green waste facility or similar facility. | ITP Condition # 8.14.3 | Throughout the term of this ITP | Permittee | |

| | Mitigation Measure | Source | Implementation Schedule | Responsible Party | Status/Date/ Initials |
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| 81 | Relationship Between the Adaptive Management Plan and this ITP. The AMP (Attachment 4) shall be used to consider and address scientific uncertainty regarding the Bay-Delta ecosystem, Covered Species ecology, and to inform the understanding of minimization of take and impacts of the taking associated with the operational criteria in this ITP. The AMP may result in recommendations regarding operational components described in Conditions of Approval to this ITP, and consequently Permittee may request amendment of this ITP based on new information developed through new science and monitoring (Condition of Approval 5) and according to the amendment standards and processes identified in CESA's implementing regulations. The AMP shall be used to build scientific understanding of Covered Species, evaluate potential changes in the Conditions of Approval in this ITP, and build a knowledge base for future permitting processes. The AMP (Attachment 4) describes this structure and steps associated with adaptive management in more detail.<br><br>The AMP does not govern real-time operations. Recommendations of the AMP shall not commit Permittee or CDFW to a definite course of action related to ITP amendments. The AMP shall not modify CDFW's discretionary decision-making as set out in the Conditions of Approval, CESA, or CESA's implementing regulations.<br><br>Condition of Approval 5 describes circumstances when CDFW anticipates that Permittee may request an amendment to this ITP in the future, including amendments that may be requested in response to recommendations from the AMP. | ITP Condition # 8.15 | Throughout the term of this ITP | Permittee | |
| 82 | Drought Contingency Planning. In addition to the DRY Team coordination as described in Section 3.13 of the Project Description, on October 1, if the prior water year was dry or critical, Permittee, in coordination with Reclamation, shall meet and confer with CDFW, USFWS, NMFS, and the State Water Board, to develop a drought contingency plan to be implemented if dry conditions continue into the following year. On February 1 if dry conditions continue, Permittee shall submit the drought contingency plan to CDFW and shall update the plan monthly based on current and forecasted hydrologic conditions. If dry conditions continue, Permittee shall regularly convene this group to evaluate hydrologic conditions and the potential for continued dry conditions that necessitate implementation of measures identified in the drought contingency plan for the current water year. By February 1 of each year following the development of a drought contingency plan, Permittee shall submit a report to CDFW on the measures employed during the previous year, including an assessment of their effectiveness. | ITP Condition # 8.16 | Throughout the term of this ITP | Permittee | |
| 83 | Early Season Natural Winter-run Chinook Salmon Discrete Daily Loss Threshold. From the effective date of this ITP through December 20, 2024 Permittee shall, in coordination with Reclamation, adhere to the following criteria to minimize take of early migrating CHNWR.<br><br>To minimize entrainment, salvage, and take of early-migrating natural CHNWR, Permittee shall restrict south Delta exports for five consecutive days to achieve a five-day average | ITP Condition # 8.17 | From the effective date of this ITP through December 20, 2024 | Permittee | |

| | Mitigation Measure | Source | Implementation Schedule | Responsible Party | Status/Date/ Initials |
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| | OMR index no more negative than -5,000 cfs when daily loss of older juveniles (natural older juvenile Chinook salmon and yearling CHNSR used as a surrogate for CHNWR) at the SWP and CVP salvage facilities exceeds the following thresholds:<br>• From November 1 – November 30: 6 older juvenile Chinook Salmon<br>• From December 1 – December 31: 26 older juvenile Chinook Salmon<br>All natural older juvenile Chinook salmon juveniles shall be identified based on the Delta Model length-at-date criteria. Loss shall be calculated for the South Delta Export Facilities using the equation provided in CDFW 2018 (Attachment 8).<br>From the effective date of this ITP through December 20, 2024, or finalization of a new ROD, whichever occurs first, Permittee shall not be required to implement Condition of Approval 8.2.1 (Natural-origin Winter-run Chinook Salmon Early Season Weekly Loss Thresholds).<br>This Condition of Approval carries forward Condition of Approval 8.6.2 from the 2020 ITP for Long-term Operation of the SWP in the Sacramento-San Joaquin Delta (ITP No. 2081-2019-066-00) and is applicable only for the time period described in this Condition of Approval. | | | | |

**Compensatory Mitigation:** CDFW has determined that permanent protection and perpetual management of compensatory habitat and additional mitigation actions are necessary and required pursuant to CESA to fully mitigate Project-related impacts of the taking on the Covered Species that will result from implementation of the Covered Activities (Attachments 5, 6, and 7). This determination is based on factors including an assessment of the importance of the habitat in the Project Area, the extent to which the Covered Activities will impact the habitat, changes in the Project's anticipated take, related impacts of the taking, and minimization measures from the 2020 ITP for the Long-term Operation of the SWP in the Sacramento-San Joaquin Delta (ITP No. 2081-2019-066-00), the duration of authorized Covered Activities, and CDFW's estimate of the protected acreage and additional actions required to provide for adequate compensation.

To meet this requirement, Permittee shall either purchase Covered Species credits from a CDFW-approved mitigation or conservation bank to achieve the acreage requirements described in Condition of Approval 9.1, or shall provide for the permanent protection, restoration, and initial and long-term management and monitoring of Habitat Management (HM) lands described in Condition of Approval 9.1. HM land protection, restoration, monitoring, and management shall be conducted pursuant to procedures and timelines set forth in Condition of Approval 9.1 below and the calculation of the management funds pursuant to Condition of Approval 9.4 below.

Permittee shall include in its ASR, pursuant to Condition of Approval 7.2, documentation demonstrating cumulative HM lands permanently protected (and restored where required) for each Covered Species to date.

Permanent protection, restoration, and funding for perpetual monitoring and management of compensatory habitat must be complete before starting Covered Activities, or, if Security is provided pursuant to Condition of Approval 10 below for all uncompleted obligations, after the effective date of this ITP.

Permittee's implementation of the protection, restoration or perpetual management of HM lands may require separate CEQA evaluation. Because no take authorization is provided through this permit for the HM lands activities, Permittee shall obtain CESA authorization as necessary to implement HM land requirements. All individual protection and restoration projects proposed to achieve the compensatory mitigation required in this Condition of Approval shall be subject to CDFW approval in writing.

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| **Compensatory Mitigation for Delta Smelt and Longfin Smelt.** | 9.1 |

| | Mitigation Measure | Source | Implementation Schedule | Responsible Party | Status/Date/ Initials |
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| 84 | Tidal Wetland Habitat Restoration for Delta Smelt. Within 1.5 years of the effective date of this ITP, Permittee shall complete siting, design, and restoration of 8,396.3 acres of DS tidal wetland habitat as compensatory mitigation to expand the diversity, quantity, and quality of DS rearing and refuge habitat in the tidal portions of the Delta and Suisun Marsh. These required acres represent a combined total of tidal wetland restoration acres carried forward from two existing compensatory mitigation requirements:<br>• The requirement to restore and conserve 8,000 acres of DS tidal wetland habitat is carried forward from the compensatory mitigation obligation, originally established in the 2008 USFWS Biological Opinion and associated CDFW Consistency Determination (CD No. 2080-2009-007-00).<br>• The requirement to restore and conserve 396.3 acres of DS tidal wetland habitat is carried forward from the compensatory mitigation obligation for take of DS due to increased diversions at the BSSP, originally established in the 2020 ITP for Long-term Operation of the SWP in the Sacramento-San Joaquin Delta (ITP No. 2081-2019-066-00).<br>Permittee shall coordinate with CDFW and USFWS during the process of site selection and restoration design for HM lands intended to serve as compensatory mitigation for impacts to DS habitat. All DS tidal wetland habitat restoration shall be subject to approval by CDFW. | ITP Condition # 9.1.1 | Within 1.5 years of the effective date of this ITP | Permittee | |
| 85 | Mesohaline and Tidal Habitat Restoration for Longfin Smelt. Within 1.5 years of the effective date of this ITP, Permittee shall complete siting, design, and restoration of 209.46 acres of LFS mesohaline habitat and 396.3 acres of LFS tidal wetland habitat as compensatory mitigation to expand the diversity, quantity, and quality of LFS rearing and refuge habitat in the tidal portions of the Delta and Suisun Marsh. The requirement to restore and conserve 209.46 acres of LFS mesohaline habitat is the remainder carried forward from two compensatory mitigation requirements:<br>• The requirement to acquire, restore, conserve and provide for perpetual management and monitoring of 800 acres of LFS mesohaline habitat take of LFS originally established in the 2009 ITP for California SWP Delta Facilities and Operations (ITP No. 2081-2009-001-03), 590.54 acres of which has been satisfied.<br>• The requirement to restore and conserve 396.3 acres of tidal wetland habitat is carried forward from the compensatory mitigation obligation for take of LFS originally established in the 2020 ITP for Long-term Operation of the SWP in the Sacramento-San Joaquin Delta (ITP No. 2081-2019-066-00).<br>Permittee shall coordinate with CDFW and USFWS during the process of site selection and restoration design for HM lands intended to serve as compensatory mitigation for impacts to LFS habitat. All LFS mesohaline habitat restoration shall be subject to approval | ITP Condition # 9.1.2 | Within 1.5 years of the effective date of this ITP | Permittee | |

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| | by CDFW. | | | | |
| 86 | Delta Smelt Summer-Fall Habitat Action. The Delta Smelt Summer-Fall Habitat Action (Summer-Fall Action) is intended to benefit DS food supply and habitat, thereby contributing to the recruitment, growth, and survival of DS. The FLaSH conceptual model states that DS habitat should include low-salinity conditions of 0 to 6 parts per thousand (ppt), turbidity of approximately 12 NTU, temperatures below 25˚C (77˚F), food availability, and littoral or open water physical habitats. The highest-quality habitat in Suisun Marsh and Grizzly Bay includes areas with complex bathymetry, in deep channels close to shoals and shallows, and in proximity to extensive tidal or freshwater marshlands and other wetlands. The Summer-Fall Habitat Action will provide the aforementioned habitat components in the Suisun Marsh and Grizzly Bay through a range of actions by water year type to improve water quality and food supplies.<br><br>Each year Permittee shall develop a plan in collaboration with Reclamation, and subject to written approval by CDFW, to operate the Project to achieve operational requirements described in the bullet below in this Condition of Approval, and implement additional actions, as available, including monitoring, science, and food enhancement actions to enhance DS habitat (Summer-Fall Action Plan). As an outcome of this annual planning and implementation process, reports documenting Summer-Fall Habitat Action operations and results from monitoring and scientific investigations shall be used as part of the AMP (Attachment 4) to better understand DS habitat during the summer-fall time period and investigate the way in which SWP and CVP operations interact with the full range of components of DS habitat. Permittee shall submit drafts of all reports to CDFW for review, incorporate CDFW input, and send final reports to CDFW for approval prior to completion.<br><br>Following WOMT discussion of the Delta Coordination Group (DCG) proposed gate operations each water year and decision-making, Permittee, in coordination with Reclamation, shall submit a final draft Summer-Fall Habitat Action Plan to CDFW for implementation of this Condition of Approval. The Summer-Fall Action Plan shall describe the planned implementation of the actions required in this Condition of Approval and the expected hydrologic and biological benefits. The Summer-Fall Habitat Action shall be implemented between June 1 and September 30 of each water year and through October 31 of the following water year.<br><br>Permittee shall include in the Summer-Fall Action Plan and adhere to the following minimum requirements:<br><br>• Improve Fall Low-Salinity Habitat (Fall X2): To increase the amount of low-salinity zone habitat for DS in wet and above normal hydrologic year types, Permittee shall, in coordination with Reclamation, maintain a 30-day average X2 ≤ 80 km from September 1 through October 31.<br><br>• Operate Suisun Marsh Salinity Control Gates: To address effects on habitat for | ITP Condition # 9.1.3 | Throughout the term of this ITP | Permittee | |

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| | juvenile DS and increase habitat and food access for DS in summer and fall (June through October) in Suisun Marsh and Grizzly Bay during above normal and below normal years, and dry years following wet or above normal years, Permittee shall operate SMSCG for 60 days, to maximize the number of days that Belden's Landing 3-day average salinity is equal to, or less than, 4 practical salinity units (psu), to maximize the spatial and temporal extent of DS low salinity zone habitat in Suisun Marsh and Grizzly Bay. Operation of the SMSCG shall occur between June 1 and October 31 in years which operation of the SMSCG is required. In dry years following below normal years, Permittee shall operate SMSCG for 30 days to maximize the number of days Belden's Landing 3-day salinity is equal to, or less than 6 psu to maximize the spatial and temporal extent of DS low salinity zone habitat in Suisun Marsh and Grizzly Bay. | | | | |
| 87 | Delta Coordination Group. The DCG is comprised of two representatives each from Permittee, CDFW, Reclamation, USFWS, and NMFS, and one representative each from the SWP water contractors and CVP water contractors. The DCG may approve conditional attendance by technical representatives when appropriate in a non-voting role. The DCG, may prepare an assessment to propose a gate operation if modeling of hydrological and/or existing D-1641 conditions indicate the action can achieve the same habitat benefits in an equal or better manner within the range of effects analyzed. Subsequently, Permittee, in coordination with Reclamation, may propose operations of the SMSCG for WOMT to consider prior to May 15 of each year a SMSCG action will be required. Permittee shall, in coordination with Reclamation and through the DCG, develop an annual monitoring plan that responds to uncertainties in the performance metrics to evaluate action performance based on a schedule determined by the AMSC. Permittee shall, in coordination with Reclamation, also produce a report that summarizes monitoring findings and assess action performance based on a schedule determined by the AMSC. The Summer-Fall Habitat Action shall be included in independent reviews under the AMP (Attachment 4). | ITP Condition # 9.1.3.1 | Throughout the term of this ITP | Permittee | |
| 88 | One-Time Water Commitment for Delta Outflow. Permittee shall deploy a 100 TAF block of water to supplement Delta Outflow in water year 2025 during the summer-fall period, from June through September, to improve DS habitat conditions. The 100 TAF shall be stored in Oroville Reservoir and is subject to spill from Oroville Reservoir if water year 2025 is wet or above normal as determined by the final 50% exceedance forecast on May 10. Beginning on February 15, 2025 Permittee shall coordinate with CDFW to develop a plan for the deployment of the 100 TAF in water year 2025 that is consistent with the biological goals described for the Summer-Fall Action (Condition of Approval 9.1.3). Upon mutual agreement Permittee and CDFW may seek input from the DCG regarding potential planning and deployment of the 100 TAF. Permittee shall submit a draft plan for | ITP Condition # 9.1.3.2 | In water year 2025 | Permittee | |

| | Mitigation Measure | Source | Implementation Schedule | Responsible Party | Status/Date/ Initials |
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| | deployment of the 100 TAF to CDFW by May 15. The final plan shall be subject to CDFW approval. | | | | |
| 89 | Delta Smelt Supplementation Program. A Delta Smelt Supplementation Program (DS Supplementation Program) is intended to work in conjunction with water management strategies, habitat restoration, and food web productivity enhancements, to support the persistence of DS in the wild. Permittee shall, in coordination with Reclamation, support the development, refinement and implementation of a DS Supplementation Strategy which shall establish the framework, objectives, and timelines for the DS Supplementation Program to bolster the current population of DS and increase the likelihood of achieving a self-sustaining status. Permittee shall fund DS Supplementation Program CDFW staff according to Condition of Approval 9.1.4.1.<br><br>Permittee shall, in coordination with Reclamation, work through the Culture and Supplementation of Smelt Steering Committee (CASS SC), to continue to collaborate with CDFW and USFWS on the development of the DS Supplementation Program and the DS Supplementation Strategy. An update to the DS Supplementation Strategy is expected to be approved by CDFW and USFWS in 2025. Permittee shall, in coordination with Reclamation, CDFW, and USFWS, and subject to necessary state and federal permitting, support implementation of the DS Supplementation Program through a collective management structure consistent with the updated DS Supplementation Strategy and the AMP (Attachment 4). DS Supplementation Program governance will consist of the CASS SC and several collaborative technical teams charged with implementation of all aspects of supplementation (e.g., fish culture, transportation and release, monitoring, and synthesis) and will be consistent with governance described in the AMP (Attachment 4).<br><br>The DS Supplementation Strategy will also evaluate and address any need for additional facilities and infrastructure improvements to existing facilities, and evaluate the benefit of new approaches to maintaining the refugial population of DS while also supporting the updated DS Supplementation Strategy and DS Supplementation Program. Permittee shall, in coordination with Reclamation, collaborate with CDFW and USFWS on the development of additional facility needs, their construction and operation, to meet a production capability of 400,000–500,000 DS that are at least 200 days post-hatch, within 10 years of the effective date of this ITP. Such facilities and infrastructure improvements are not Covered Activities of this ITP and could require separate processes for compliance under CESA and CEQA for their construction and eventual operation.<br><br>To support CDFW's role in the DS Supplementation Program, Permittee shall fund a full-time biologist position (Condition of Approval 9.1.4.1). | ITP Condition # 9.1.4 | Throughout the term of this ITP | Permittee | |

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| 90 | Delta Smelt Supplementation Program CDFW Staff. To support implementation of Condition of Approval 9.1.4, Permittee shall fully fund one new CDFW Environmental Program Manager 1 Managerial position to actively engage in scientific research, technical teams, and management teams tasked with implementation of DS Supplementation in collaboration with Permittee, Reclamation, and USFWS, in addition to other agency and non-agency collaborators. This CDFW staff duties will include, but not be limited to, the following:<br>• Conducting scientific research to inform DS Supplementation in coordination with Permittee, Reclamation, USFWS, and interested party scientists;<br>• Providing technical assistance and expertise to plan and implement releases of cultured DS and oversee CDFW staff engaged in releases of cultured DS;<br>• Actively engaging in the design and development of expanded facilities to support DS Supplementation;<br>• Participating in interagency technical teams involved in the implementation of DS Supplementation and Adaptive Management Teams involved in implementation of the long-term operations of the CVP and SWP Biological Opinions and long-term operations of the SWP ITP;<br>• Engaging in the CASS working groups and steering committee (as needed); and<br>• Work collaboratively with Permittee, Reclamation, and USFWS on updating and implementing the DS Supplementation Strategy. | ITP Condition # 9.1.4.1 | Throughout the term of this ITP | Permittee | |
| 91 | Longfin Smelt Refugial Population Establishment and Management. Permittee shall establish a Longfin Smelt Culture Program that will create and maintain a robust, genetically managed captive refugial population for LFS within 10 years of the effective date of this permit. The Longfin Smelt Culture Program shall have two primary goals:<br>(1) Buffer against extinction and;<br>(2) Provide a source of fish for research.<br>The Longfin Smelt Culture Program shall expand upon the efforts initiated within the LFSSP and continue to be guided by the LFS Science Program (Condition of Approval 7.8.1). The governance of the Longfin Smelt Culture Program will implemented by Permittee and CDFW, in coordination with Reclamation and USFWS, while the Longfin Smelt Technical Team, as part of LFS Science Program, will continue to provide technical guidance and expertise to support advancements in LFS captive propagation.<br>Permittee shall fund the Longfin Smelt Culture Program to continue the effort to fully close the LFS life cycle in captivity. Permittee shall also fund the development of a genetic | ITP Condition # 9.1.5 | Within 10 years of the effective date of this permit | Permittee | |

| | Mitigation Measure | Source | Implementation Schedule | Responsible Party | Status/Date/ Initials |
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| | management strategy and plan to implement once the refuge population is established in captivity. Permittee shall then continue to fund and support the genetically managed refugial population, in a manner that will allow for the production of fish for research, as coordinated with the LFSSP, without compromising the genetic integrity of the refuge population.<br><br>Permittee shall ensure that the Longfin Smelt Culture Program has sufficient facilities and facility infrastructure to allow for varying levels of salinity during propagation and to support sufficient brood stock collection. | | | | |
| **Compensatory Mitigation for Winter-run and Spring-run Chinook Salmon.** | | 9.2 | | | |
| 92 | <u>Implementation of the Yolo Bypass Salmonid Habitat Restoration and Fish Passage Project</u>. By 2026, Permittee shall complete the implementation of the Yolo Bypass Salmonid Habitat Restoration and Fish Passage Project. This requirement to implement the Yolo Bypass Salmonid Habitat Restoration and Fish Passage Project is carried forward from the compensatory mitigation obligation for take of CHNWR and CHNSR originally established in the 2009 NMFS Biological Opinion and associated Consistency Determination (CD No. 2080-2009-011-00), and the 2020 ITP for the Long-term Operation of the SWP in the Sacramento-San Joaquin Delta (ITP No. 2081-2019-066-00). The objective of the Yolo Bypass Salmonid Habitat Restoration and Fish Passage Project is to enhance floodplain rearing habitat and fish passage in the Yolo Bypass by implementing the project as described in Alternative 1 of the Yolo Bypass Salmonid Habitat Restoration and Fish Passage Project Final EIR/EIS and subsequent addendums. This project will benefit CHNWR, CHNSR, California Central Valley steelhead, the sDPS of North American Green Sturgeon, and WS.<br><br>The first objective of the project is to increase the availability of floodplain rearing habitat for juvenile CHNWR, CHNSR, and California Central Valley steelhead. The project can also improve conditions for Sacramento Splittail and Central Valley fall-run Chinook Salmon. Specific biological goals include:<br><br>• Improve access to seasonal habitat through volitional entry,<br>• Increase access to and acreage of seasonal floodplain fisheries rearing habitat,<br>• Reduce stranding and presence of migration barriers, and<br>• Increase aquatic primary and secondary biotic production to provide food through an ecosystem approach.<br><br>The second objective of the project is to reduce migratory delays and loss of fish at Fremont Weir and other structures in the Yolo Bypass. Specific biological goals include:<br><br>• Improve connectivity within the Yolo Bypass for passage of salmonids and sturgeon, and | ITP Condition # 9.2.1 | By 2026 | Permittee | |

| | Mitigation Measure | Source | Implementation Schedule | Responsible Party | Status/Date/ Initials |
|---|---|---|---|---|---|
| | • Improve connectivity between the Sacramento River and the Yolo Bypass to provide safe and timely passage for:<br>  • Adult CHNWR between mid-November and mid-March when water surface elevations in the Sacramento River are amenable to fish passage,<br>  • Adult CHNSR between January and mid-March when water surface elevations in the Sacramento River are amenable to fish passage,<br>  • Adult California Central Valley steelhead in the event their presence overlaps with the defined seasonal window for other target species when water surface elevations in the Sacramento River are amenable to fish passage,<br>  • Adult sDPS of North American Green Sturgeon between February and mid-March when water surface elevations in the Sacramento River are amenable to fish passage, and<br>  • Adult WS between February and mid-March when water surface elevations in the Sacramento River are amenable to fish passage.<br><br>The project includes the construction of a new gated notch in Fremont Weir located in the northern Yolo Bypass and channel that parallels the existing east levee of the Yolo Bypass. The gated notch and channel have the ability to convey flows up to 6,000 cfs, depending on the Sacramento River, to provide open channel flow for adult fish passage, juvenile fish emigration, and floodplain inundation. This alternative also includes a supplemental fish passage facility on the west side of Fremont Weir and improvements to allow fish to pass through Agricultural Road Crossing 1 and the channel north of Agricultural Road Crossing 1.<br><br>Permittee shall implement the Yolo Bypass Salmonid Habitat Restoration and Fish Passage Project in accordance with its adaptive management and monitoring plan, and any subsequent revisions. | | | | |
| 93 | Feather River Fish Passage and Hatchery Improvements. By July 2025, Permittee shall fund $1 million toward the Sunset Weir and Pumps Project on the Feather River. The objective of the Sunset Pumps Project is to improve fish passage by removing the existing boulder weir, a known migratory barrier to CHNSR, fall-run Chinook Salmon, California Central Valley steelhead, WS, and the sDPS of North American Green Sturgeon, and installing CDFW approved fish-protective screens for the Sunset division and upstream neighboring private diversions to reduce entrainment risk into currently unscreened diversions.<br><br>By 2026, Permittee shall commit an additional $14 million toward the Sunset Weir and Pumps Project and $4.9 million toward a disinfection system at the Feather River Fish Hatchery. The disinfection system is intended to reduce or remove pathogen contamination for hatchery reared CHNSR, fall-run Chinook Salmon, and California Central Valley steelhead. This requirement to fund $19.9 million in CHNWR and CHNSR compensatory mitigation is carried forward from the compensatory mitigation obligation originally | ITP Condition # 9.2.2 | By July 2025 for an initial $1 million commitment<br><br>By 2026 for $18.9 million commitment | Permittee | |

| | Mitigation Measure | Source | Implementation Schedule | Responsible Party | Status/Date/ Initials |
|---|---|---|---|---|---|
| | established in the 2020 ITP for the Long-term Operation of the SWP in the Sacramento-San Joaquin Delta (ITP No. 2081-2019-066-00). | | | | |
| 94 | Spring-run and Winter-run Chinook Salmon Climate Change Support. In addition to the mitigation originally established in the 2020 ITP for the Long-term Operation of the SWP in the Sacramento-San Joaquin Delta (ITP No. 2081-2019-066-00) Permittee shall provide $900,000 each year to support projects that address stressors on CHNWR and CHNSR associated with climate change, including drought. Projects that may be considered as a part of this annual process include, but are not limited to:<br>• Broodstock collection, and holding of CHNWR or CHNSR to preserve genetic diversity of the population;<br>• Further improvements to the Feather River Fish Hatchery;<br>• Habitat restoration, or improvements to existing habitat; and<br>• Improve fish passage.<br>To implement this Condition of Approval, Permittee and CDFW will meet annually no later than December 1 each water year beginning in 2025 to discuss projects that could receive funding and prepare a list of high priority projects for consideration. Permittee shall submit the list of agreed-upon projects for review by CDFW no later than January 30. Permittee shall provide funds and support implementation of the project approved for implementation by CDFW in that water year. In any given water year CDFW may decide to carry funds over to the subsequent water year(s) to enable larger investments later, or detract from future years funding to support larger projects in the near term to better focus the funding on climate change stressors of highest priority. Unless otherwise approved in writing by CDFW, projects involving the acquisition restoration, and perpetual management of compensatory mitigation lands shall be subject to the requirements of Condition of Approval 9.5 of this ITP. | ITP Condition # 9.2.3 | Throughout the term of this ITP | Permittee | |
| 95 | Compensatory Mitigation for White Sturgeon. Permittee shall, in collaboration with CDFW, continue to convene and fund $150,000 to support the evaluation of potential habitat restoration project(s) within the Sacramento and San Joaquin rivers for WS. The evaluation shall include but not be limited to the scoping of potential restoration projects within the Sacramento and San Joaquin rivers. Permittee shall submit a draft report documenting the results of the scoping process, including associated restoration project recommendations to CDFW by April 12, 2025. Permittee shall work with CDFW to incorporate comments on the draft document and shall submit a final report to CDFW within one year of April 12, 2025 for written approval by CDFW.<br>Permittee shall subsequently develop a plan for additional habitat restoration to offset impacts of Project operations on WS, in collaboration with CDFW. This plan shall rely on the evaluation of habitat restoration projects required by this Condition of Approval, be informed by the WS Life Cycle Model developed as a part of the WS Science Program | ITP Condition # 9.3 | Submit a draft report to CDFW by April 12, 2025<br>Submit a final report to CDFW within one year of April 12, 2025<br>Submit a draft restoration plan to CDFW by April 12, 2030 | Permittee | |

| | Mitigation Measure | Source | Implementation Schedule | Responsible Party | Status/Date/ Initials |
|---|---|---|---|---|---|
| | (Condition of Approval 7.10.1), and include a budget and timeline for restoration implementation. Permittee shall submit a draft plan to CDFW for review by April 12, 2030. Permittee shall work with CDFW to incorporate comments on the draft plan and shall submit a final plan to CDFW by October 12, 2030 for written approval by CDFW. Following CDFW approval, Permittee shall provide $1,900,000 to implement the final plan. Unless otherwise approved in writing by CDFW, projects involving the acquisition, restoration, and perpetual management of compensatory mitigation lands shall be subject to the requirements of Condition of Approval 9.5 of this ITP.<br><br>As a part of the process to develop and finalize a plan for additional habitat restoration to offset impacts of Project operations on WS Permittee and CDFW shall collaboratively use the WS Life Cycle Model to re-evaluate Project impacts on WS as compared to the analyses used to support this ITP. Permittee, in collaboration with CDFW, may propose adjustments to this funding obligation for WS mitigation based on this updated evaluation of the magnitude and scope of impacts of Project operations on the species, which adjustments may decrease or increase the obligation, with CDFW approval and determination that funding will provide sufficient restoration to continue to meet the full mitigation standard under CESA for this WS. The restoration plan required by this Condition of Approval, shall ensure full mitigation for Project impacts during the time period when the species is a Covered Species under this ITP, which shall include the period in which it is a candidate species.<br><br>CDFW acknowledges that planning, environmental review, and permitting may be necessary for restoration project implementation and funding under this Condition of Approval may be used for these project development activities. In some cases, implementation may be in the form of funding a restoration project in whole or in part to supplement restoration projects being implemented by others, when appropriate and approved by CDFW and when CDFW determines that funding under this Condition of Approval will ensure additive benefits to WS that would not occur in the absence of Permittee's contribution. However, under no circumstances shall any funds under this Condition of Approval be used to fund any other regulatory permitting requirement other than those established in this ITP. Final allocation of this funding shall be subject to CDFW approval. | | Submit a final restoration plan to CDFW by October 12, 2030 | | |

**Long Term Operations of the State Water Project and the Central Valley Project – Adaptive Management Program**

1. Introduction

Adaptive management is a science and decision analytic-based approach to evaluate and improve management actions, with the aim to reduce uncertainty over time and increase the likelihood of achieving and maintaining a desired management objective. Decision analysis tools can be used to determine which uncertainties are important for management decisions, and which scientific approaches should be deployed to address those uncertainties considered necessary to inform subsequent decisions. When correctly designed and executed, adaptive management provides a means to evaluate management actions or programs (collectively "actions") and allows for evidence-based adjustments to the actions defined, to improve their effectiveness in achieving management objectives, if warranted. The adaptive management approach can provide a scientific basis for continuing or modifying an action or allow for an alternative action to be evaluated and implemented, if determined.

The Department of Water Resources (DWR), the Department of Fish and Wildlife (CDFW), Bureau of Reclamation (Reclamation), U.S. Fish and Wildlife Service (USFWS), and National Marine Fisheries Service (NMFS) (collectively, "the Implementing Entities") intend to utilize adaptive management to inform the long-term operations of the State Water Project (SWP) and the Central Valley Project (CVP) and related activities described as a part of this Adaptive Management Program (Program).

The Implementing Entities anticipate that it may be necessary to undertake additional monitoring and research that builds on existing efforts in order to carry out this Program. The Implementing Entities will establish an Adaptive Management Steering Committee (AMSC) that will serve as the primary decision group for implementation of this Program. Members of the AMSC will include one designated sub-Director representative[1] and one designated alternate each from DWR, CDFW, Reclamation, USFWS, and NMFS. The AMSC's role in implementing this Program is described in Section 4a.

The Implementing Entities intend to use the AMSC to provide direction and guidance for work under this AMP through Adaptive Management Technical Teams (AMTs), coordinate each agencies participation, and assign existing work groups to the extent possible (for example the Delta Coordination Group (DCG)) to serve as AMTs, only creating new work groups if needed. Appendix A describes the role of adaptive management, as envisioned by this Program, to inform the long-term operations of the SWP and CVP. The AMSC will utilize AMTs and outside experts (as needed) to develop adaptive management plans or work plans to implement Adaptive Management Actions (AMAs) identified in this Program (Appendix B) and track required monitoring, data collection, research, and publications that inform future decisions (see Section 4b).

The Program will utilize a suite of decision support tools tailored to each action with consideration of each AMA's management objective, timeline, stage of development (i.e., initiating a new AMAs or continuing an existing longer-term effort), the anticipated application and or incorporation of information gained. The AMSC and its AMTs agree to use the fundamental components of Structured Decision Making (SDM) for AMAs identified in the Program including independent, floating facilitators to assist with problem framing, objective development, and information synthesis. Floating facilitators are intended to serve as independent, neutral facilitators of the entire AMP. Their role is to facilitate each

[1] "Designated Sub-Director Representative" means the official representative designated by the director of an Implementing Entity to act on her or his behalf.

individual AMT, ensuring the AMTs follow guidance and sideboards provided by the AMSC, fostering cross communication among AMTs when helpful, and working closely with assigned leads of each AMT. In addition to working directly with AMTs they will also facilitate the AMSC, foster communication between AMTs and the AMSC as needed to inform discussions and decision making, and assist in communicating guidance and sideboards from the AMSC to individual AMTs. Given the scope of the AMP, it is likely that a team of independent facilitators will be needed to serve these roles.

Appendix B provides an initial list of AMAs and expectations for monitoring and science activities to be implemented by the AMTs. Roles and responsibilities of the AMSC and AMTs are described in Sections 4a and 4b of this document. Independent science reviews may be used to evaluate progress towards reducing uncertainty and utilizing the best available science for informing CVP and SWP management (see Section 7c). Appendix B also sorts AMAs into Bins (1-3) based on the timeframe of their evaluation and the level of SDM tools anticipated to be needed for evaluation and decision making. AMAs to be included in Bin 1 will be managed adaptively based on present conditions, such as hydrology or annual species status, and will require quick decision-making relative to full SDM. Consultation and ITP amendment inquiries will be conducted, but reinitiation of consultation or an ITP amendment is not expected to be required to refine the approach to implementation after each evaluation. Bin 2 will apply to those AMAs that are iterated or linked over time whereby actions taken early on may result in learning that improves management within the next 3-8 years. The evaluation may trigger re-initiation of consultation or an ITP amendment for the actions, or not, depending on scope and scale of recommended change. Bin 3 will include AMAs for which agencies evaluate data over longer periods of implementation, on the order of 10-15 years. These AMAs require a full SDM process whereby qualified and independent facilitators will guide a structured decision-making process. It is anticipated that Bin 3 AMAs will require substantial time to plan, evaluate, and implement to facilitate learning opportunities for future action management.

The use of decision support tools will help the AMSC make transparent, evidence-based decisions by comparing the expected outcomes of alternative actions with regard to meeting management objectives, identifying key sources of uncertainty affecting the ability to predict action outcomes, and highlighting tradeoffs between competing management objectives. There are additional studies that may be at different stages of development and do not provide for the shared consideration of alternatives but warrant the sharing of information and the use of components of SDM.

Working through the collaborative process outlined in this Program, the Implementing Entities commit to reach consensus within the AMSC to the maximum extent possible, while still retaining individual agency discretion to make decisions (as appropriate). Should the AMSC not come to consensus, the Implementing Entities would follow the governance process identified in the associated Biological Opinion and ITP. The Implementing Entities seek to use the potential flexibility provided by an adaptive management approach to ensure the specific management objectives identified for each action are met, maintained, and/or improved upon. The full implementation of an independently facilitated AMP is an approach that the Implementing Entities believe best balances positive outcomes for species listed under the federal Endangered Species Act (ESA) and the California Endangered Species Act (CESA) with operation of the CVP and SWP.

Nothing in this Program is intended to modify each Implementing Entity's roles, authorities, or obligations under statute or regulation. Each Implementing Entity retains discretion to make decisions as appropriate within its authority after considering the available information and considering the input of the other Implementing Entities through the AMSC.

2. Purpose and Intent

Scientific uncertainty will always exist regarding Central Valley rivers and Bay-Delta ecosystems, including the needs of the listed species, the effects of coordinated CVP and SWP operations on those species and their habitats, and the efficacy of actions intended to minimize or mitigate those effects. Further, even when scientific certainty is relatively high, the real-world need for trade-offs will increase the complexity of implementing decisions. This Program is being implemented to help reduce important scientific uncertainty where it exists, and to enhance application of decision tools to support decision making related to the long-term operations of the CVP and SWP.

Adaptive management is a structured, iterative process for decision making when confronted with uncertainty. It emphasizes learning through management where knowledge is incomplete and provides a process for building knowledge through monitoring and science, reducing uncertainty, and improving management over time in a goal-oriented and structured way. Key components of adaptive management are establishing clear and measurable objectives, identifying action goals, and determining management options for best achieving those desired goals.

The broad purposes of this Program are: 1) to promote collaborative, participatory, accountable, relevant, innovative, and transparent science and documentation of the decision process, 2) guide (by identifying, prioritizing, and funding) the development and implementation of scientific investigations and monitoring for CVP and SWP management actions necessary to evaluate if management objectives are being achieved, 3) incorporate new information into decision support tools to gain insights to management decisions, actions, and constraints, and 4) maximize the effectiveness of an action toward achieving the management objectives for the operation of the CVP and SWP while considering potential tradeoffs.

This Program creates a structure whereby participants in science workgroups (i.e., AMTs) working with floating, independent facilitators to implement scientific investigations and monitoring that will best reduce important uncertainties specific to each AMA (Appendix B). The science-based decision products of the AMTs are rolled up by the floating, independent facilitators and presented to the steering committee (i.e., AMSC) for consideration by each agency. The members of the AMSC can then make informed resource management decisions such as whether to propose changes to an existing AMA determine whether particular lines of inquiry are no longer able to generate further insight, and other kinds of decisions that can be expected to typify an adaptive response to a set of recurring actions. Decisions regarding potential changes to regulatory approaches will be handled separately, as described in Section 5 of this document.

The intents of this Program are to:

a. Describe the steps required to implement the adaptive management process (see Appendix A) and explain how the process links to the operations of the CVP and SWP.

b. Describe how adaptive management for ongoing engagement on the operations of the CVP and SWP will be utilized for specific actions (see Appendix B).

c. Inform future consultation and permitting processes for the CVP and SWP through the science produced by the Program, which can be thought of as adaptive management of more involved decisions occurring over longer time scales.

d. If necessary and agreed upon by the Implementing Entities, develop and implement new AMAs.

e. Describe the decision-making and governance structure that will be used to implement the adaptive management process including how adaptive changes will be made to the AMAs with consideration of how these changes will be coordinated and reflected in corresponding state and federal authorizations.

f. Describe the structure for communication among the Implementing Entities and the broader stakeholder community regarding implementation of this Program.

g. Describe the role of the AMSC in tracking, on an annual basis, funding for this Program.

3. Scope of Adaptive Management Program

a. Actions

The CVP and SWP have been operated for decades. Scientific research and monitoring of the projects' ecological impacts has been extensive, and these impacts are thoroughly discussed and described. Operational approaches have varied over time, in part guided by the accumulation of ecological data and improved understanding of the projects' impacts on species and their habitats. However, constraints on successfully reducing impacts to listed species caused by operations of the projects under varying climatic conditions are also understood and documented, yet difficult to achieve while maintaining project objectives. The initial adaptive decision space proposed in this Program involves the application of decision analysis and scientific inquiry into topic areas where the Implementing Entities believe that further understanding might improve one or more aspects of CVP and SWP operations. Decision support tools will be used to facilitate evaluation of effects of components of the AMAs identified (Appendix B) and inform Implementing Entities about whether and how best to adapt those AMAs, if needed. The AMAs to be evaluated include, but are not limited to, the following:

- Winter-run Chinook Salmon OMR Management
- Spring-run Chinook Salmon OMR Management
- Larval and Juvenile Delta Smelt OMR Management
- Larval and Juvenile Longfin Smelt OMR Management
- Summer-Fall Habitat Action for Delta Smelt
- Tidal Habitat Restoration Effectiveness for Smelt Fishes
- Tributary Habitat Restoration Effectiveness for Salmonid Fishes
- Shasta Spring Pulse Flow Studies
- Winter-run Chinook Salmon Through Delta Survival and Salvage Thresholds
- Longfin Smelt Science Plan Actions
- Delta Smelt Supplementation
- Steelhead JPE
- Alternative Salmonid Loss Estimation Pilot Study

- Shasta Cold Water Pool Management
- Georgiana Slough Migratory Barrier Effectiveness for Salmonid Fishes
- Spring Outflow
- Clear Creek

b. Compliance and Effectiveness Monitoring

Compliance and effectiveness monitoring programs will include the elements as described in Appendix B, unless the AMSC, through its adaptive management process, recommends a modification, DWR and Reclamation request modifications, and the regulatory agencies accept those modifications. Such modifications may be subject to independent review (see Section 7). Changes to the compliance and effectiveness monitoring (see Section 3.10 of the ITP) may require ESA consultation and may require amendments to the relevant CESA authorization before being implemented (see Section 5).

4. Program Structure, Roles, and Responsibilities

a. Adaptive Management Steering Committee (AMSC)

The Implementing Entities will establish the AMSC to implement the Program. The Implementing Entities through the AMSC are responsible for support, coordination, and implementation of the Program. The Program will address important uncertainties and trade-offs (policy and ecological) associated with adaptively managing actions identified in Appendix B. AMSC decisions will be informed by AMTs dedicated to each individual AMA identified in Appendix B. The agencies comprising the AMSC will hire a team of floating independent facilitators to help each AMT identify management objectives and goals, identify and synthesize information areas related to those objectives, determine critical uncertainties affecting management decisions, define additional information needs to reduce critical uncertainties, and integrate products of the various AMTs in a way that clarifies what decisions need to be made, what trade-offs may need to be considered, and how confidently the outcomes of those decisions can be predicted.

i. Purpose and Function

The purpose of the AMSC is to provide guidance and direction for the Program and ensure effective and efficient implementation of all AMAs. Specifically, the AMSC will:

- Provide recommendations to Agency Directors based on recent science, including the need to re-initiate consultation and request an ITP amendment.
- Elevate issues for resolution to Agency Directors, as needed, including disputes and results of adaptive management processes conducted through AMTs and the AMSC.
- Serve as primary management level review of AMA implementation. All considerations involving a regulatory change under CESA or ESA do not fall under the perview of the AMSC, see Section 5.
- Provide direction and guidance for action-specific AMTs including articulation of management objectives, dispute resolution, and coordinating participation by each agency.

- Request annual presentations from each AMT to track the status of AMA implementation and look ahead to next steps.
- Review AMT suggestions for identified areas of uncertainty, needed data improvements, proposals for enhanced monitoring or focused research, as appropriate, to assure they are effectively supporting the information needs of the members of the AMSC.
- Request proposals from AMTs to conduct new data collection or conduct focused research to reduce uncertainty or fill data gaps relevant to components of identified AMAs.
- Discuss recommendations from AMTs based on the decision-making process.
- Form and direct AMTs as necessary. Existing teams and workgroups will be used to the maximum extent practicable.
- Assure that all AMSC and AMT activities are conducted in a transparent manner. To allow time for coordination with interested parties meeting schedules will allow for at least 30-day review and consideration of relevant documentation prior to any decision making regarding potential changes to an action in the ITP or PA by the AMSC.
- Post meeting notes, AMT presentations, documentation of decisions, and rationale to support decisions on a publicly available website.
- Identify the need for independent review of specific adaptive management plans and results.
- Set the course for scope and facilitation of reviews, identify the appropriate group to conduct independent reviews, and develop any draft charges for independent review.
- Conduct outreach to the broader stakeholder community regarding implementation of the Program.
- Review annual AMP budget annually to assess potential gaps in funding relevant to overall implementation.

ii. Membership

The AMSC will include one designated sub-Director level representative and one designated alternate each from each of the Implementing Entities. Upon unanimous approval, the members of the AMSC may invite additional staff from any of the Implementing Entities or consultants engaged by one or more of the Implementing Entities to provide technical assistance or other support for specific topics. AMSC meetings will be organized and facilitated by a floating, independent facilitator (or team of facilitators) agreed upon by all Implementing Entities to ensure continuity across meetings and efficient use of time.

b. Adaptive Management Technical Teams (AMTs)

AMTs will be dedicated to each AMA identified in Appendix B. AMTs are charged with identifying uncertainty, building knowledge, and implementing each AMA.

i. Purpose and Function

The purpose of individual AMTs is to convene scientific technical staff from each of the Implementing Entities and interested parties in working groups to plan, implement, and assess each of the actions identified in Appendix B. AMTs formed by the AMSC will have at least one designated team leader from an Implementing Entity and will report to the members of the AMSC on progress in addressing uncertainty associated with each AMA identified in Appendix B (see Appendix A for additional details regarding required reporting). The AMTs will design and implement monitoring and science plans to gather data necessary to build knowledge and decrease uncertainties and conduct the analysis and synthesis of the information gained. The AMTs will evaluate whether actions identified in Appendix B are achieving their intended management goal, and identify potential adaptive management changes based on the science if objectives and or those goals are not being achieved, to be considered by the members of the AMSC for implementation in the future. Generally, each AMT will:

- Utilize decision support tools to define relevant uncertainty, develop action alternatives, estimate expected consequences of the alternatives, and evaluate trade-offs and preferences when making choices between alternative courses of action. Depending on the scope and timeline of each AMA, and the level of SDM tools used by the AMA, these could include:
  - Development of performance metrics for each AMSC-defined management objective to allow evaluation of ongoing and proposed actions relative ability to achieve those objectives.
  - Development of potential alternative actions and synthesis of existing information to evaluate expected action performance.
  - Identification of uncertainties in expected action performance that are most influential in decision tradeoffs.
  - Development of monitoring and science plans to reduce uncertainty around management action outcomes.
  - For AMAs in Bin 1, develop experimental actions supported by monitoring and science, and review outcomes of experimental actions and revise experimental actions as appropriate.
- As requested by the AMSC, prepare necessary documentation for independent reviews, and participate in post-review dialogue.
- Provide data to support the members of the AMSC to track Adaptive Management Program implementation.
- Track other monitoring and research relevant to the subject of the AMA.
- Assure transparency in the implementation and investigation of the AMA.
- Prepare annual presentations of AMA implementation status to the AMSC and subsequently post presentations on a publicly available website.

The scope and responsibilities of each AMT, and timelines for deliverables, are described in more detail for each AMA in Appendix B. The descriptions in Appendix B may be refined using decision support tools by each AMT and documented in a work plan describing the monitoring and or science that the AMTs plan to conduct, which will be submitted to the AMSC for review and approval.

ii. Membership

Membership in individual AMTs will be open to technical staff from each of the Implementing Entities. AMTs will also be open to tribes, consultants, stakeholders, other local, State or federal agencies, or academic researchers, as described in the individual team charter.

c. Decision-making

The Implementing Entities commit to working collaboratively through the AMSC and AMTs to reach consensus on adaptive management changes (including decisions not to make changes) to the maximum extent feasible, and to elevate any disputes over decisions to the Directors for each Implementing Entity. In the event that resolution of the dispute cannot be reached by the AMSC, review of the issue in dispute may occur through the presentation of alternative viewpoints as part of an annual review, or a separate independent science review. Decision support tools, including structured decision making, as described in Appendices A and B, will be used to provide a rational and organized framework for evaluating management objectives relative to each action's goal, as well as any alternative decisions.

Nothing in this Program is intended to modify each Implementing Entity's roles, authorities, or obligations under statute or regulation. Each Implementing Entity retains discretion to make decisions as appropriate within its authority after considering the available information and considering the input of the other Implementing Entities through the AMSC.

5. Link between AMP and Regulatory Processes

a. Federal Endangered Species Act

The Code of Federal Regulations at 50 CFR § 402.16 describe the process for reinitiating ESA section 7 consultation. Specifically, reinitiation is required and shall be requested by the Federal action agency (in this case, Reclamation) or by the USFWS or NMFS (depending on which species are involved) if any one or more of several criteria are met. Although, there is no regulatory mechanism to modify ESA section 7 biological opinions absent reinitiating the section 7 consultation, there are options to improve understanding or modify an action without reinitiating the section 7 consultation so long as doing so does not meet a reinitiation trigger. Specifically, new information or a change in the proposed action would require reinitiation of consultation if:

1. new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered; or

2. the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion or written concurrence.

Therefore, the additional objectives of this Program, as it pertains to ESA section 7 consultation, are to:

1. identify the areas of potential action uncertainty and the range of effects to species that may occur as the AMP is implemented such that the potential range of effects of the action may be considered during consultation; reinitiation will be required if that range of anticipated effects is exceeded; and

2. provide the mechanism for regular inquiries and evaluation to determine if reinitiation is required as the AMP is implemented.

In the event that a change is required to the Incidental Take Statement (ITS), and the change is fully consistent with the analysis in the biological opinion, the Services can revise the ITS without reinitiating the consultation. Examples include where new information allows for a more specific take surrogate, reduction in the amount or extent of take (which would include surrogates), or for clarification of the terms and conditions. Under these scenarios, the Services would issue a new ITS to the Federal action agency.

b. California Endangered Species Act

Title 14 of the California Code of Regulations (CCR), section 783.6, subdivision (c) describes general criteria and information pertaining to minor and major amendments to ITPs. If permittee (in this case, DWR) submits a request for changes to an ITP that do not significantly modify the scope or nature of the project or any of the minimization, mitigation, or monitoring conditions of the ITP, as determined by the CDFW, a minor amendment may be processed. However, if a permittee is seeking changes that will significantly modify the scope or nature of the project, or if those changes trigger additional review under the California Environmental Quality Act, as determined by CDFW, the amendment would be processed as a major amendment. CDFW reviews major amendment requests according to processes set out for initial permit applications, including submittal of an application and supporting information, although the amendment application may rely on and supplement the information from the initial application. Approval of both minor and major amendments to ITPs are subject to CDFW finding that the ITP issuance criteria in CCR title 14, section 783.4 continue to be met.

6. Funding

Funding is anticipated from a variety of sources including CDFW, DWR FWS, NMFS, and Reclamation. Federal funding is subject to appropriations. CDFW cannot fund DWR permit obligations but may allocate staff time to provide technical assistance and engage in implementation of this program.

It is expected that the Adaptive Management Plan will require substantial resources to support the required evaluations and independent review. The specific level of support remains to be determined and will likely vary depending on the Adaptive Management Actions conducted each year.

7. Relationship of the Adaptive Management Program to Other Processes

a. Real-time Operations

The adaptive management and decision-making processes described here do not directly apply to real-time operations; where individual real-time operation decisions must be made on a daily, weekly, or monthly time scale. However, real-time operational criteria may be changed over time through the adaptive management process based on new information. Such a change may require an ESA reinitiation of consultation inquiry and an ITP amendment (See Section 5, Link between AMP and Regulatory Processes).

b. Voluntary Agreements

The Voluntary Agreements are a package of flow and non-flow measures proposed by a diverse range of interests for adoption by the SWRCB as an approach to implement the Bay-Delta Water Quality Control Plan (Bay-Delta Plan). The Voluntary Agreements would state commitments of water, funding, and other measures to implement Bay-Delta Plan water quality objectives related to protection of native fishes, including the Covered Species. The Voluntary Agreements offer a watershed-wide approach that includes new flows, habitat restoration in the Delta and Suisun Marsh as well as tributary systems, and a governance and science program that would use a structured decision-making approach to guide adaptive management. Voluntary Agreements include commitments to fund and undertake new science (monitoring and research) to address hypotheses related to the efficacy of flow and habitat restoration actions, including increases in Delta outflow in March – June to benefit Covered Species. As information is gained through the VA Science Program pertaining to actions contained in the AMP, it may be used to inform AMT discussions and recommendations and may be considered in decision-making processes of the AMSC.

The Voluntary Agreements are subject to ongoing discussion and have neither been finalized nor adopted by the State Water Resources Control Board.

c. Independent Peer Review

Independent peer review can play an important role in guiding the evaluation and response stages of the adaptive management cycle by providing unbiased, transparent reviews of the science and advice for the processes used to guide management decisions. The AMSC will oversee the use of independent peer review processes on an as-needed basis for individual adaptive management actions. The need for independent peer review may rise from a lack of consensus on the relevant science and its application to the management action, from a need for additional expertise on a specific subject matter, or when specific management actions have reached a milestone in terms of the volume of available information. In the latter situation, independent review is advisable for informing key management decisions.

Independent review may consist of letter reviews without associated formal meetings, or panel reviews in which reviewers have a public opportunity receive information from the members of the AMSC or relevant AMT in a meeting. The members of the AMSC may initiate an independent review for any adaptive management action if there is a consensus on the need for the review. The members of the AMSC can request the services of an impartial organization to facilitate the peer review process (e.g., the Delta Science Program, National Academy of Sciences, or similar organizations). In the interest of transparency, materials and recommendations from panel or letter reviews will be available publicly on agency websites. The AMSC members will encourage and support the development of peer-reviewed publications in scientific journals. Article publications, along with reports and datasets, may inform the evaluation of the adaptive management actions.

**Attachments**

**Appendix A:** Adaptive Management Program Framework and Implementation

**Appendix B:** Adaptive Management Actions and Programs

**Appendix A: Adaptive Management Program Framework and Implementation**

## 1 Overview

In the broadest sense, the set of decisions that collectively answer the question what is the 'best' way to operate the Central Valley Project (CVP) and State Water Project (SWP) (hereafter, Projects) is a complex series of recurring decisions based on an ever-changing knowledge base and set of socio-ecological circumstances. The decisions about how best to operate the Projects have increased in complexity over time due to a growing number of constraints on the decision space (Figure A.1). The accumulation of constraints is one 'certainty' in 'wicked problems', which are problems that morph over time and change in response to intervention (Rittel and Webber 1973; Luoma et al. 2015).

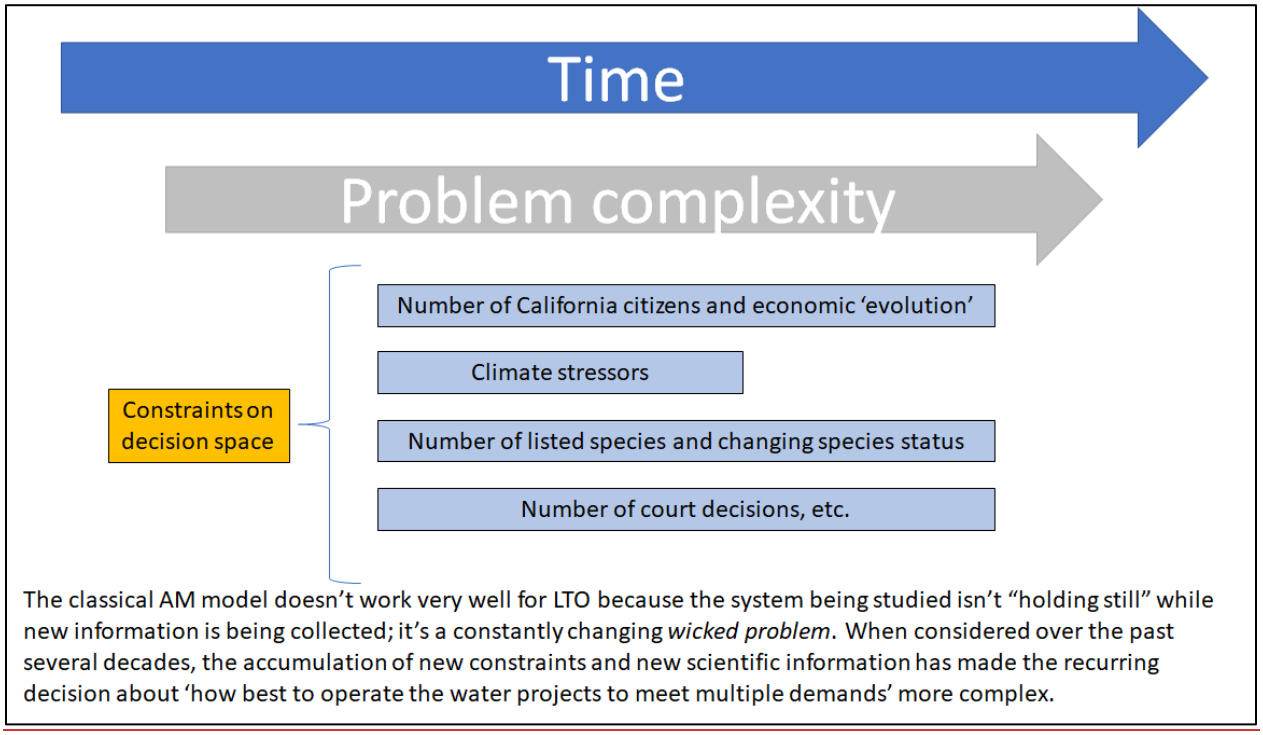


**Figure A.1. Conceptual diagram of the increasing complexity of water operations consultations over time as constraints on decision space have increased.**

The classical adaptive management (AM) model posed by Walters and Hilborn (1978) suggests that applying the scientific method to complex natural resource management problems is an objective way to navigate complex problems, and as such, AM has frequently been suggested as a best management practice for Project operations. However, AM as originally described does not work well in the management of systems experiencing constant change, i.e., systems that are of themselves wicked problems (DeFries and Nagendra 2017). Rather, wicked problems require a more nuanced version of 'adaptive management' that is better integrated in decision theory or structured decision-making (SDM; Figure B.2).

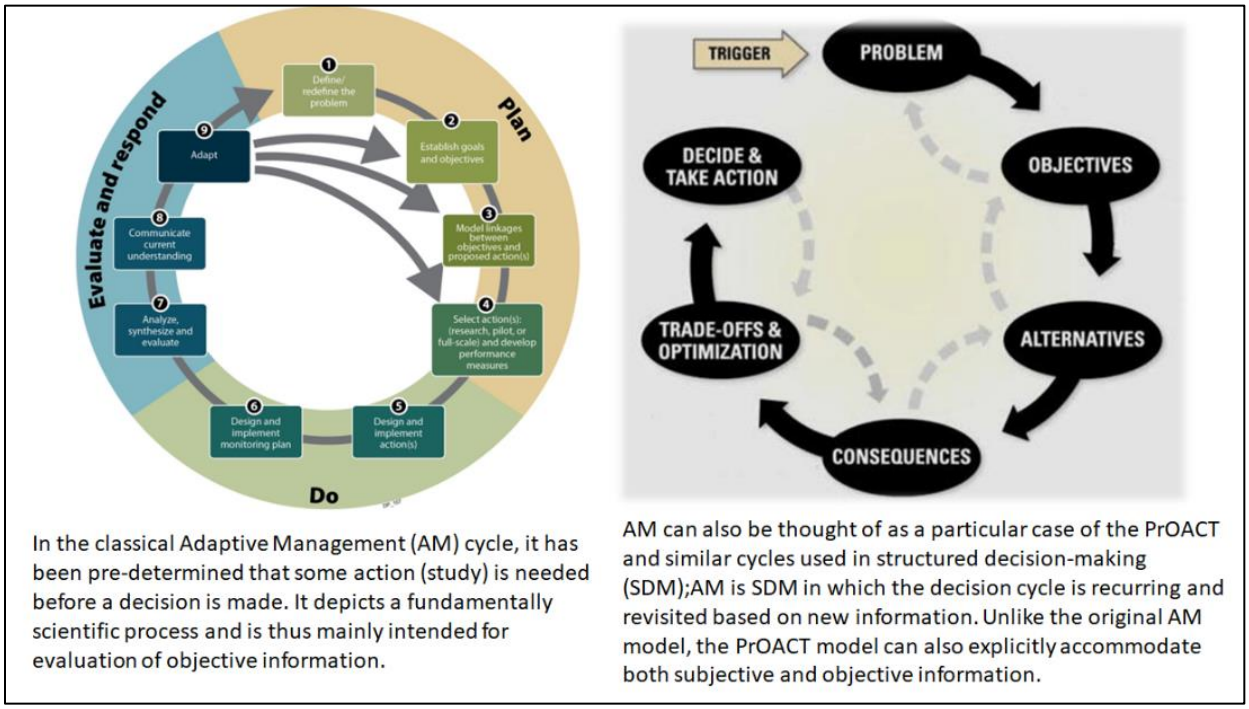


**Figure A.2. Comparison of adaptive management as described by DSP (2013; derived from Walters and Hilborn (1978) and the PrOACT cycle, a variant of the general approach to structured decision-making.**

The reason that SDM is needed for wicked problems is that they often do not "hold still" long enough to robustly apply scientific methods. Further, wicked problems involve subjective values dimensions that cannot be ignored. The "values" can be things like different agency perspectives on the relative importance of the objectives, or socio-political constraints on decision space (Figure A.1). SDM is a set of tools that has been developed to transparently combine objective and subjective information to make the best decision that can be made with the information available at the time. The repeated use of SDM applied to a wicked problem does not stop the problem from changing over time, but it can allow necessary adaptation as the problem develops new dimensions.

Endangered species consultations on the operation of the Projects involve navigation of an evolving social-ecological system with multiple, often competing objectives. Consultations under both ESA and CESA have been a facet of Project operations since the 1990s and are one of the drivers increasing decision complexity (Figure A.1). A conceptual model of CVP and SWP ESA/CESA consultations as a recurring decision is shown in Figure A.3. The conceptual model is superimposed on the PrOACT cycle, which is a predominant SDM framework. This is not done to imply that historical consultations have proceeded using decision analysis techniques, but rather to show how the process still has to move through the steps of a decision-analytic cycle. Here we use the word 'cycle' to describe each time a major new consultation has occurred. Several things have acted as drivers of a new consultation cycle; these are shown in yellow. In the broadest sense, the problem and the objectives do not change from cycle to cycle, but they do imply a decision involving multiple competing objectives. The Biological Assessment prepared by the US Bureau of Reclamation (Reclamation) and the incidental take permit (ITP) application prepared by the Department of Water Resources (DWR) constitute a negotiated alternative (collectively, proposed action); these documents and the resulting biological opinions issued

by the US Fish and Wildlife Service and National Marine Fisheries Service (BiOps) and ITP issued by CDFW (LTO ITP) provide the analysis of the alternative; the decision is the new BiOps and LTO ITP.

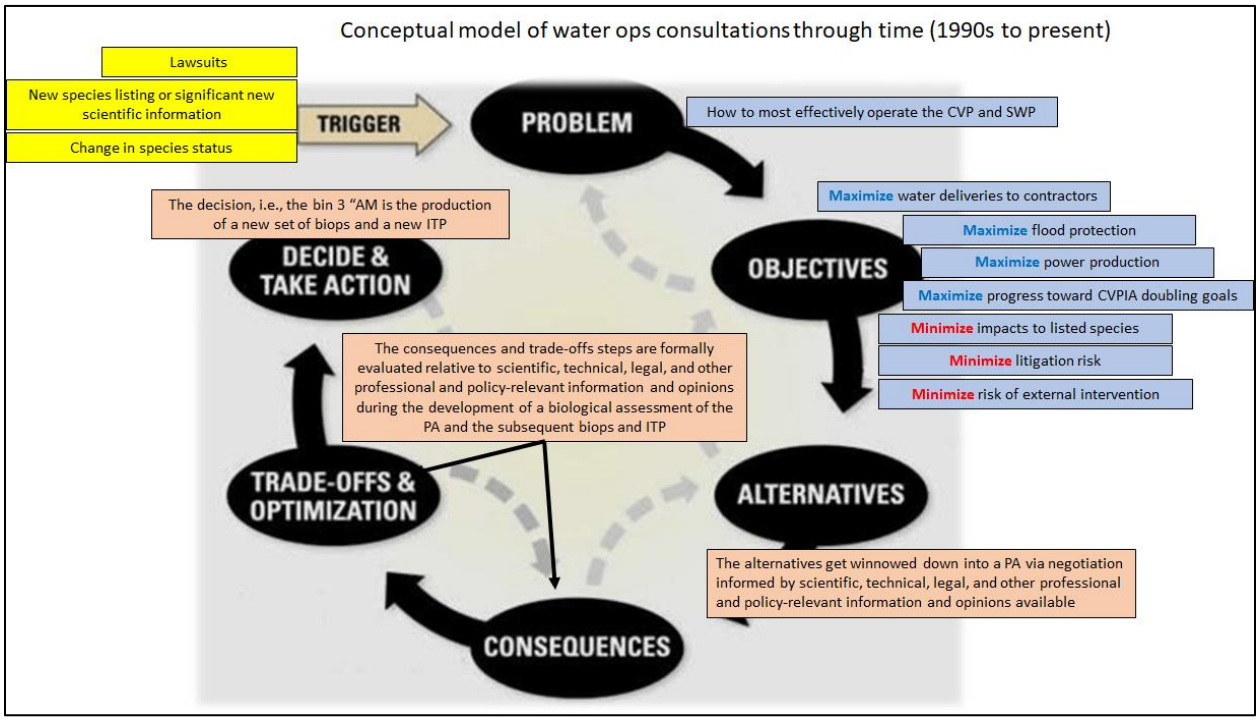


**Figure A.3. Conceptual model of ESA/CESA water operations consultations as a recurring decision.**

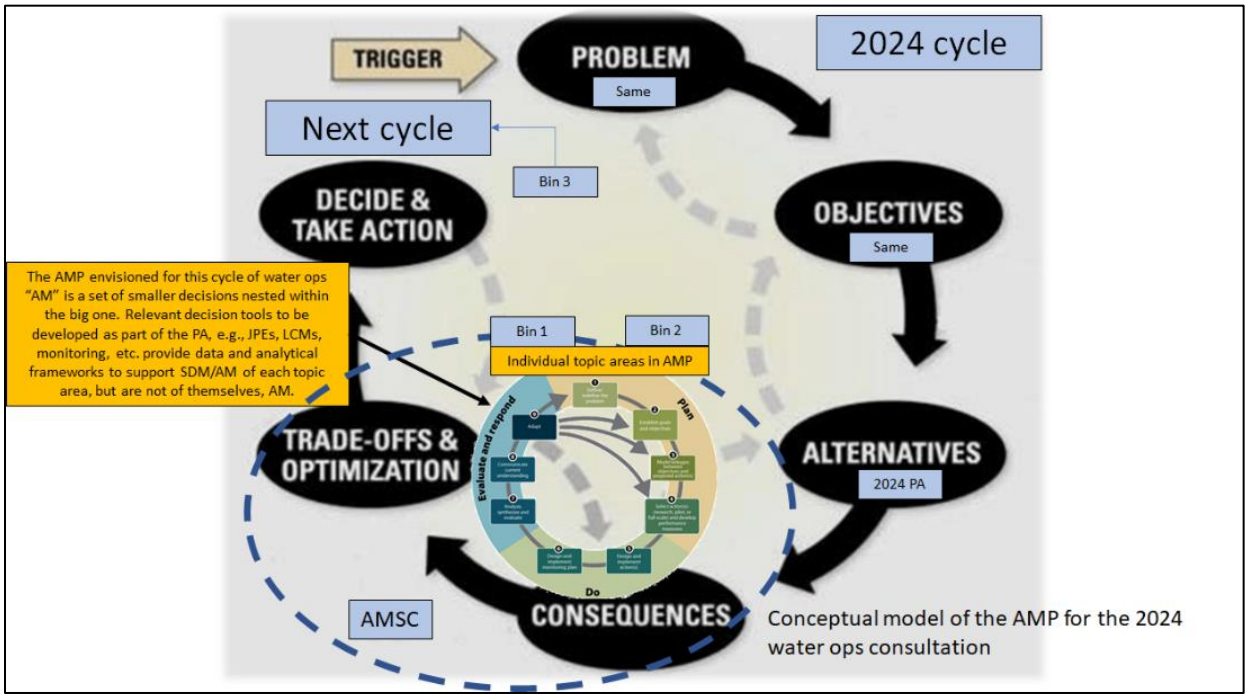


**Figure A.4. Conceptual model of the Adaptive Management Program described in this appendix within the current consultation cycle. Refer to Figure A.3 for additional details.**

The adaptive management framework envisioned for this cycle of water project consultations involves ongoing scientific re-evaluation of multiple topic areas that sit within the 'consequences' and 'trade-offs/optimization' steps of the current PA decision cycle (Figure A.4). The framework or 'Adaptive Management Program' (AMP) will be used for two major purposes. The first is to provide a potential path to modify water operations rules without a full new cycle (e.g. new full reinitiation of consultation or ITP development) if the existing and proposed studies, tools, and monitoring are developed and their use supports a change. The evaluation of changes that could be conducted within the current cycle are called Bin 1 and Bin 2 pathways and they are differentiated depending on their implementation timeline (see Appendix B). Bin 1 pathways may result in modifications within 3 years of issuance, while Bin 2 pathways may result in modifications but are not expected in fewer than 3 years of issuance. Bin 3 pathways are longer-term, and considerations are not expected to be complete within a single consultation cycle because they involve either or both long data evaluation timelines or substantial changes to authorized levels of listed species take. Topics in the Bin 3 category are included because they require continued data collection and analysis to inform their evaluation in the next consultation cycle.

## 2 AMP Framework and Implementation

The AMP will be used to evaluate and adapt the operations, actions, and related activities identified in Section 3a of the AMP and Appendix B. This evaluation will include addressing areas of known uncertainty, improving scientific understanding by filling data gaps, and weighing whether new information should be incorporated into the relevant ESA and CESA authorizations. To do so, an Adaptive Management Steering Committee (AMSC) will oversee efforts to monitor and evaluate existing

operations and related activities through existing technical teams (to the maximum extent practicable), make decisions at that level, and suggest to the Directors whether modifications or alternative actions may be warranted. The AMSC will utilize a structured decision-making process to assess the relative benefits or impacts of proposed operational changes and activities for listed species compared to what is being implemented at the time. Any proposed changes to project operations or related activities through adaptive management should provide equivalent or increased conservation benefits to the listed species.

Adaptive management typically utilizes a multi-step process. The following adaptive management framework includes elements from the Delta Plan (DSP 2013) and recommendations from the Delta Independent Science Board (2016). This framework is made up of three broad phases that are part of any scientific endeavor: (1) Plan; (2) Do; (3) Evaluate and respond. Within the phases are nine steps as represented in Figure A.2.

## 2.1 Phase 1: Plan

The first phase of an adaptive management process is to plan. The suite of tools to be developed and general adaptive management topics are described in Appendix B. As approved by the AMSC, Adaptive Management Teams (AMTs) will develop their own plan for each activity identified in Appendix B. Annual Presentations prepared by each AMT, as described in Section 2.3.1, will include the compilation of the individual actions covered under that AMT.

The planning process begins by clearly defining the problem or question to be addressed (*Step 1*), identifying goals and objectives (*Step 2*), and identifying the model linkages between the goals, objectives, and proposed actions (*Step 3)*. Models can be conceptual, statistical, physical, decision support, or simulation. The AMSC and its facilitator(s) will oversee steps 1 and 2, then the AMTs will take a lead role in step 3.

The proposed action, LTO ITP, and BiOps outline the problems to be addressed, the goals and objectives, and in some cases describe the conceptual linkage between the actions and the objectives. However, these steps should be formally evaluated by the AMSC and its facilitator(s) once the group is established. A list of the proposed tools to be developed as part of the AMP and the general topic areas addressed by this AMP are the subject of Appendix B; more detail about the goals, objectives, and rationale is in the text below and in the associated effects analyses of the proposed action, BiOps, and LTO ITP.

The first part of *Step 4* in the Adaptive Management cycle is to decide whether a change in an existing action(s) will be recommended based on the modeling results. The proposed action, BiOps, and LTO ITP are the starting point for AM actions. Future assessments may support keeping an action as is, or modifying it in some way. A key part of the AMP (coordinated through the AMSC) will be the development of performance metrics (response variables for each tool, study, monitoring program etc. associated with each adaptive management action) to guide the program (*Step 4*). Performance metrics would be measured utilizing a suite of activities including monitoring (long-term surveys; new measurements), experimental methods (e.g. fish enclosures), and modeling (e.g. 3-D modeling, life cycle modeling). Each operation and activity, and each adaptive management change must be accompanied by a set of criteria that the implementing entities can use to determine whether the action is having the anticipated effects.

### 2.1.1 Structured Decision Making

The AMSC, and associated AMTs, will utilize decision-analytic tools or a structured decision-making process to define relevant uncertainty, develop action alternatives, estimate consequences and evaluate trade-offs and preferences when making choices between alternative courses of action (e.g., *Steps 1- 4* above*)*. Structured decision-making processes can include consideration of value-based objectives and priorities as well as science-based objectives. These processes also document the basis for decisions in a transparent, organized and repeatable framework. Below provides more detailed information on examples of structured decision-making processes currently being used by technical teams and CSAMP.

Structured decision making (SDM) is a collection of practices rooted in decision theory that provides a rational, organized framework for evaluating alternatives against consistent and explicit quantifiable objectives, encourages clear articulation of anticipated effects, and transparent consideration of trade-offs and uncertainty (Figure A.5). SDM can take many forms, depending on which of the six typical steps receive greater relative emphasis. SDM can be used to help build consensus if the SDM process includes deliberation about trade-offs and this deliberation informs the development of new alternatives that better address the range of interests represented.

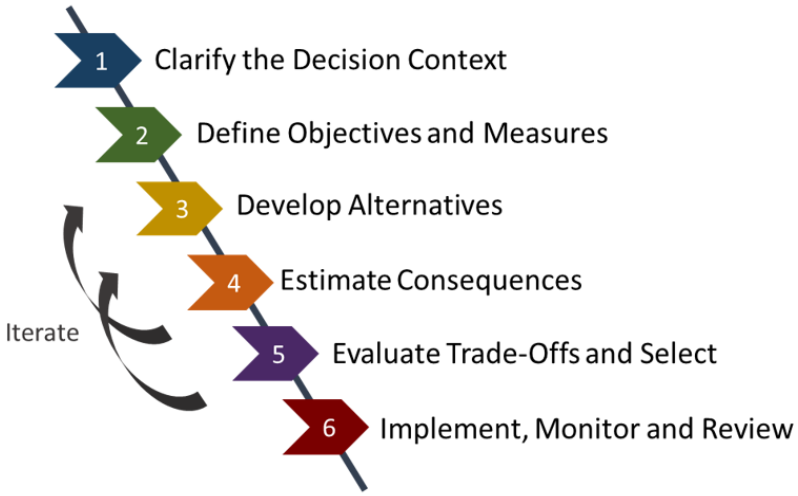


**Figure A.5. Six steps of a typical SDM process (Gregory et. al. 2012).**

1. Clarify the Context – The first step is to clearly establish the planning and decision-making context through answering questions such as: What decision needs to be made and who will make it? Who else needs to be involved or consulted? What is the scope and bounds of the process and the decision (e.g., what's in and what's out)? The initial structuring step lays out a road map for both the deliberations and the analysis that will follow.

2. Define Objectives and Measures – Objectives define the interests and values about the decision at hand. Measures define exactly what is meant by an objective and are used to estimate and report the predicted consequences of different alternatives for making a choice.

3. Develop Alternatives – Alternatives are the various actions or strategies that are under consideration. This step involves iteratively developing, comparing, and refining alternatives in the search for one(s) that offers the best balance across objectives.

4. Estimate Consequences – Consequences of the alternatives against each objective are estimated or characterized, including identifying uncertainties. Results are typically presented in a consequence table, which is a concise summary matrix illustrating the performance of each alternative with respect to each objective, as reported by the measures.

5. Evaluate Trade-offs and Preferences – Explicit choices must be made for preferred alternatives, based gains and losses for each objective. Each decision-maker is asked to make choices based on their own values and their understanding about the values of others. A variety of methods from the decision sciences are used to facilitate constructive deliberations about values and trade-offs and to ensure that tradeoff judgments are informed, thoughtful and transparent.

6. Decide, Monitor, and Learn – The focus at this stage of the process is on how to implement the decision in a way that reduces uncertainty, improves the quality of information for future decisions, and provides opportunities to revise and adapt based on what is learned. The SDM process should end with a formal transition into adaptive management and monitoring, and produce recommendations for the governance and oversight of monitoring programs, as well as triggers and mechanisms for review and amendment.

*Example Applications of SDM*

SDM is being utilized by the Delta Coordination Group (DCG) for the Summer-Fall Action. During 2022, Reclamation and DWR developed an SDM approach for informing decisions regarding the Delta Smelt summer-fall habitat actions. This modeling approach utilized existing and new modeling, data, and expert opinion on the impacts of the summer-fall habitat actions to provide information on the physical and biological consequences associated with implementing the various actions compared to a baseline of these outcomes without the summer-fall habitat actions. Through this SDM process, Reclamation and DWR also developed a multiyear monitoring and science plan that includes additional science that might be helpful to further investigate the spatial and temporal distribution of abiotic and biotic factors known to influence Delta Smelt habitat, including its food supply and access to those prey, Delta Smelt abundance, survival, and viability during the summer-fall time period.

## 2.2 Phase 2: Do

The 'Do' phase of adaptive management includes two steps that occur in parallel. The design and implementation of studies, monitoring, or modeling of actions as they are implemented with the explicit goal of improving the understanding of how strongly the action is affecting the vital rate or performance metric (*Step 5 and 6*).

Monitoring plans associated with each relevant operational or management action will include data management plans that describe the process for organizing and clearly documenting observations, including how data are collected; the methods, quality assurance, and calculations used; the temporal and spatial scales of the variables; and accurate site locations and characteristics. Monitoring must provide the data necessary to determine whether the performance metrics are responding to the management action(s). Monitoring plans may also include targeted research to better understand observed results and further resolve key uncertainties. Results of monitoring and research must be clearly communicated so that the information gathered, and current understanding, is broadly understood.

### 2.2.1 Work Plan and Budget

#### 2.2.1.1 AMSC Annual Work Plan and Budget

The planning and doing outlined in phases 1 and 2 will be described in an Annual Work Plan and Annual Budget prepared by the AMSC for the upcoming year. The Annual Work Plan will describe the proposed activities of the AMP. This plan will include 1) monitoring and research that are part of the proposed action or are otherwise required by the SWP ITP, BiOps, 2) needed facilitation services to coordinate and support implementation of the AMP, and 3) any additional monitoring and research that is planned, including any relevant monitoring and research that is part of the IEP annual work plan, as approved by the AMSC. The Annual Budget will set out projected expenditures and identify the sources of funding for those expenditures. If the Annual Work Plan describes activities that span multiple years, the budget for those activities will cover the entire period they will be implemented. The AMSC will ensure the Annual Budget accurately sets forth and makes adequate provision for the implementation of the BiOps and LTO ITP terms under which the CVP and SWP operate.

At a minimum, the Annual Work Plan and Annual Budget will contain the following information:

A. A description of the planned actions under the AMP including their goals, objectives, and performance metrics.

B. A description of the planned monitoring activities and the entities that will implement those activities.

C. A description of the anticipated research to be undertaken and the entities that will conduct the studies.

D. A budget reflecting the costs of implementing the planned actions.

E. A description of the sources of funds that will be used to support the budget.

The AMSC will develop and approve the Annual Work Plan and Annual Budget with support from independent facilitators. The first Annual Work Plan and Annual Budget will be completed within the first year the AMSC begins convening, and annually thereafter. Upon approval, the Annual Work Plan will be posted on a public website.

#### 2.2.1.2 Individual AMT Work Plans

Within twelve months of their initial meeting, each AMT will develop a work plan that describes the timeline needed to gather and/or synthesize the needed information for its purpose, all reasonable hypotheses addressed for that action, and the timeline for incorporating information into individual SDM processes. The AMSC will review the work plans for each AMT, provide direction or edits as needed, and approve the final plan when they are satisfied with it. Thereafter, each AMT will provide a presentation to the AMSC at least annually to document progress toward addressing the relevant hypotheses (see Section 2.3.1 below). The work of individual AMTs and associated annual presentations can cease if a team has achieved what it was tasked to do.

### 2.3 Phase 3: Evaluate and Respond

The 'evaluate and respond' phase of adaptive management includes three key steps. Analysis, synthesis, and evaluation of the action(s) (*Step 7*) are critical for improving current understanding. Analysis and synthesis will incorporate information on how conditions have changed, expectedly and unexpectedly, as a result of implementing the action(s). Because measurable improvement in conditions for covered species might not occur on short timescales, evaluations will also examine whether actions taken prevented deterioration of conditions that may have occurred if no actions were taken or if the action is resulting in species responses trending in the desired direction. The evaluation will examine whether performance metrics indicate that one or more of the objectives have been met as a result of the implemented action(s). If an objective is not met, the potential reasons why it was not met will be identified. As each year's data become available, recognizing that specific actions may not be required in that particular year or sequence of years, analyses should assess whether the probability of the desired outcome has changed and, if so, how this affects decisions about the action. Within the AMP it is anticipated that the AMTs will be primarily responsible for the "evaluation" step, while the AMSC will be primarily responsible for the "response" step.

Communication (*Step 8*) of current understanding gained through analysis, synthesis, and evaluation of implemented actions and monitoring will occur through a variety of channels including: 1) regular back and forth communication between the AMSC and AMTs via the floating facilitators, and when relevant, between the AMSC and the Directors, 2) annual presentations from each AMT to the AMSC, and 3) with interested parties external to the AMP by posting meeting notes on websites, giving presentations, preparing white paper reports, ensuring transparency of independent peer review materials and recommendations, and publication in peer reviewed scientific journals.

### 2.3.1 Annual Presentations by AMTs

During each implementation year, each AMT will provide at least one presentation (Annual Presentation) to the AMSC. The Annual Presentation will provide an overview of the AMT activities carried out during the previous implementation year.

Each AMT Annual Presentation will include, among other things, the following types of information:

1. An assessment of the implementation and efficacy of studies, monitoring, and modeling of actions during the prior reporting period, including new information gained.

2. Identification of tasks that have not been implemented on schedule and an explanation for the deviation from schedule. For actions that are behind schedule, a suggested schedule or process for completing them will also be included.

3. Adaptive management changes to actions resulting from the SDM process and proposed by an AMT for consideration by the AMSC, including the scientific rationale for the action.

### 2.3.2 Adapt

When it is informed and equipped with new results and better understanding, the AMSC will re-examine the actions it has been evaluating (e.g., see Appendix B). It is possible that revisions may be suggested when current information suggests doing so (*Step 9*). Possible adaptations could include anything from staying the course, to making a minor modification that can be made without formal changes to the existing LTO ITP and BiOps, to considering reinitiation or an LTO ITP amendment as mechanisms to enable a new management action or paradigm to be implemented.

Decisions to adapt are anticipated to be needed at various time intervals depending on the action or environmental conditions which may delay implementation of certain actions in any particular year or series of years. Appendix B contains a description of the planned timeframe for each action that estimates when decisions regarding AMP actions may be ready to evaluate for potential changes. In general, one year's results, however anomalous, are seldom enough to demonstrate that an action should be subject to change as a part of the adaptive management process. Furthermore, when the analysis, synthesis, and evaluation of information learned from implementing an action over time indicates that no benefit accrues, resources should no longer be spent on that action no matter how popular the action might be.

**References Cited**

DeFries, R. and Nagendra, H., 2017. Ecosystem management as a wicked problem. *Science*, *356*(6335), pp.265-270.
Rittel and Webber 1973

Delta Independent Science Board. 2016. Improving adaptive management in the Sacramento-San Joaquin Delta. Sacramento, CA.

Delta Science Program. 2013. Delta Plan. Appendix C: Adaptive management and the Delta Plan. Sacramento, CA.

Gregory R., Failing L., Harstone M., Long G., McDaniels T. and Ohlson D. 2012. Structured Decision Making: A practical guide to environmental management choices. Sussex, UK.

Luoma, S. N., Dahm, C. N., Healey, M. and Moore, J. N. 2015. Challenges facing the Sacramento-San Joaquin Delta: Complex, chaotic, or simply cantankerous? San Francisco Estuary and Watershed Science 13(3): 1-25

Rittel, H. W. J. and Webber, M. M. 1973. Dilemmas in a general theory of planning. Policy Sciences 4:155-169

Walters, C. J. and Hilborn, R. 1978. Ecological optimization and adaptive management. Ann. Rev. Ecol. Syst. 9:157-188

recommendations from the Delta Independent Science Board (2016)

**Appendix B: Adaptive Management Actions and Programs**

**A. Timeframe of implementation and evaluation of individual Adaptive Management Actions**

Bin 1: Evaluation occurs annually - biannually by technical teams.
Actions for which agencies evaluate recent data to determine how to proceed before the action is conducted again. Refinement of the approach is expected to occur regularly based on prior data and targeted research. There is an expectation that Bin 1 Adaptive Management Actions or Programs (collectively AMAs) have defined objectives and performance metrics with associated monitoring occurring during the implementation of the action. Consultation and incidental take permit (ITP) amendment inquiries will be conducted, but reinitiation of consultation or an ITP amendment is not expected to be required to refine the approach to implementation after each evaluation.

Bin 1 AMAs will require components of a Structured Decision Making (SDM) process to maintain an organized approach for agency collaboration and to ensure transparency in determinations. However, Bin 1 AMAs will be managed adaptively based on present conditions, such as hydrology or annual species status, and will require quick decision-making relative to full SDM. It is not anticipated that Bin 1 AMAs will require long-term action objectives or performance measures to be determined prior to implementation nor will they require identification or evaluation of long-term alternatives. Decision support tools such as utilization of an independent facilitator and Adaptive Management Technical Team (AMT) evaluation of near-term implementation alternatives and tradeoffs will guide the Adaptive Management Steering Committee (AMSC) annual or biannual implementation action decision.

Bin 2: Evaluation and potential refinement occurs within the timeframe of the Biological Opinions and ITP.
Actions for which agencies evaluate data from multiple years of implementation. There is an expectation that coordinated science and monitoring is occurring during implementation of these actions. The evaluation may trigger re-initiation of consultation or an ITP amendment for the actions, or not, depending on scope and scale of recommended change.

Bin 2 will apply to those AMAs that are iterated or linked over time whereby actions taken early on may result in learning that improves management within the next 3-8 years. It is anticipated that Bin 2 AMAs have existing AMTs and/or have some understanding of action objectives and performance measures and have already undergone some evaluation of alternatives and trade-offs. However, it is acknowledged that Bin 2 AMAs may need refinement once implementation has occurred to minimize uncertainties associated with known data gaps. Independent facilitators and AMTs will utilize decision support tools to assess monitoring data obtained, evaluate updated knowledge base against action objectives and performance measures, develop and evaluate new alternatives if warranted, and present action implementation trade-offs to the AMSC for consideration.

Bin 3: Evaluation and potential refinement occurs in a longer timeframe on the order of 10 – 15 years and may inform the next section 7 consultation and development of a new ITP.
Actions for which agencies evaluate data over longer periods of implementation, on the order of 10-15 years. There is no expectation of an ongoing evaluation to occur during the time period of the ITP or Biological Opinions (BiOps) for long-term operations of the State Water Project (SWP) and Central Valley Project (CVP). However, there is an expectation that science and monitoring is occurring during the timeframe of the ITP and BiOps to support evaluation and refinement during the development of a new ITP and BiOps.

Bin 3 AMAs may have complex objectives, unknown alternatives, significant uncertainty in outcomes, and/or large data gaps. These AMAs require a full SDM process whereby qualified and independent facilitators will guide the AMSC and associated AMTs and utilize decision-analytic tools or a structured decision-making process to define relevant uncertainty, develop action alternatives, estimate expected consequences of the alternatives, and evaluate trade-offs and preferences when making choices between alternative courses of action. It is anticipated that Bin 3 AMAs will require substantial time to plan, evaluate, and implement to facilitate learning opportunities for future action management.

Some AMAs may have components that fall in different Bins. For example, some AMAs in Bins 1 and 2 may yield the development of a decision support tool for use in an AMA in Bin 3 during future consultation. Therefore, it is important all AMAs use components of structured decision-making and apply a consistent and coordinated approach to monitoring performance metrics identified so that results from various AMAs can be comprehensively evaluated when related.

**B. Adaptive Management Actions**

1) Winter-run Old and Middle River Flows Management
   a) *Brief Description:* Onramping and offramping Old and Middle River Flows (OMR) management for winter-run Chinook Salmon is currently informed by the Salmon Monitoring Team (SaMT). The SaMT is a technical advisory team made up of technical staff from the US Bureau of Reclamation (Reclamation), the Department of Water Resources (DWR), the National Marine Fisheries Service (NMFS), the California Department of Fish and Wildlife (CDFW), and the State Water Resources Control Board (SWRCB) that synthesizes recent field monitoring data and historical long-term monitoring data, along with expert opinion to inform the Water Operation Management Team (WOMT). Specifically, the SaMT will evaluate real-time data, including the Salmonid Distribution Table, and the weekly loss threshold table, which classifies the winter-run Chinook salmon population as the percent in the Delta. This information is used to implement the winter-run weekly loss thresholds and to minimize the effects of water operations on winter-run Chinook Salmon.

      ITP Conditions of Approval 8.4.3 and 8.4.4 (Proposed Action (PA) Sections 3.7.4.1 and 3.7.4.5.3) describe the use of winter-run Chinook Salmon weekly and annual loss thresholds to trigger actions aimed to minimize entrainment and loss of juvenile out-migrants. However, it is anticipated that the criteria associated with the Winter-Run Chinook Salmon Machine Learning Model will need to be reassessed using the genetics-based run-identification loss dataset currently available as described in ITP Conditions of Approval 7.9.2 (PA Section 3.7.4.1) and a larger effort to develop a real-time assessment tool for the SaMT to recommend OMR management actions to minimize entrainment into the south Delta well before salvage events occur.

   *b) Assigned AM Bin:* **Bin 2**
      *i.* The development of a model explicitly predicting daily winter-run Chinook Salmon migration timing using historical long-term monitoring data and environmental variables is necessary to reduce uncertainty in the weekly Salmonid Distribution Table and the

estimated percent of winter-run present in the Delta. This model needs to be made readily available as a transparent prediction tool that leverages recent biotic and abiotic data to predict current and near-future migration timing and provided to the SaMT to inform their discussions prior to WOMT. This effort should be completed and implemented no later than 2026.

*ii.* The explicit rate of winter-run Chinook Salmon juvenile out-migrant entrainment into the South Delta, the fate of individuals entrained due to OMR management, and the effects of the State Water Project (SWP) and Central Valley Project (CVP) south Delta water operations is a topic area in OMR management that has been studied in the past and merits further investigation. Loss associated with salvage events at the SWP and CVP facilities is currently used to trigger OMR management actions, but these detections in salvage occur days or even weeks after individuals were initially entrained into the South Delta and account for only a proportion of entrained individuals lost to the population. A new modeling framework is necessary for more effective real-time OMR management actions to be used to minimize winter-run Chinook Salmon entrainment into the South Delta. Specifically, the modeling framework should integrate a winter-run Chinook Salmon distribution model (e.g., Bin 2 item *i* above) with particle tracking model outcomes (potentially the individual-based ECO-PTM model developed by USGS and DWR) to estimate the proportion of the out-migrant population vulnerable to entrainment into the South Delta per day, the probability of entrainment into the South Delta given current hydrologic conditions, and the travel time to the water export facilities. Such a modeling framework should be converted into a real-time assessment tool for the SaMT to recommend OMR management actions to minimize entrainment into the South Delta well before salvage events occur.

c) *Adaptive Management Technical Team:* The existing Winter-run Chinook Machine Learning Interagency Team will lead analysis and development of all winter-run Chinook salmon OMR management sub-actions in coordination with other interested agencies and stakeholders. Specific work pertaining to this action should be conducted by the current Winter-run Chinook Machine Learning Interagency Team. The team has welcomed input from a diverse array of agency and stakeholder representatives since its inception to provide critical guidance throughout model development and interpretation. This role would continue with the addition of SDM processes as needed.

*d) Tools:* Winter-Run Chinook Salmon Machine Learning Model

2) Spring-run OMR Management

*1) Brief description*: Spring-run OMR Management, Science, and Monitoring: ITP Conditions of Approval 7.9.3, 7.9.4, 8.4.5 and 8.4.6 and Section 3.9.2 of the Proposed Action describes an approach to minimize impacts of SWP and CVP operations in the South Delta on Sacramento River origin spring-run Chinook Salmon that relies on detection of hatchery-origin Chinook Salmon (spring-, fall-, and late fall-run) in salvage at the SWP and CVP facilities as surrogates for entrainment of natural-origin spring-run in the Central and South Delta. While implementing the Spring-run Hatchery Surrogate measure a parallel effort is ongoing to develop an annual Spring-run Juvenile Production Estimate (JPE) (ITP Condition of Approval 7.9.3 and PA Section 3.9.2).

ITP Condition of Approval 7.9.3 and PA Section 3.9.2 describe the timeline for initial program development (interim monitoring, special studies, and development of the JPE database and model) and the intention to utilize independent peer reviews. The Spring-run JPE Core Team is also responsible for evaluating the existing Spring-run Hatchery Surrogate measure (ITP Condition of Approval 7.9.3). Recommendations from these reviews will inform considerations for future reinitiation of consultation and ITP amendments with NMFS and CDFW. A subsequent independent peer review will be considered to continue to evaluate monitoring and special study data available through implementation of the Spring-run JPE as well as the initial Spring-run Lifecycle Model.

2) *Assigned AM Bin*: **Bin 2**
Development of an interim Spring-run JPE is ongoing and independent peer reviews of the Spring-run JPE program will be considered in the near-term. Additionally, the Spring-run JPE Core Team is tasked with reviewing the Spring-run Hatchery Surrogate measure (ITP Condition of Approval 7.9.3 and PA Special Studies Section) in early 2025.

3) *Adaptive Management Technical Team*: The Spring-run JPE Core Team is responsible for implementing the Spring-run JPE program, and collaborating with the AMSC to charter independent peer review panels when initiated, and evaluating the Spring-run Hatchery Surrogate measure. After these reviews DWR and Reclamation will continue to convene the Spring-run JPE Core Team and subteams in coordination with CDFW, NMFS, and the US Fish and Wildlife Service (USFWS), and support implementation of the Spring-run JPE Science Plan, the Spring-run JPE Monitoring Plan, the Spring-run JPE Race ID Program Development Plan, the Spring-run JPE Data Management Strategy, and updates to those plans.

4) *Tools:* The Spring-run JPE and the Spring-run Lifecycle Model are key tools needed to reduce uncertainty regarding the timing and abundance of young-of-year and yearling life stages entering the Delta from the Sacramento River and assess impacts of a variety of stressors on spring-run Chinook Salmon.

3) Larval and Juvenile Delta Smelt OMR Management

a. *Brief Description:* The Larval and Juvenile Delta Smelt Protection Action in Chapter 3 of the ITP Application describes an approach to minimize the impacts of the SWP and CVP operations in the south Delta on larval and juvenile Delta Smelt that relies on the collection of Secchi depth data by field surveys. While this metric of water clarity is based upon the best available science, it is anticipated that an evaluation of turbidity data from telemetered water quality stations across the south and central Delta could yield a trigger that would be more responsive to real-time conditions and would eliminate the need for field crews to conduct additional Secchi depth surveys when data is needed more frequently than biweekly. The turbidity-based trigger level will be as close as is feasible to matching the existing Secchi depth trigger of 1 meter, including using multiple turbidity stations to match the geographic scope of the 12 stations used for the Secchi depth trigger.

b. *Assigned Adaptive Management Bin:* **Bin 2**

Development of a turbidity-based trigger to replace the Secchi depth trigger will be considered in the near term.

c. *Adaptive Management Technical Team:* A team of technical staff from CDFW, USFWS, DWR, and Reclamation will convene to discuss analytical approaches to developing a turbidity-based trigger that provides the same level of minimization as the Secchi depth trigger.

d. *Tools:* The Delta Smelt Life Cycle Model informed the development of the Secchi depth trigger and may be used to evaluate a turbidity-based trigger.

4) Larval and Juvenile Longfin Smelt OMR Management

a. *Brief Description:* The Larval and Juvenile Longfin Smelt Protection Action in Chapter 3 of the ITP Application describes an approach to minimize the impacts of the SWP and CVP operations in the south Delta on larval and juvenile Longfin Smelt that relies on paired real-time hydrologic and monitoring triggers. While these OMR management triggers are designed to provide entrainment minimization for larval and juvenile Longfin Smelt, the inclusion of new monitoring data and quantitative tools could provide further evaluation of environmental and monitoring data that could potentially yield an action that would be more responsive to real-time conditions and be more effective at minimizing entrainment.

b. *Assigned Adaptive Management Bin:* **Bin 2**

Development of a new OMR management trigger will be considered in the near term.

c. *Adaptive Management Technical Team:* A team of technical staff from CDFW, USFWS, DWR, and Reclamation will convene to discuss analytical approaches to analyzing water quality, hydrologic, and distribution data to inform the creation of a new trigger framework initiating OMR management.

d. *Tools:* Available water quality, hydrologic, and fish monitoring datasets will be analyzed, as well as relevant flow and particle tracking models, as appropriate. New Longfin Smelt life cycle model tools will be utilized, as available.

5) Summer-Fall Habitat Action for Delta Smelt

To study habitat effects on Delta Smelt survival and evaluate effectiveness of mitigation actions in improving habitat and food availability, DWR and Reclamation have proposed the Summer Fall-Habitat Action (SFHA). The SFHA includes, but is not limited to, the actions described below. The Delta Coordination Group (DCG) will a) develop a multi-year science and monitoring plan for the Summer-Fall Habitat Action including focused studies and b) conduct reviews of action plans and seasonal action results to inform future summer-fall actions or improvements to science and monitoring to inform uncertainties in evaluation. The DCG will utilize project-specific and technical teams for coordination on the adaptive management framework as described in the AMP. Specific

adaptive management plans for the Summer-Fall Habitat Actions will be reviewed by the AMT (where applicable), and coordination with the AMT may differ for actions based on assignment of AM bins.

Fall X2

a) *Brief Description:* To increase the amount of low-salinity zone habitat for Delta Smelt in wet and above normal hydrologic year types, DWR and Reclamation will maintain a 30-day average X2 ≤ 80 km from September 1 through October 31.

   In 2012, USFWS initiated the development of several life cycle modeling efforts to better understand the factors that affect Delta Smelt population growth rates. These efforts led to two published life cycle models. The results of these life cycle model variations support the hypothesis that Delta outflow in the summer has a stronger effect on Delta Smelt survival than Delta outflow in the fall. The best information currently available suggests that high summer flows help align habitat needs of Delta Smelt in the Suisun Marsh and Suisun Bay region, including turbidity and water temperature, while also increasing food subsidies, supporting Delta Smelt growth and survival. The same outcome is expected if flows are high enough in the fall, but the response of Delta Smelt is expected to be less, because ambient air temperatures cool into more appropriate ranges and the prey subsidy is reduced as prey populations seasonally senesce. These changes in fall habitat conditions are expected to occur part way through the September – November time period considered in the Delta Smelt lifecycle models. This newer information merits a robust synthesis effort to bring together available modeling tools, including the Delta Smelt lifecycle model, and monitoring data.

***b)*** *Assigned AM Bin:* **Bin 1**
   While science and monitoring in the summer and fall will occur each year (during implementation and non-implementation years), evaluation of the Fall X2 action will occur on a shorter timeframe, after multiple years of implementation since its inception in 2008. The AMT will work with described technical teams to develop a comprehensive synthesis of summer-fall habitat conditions to inform the development of an adaptive management plan. The AMT may recommend an independent workshop or review of the Fall X2 action following sufficient a robust evaluation and synthesis effort. The AMSC may also request that the AMT develop alternative X2 actions to implement during the summer-fall time period that provide equal or better benefits to Delta Smelt as the Fall X2 action originally developed in 2008.

c) *Adaptive Management Technical Team:* The Delta Coordination Group (DCG), in collaboration with DCG technical teams (Science and Monitoring Workgroup and Hydrology and Operations Workgroup) will be responsible for developing adaptive management plans specific to the Fall X2 including describing AM objectives, hypotheses, and performance metrics for evaluation.

Suisun Marsh Salinity Control Gate

a) *Brief Description:* To improve Delta Smelt habitat in Suisun Marsh and Grizzly Bay during summer-fall, Suisun Marsh Salinity Control Gates (SMSCG) will be operated as described in ITP

Condition of Approval 9.1.3 and the PA to maximize the number of days at Belden's Landing where the 3-day average of salinity is equal or less than 4 psu during Above Normal and Below Normal years and 6 psu in Dry years with the goal of maximizing the amount of suitable habitat available to Delta Smelt in Suisun Marsh and Grizzly Bay.

b) *Assigned AM Bin:* **Bin 3**
While science and monitoring will occur each year (during implementation and non-implementation years), evaluation of SMSCG operation efficacy will occur on a longer timeframe after multiple years of implementation across a range of hydrologic conditions, within 10-15 years. The AMT will work with described technical teams to review monitoring plans and focused research as needed within the larger SDM process. They may recommend an independent workshop or review of the action following sufficient implementation and monitoring for a robust evaluation.

c) *Adaptive Management Technical Team:* The Delta Coordination Group (DCG), in collaboration with DCG technical teams (Science and Monitoring Workgroup and Hydrology and Operations Workgroup) will be responsible for developing adaptive management plans specific to the SMSCG action including describing AM objectives, hypotheses, and performance metrics for evaluation.

Experimental Food Enhancement Actions

*a)* *Brief Description:* Each year food subsidy measures to augment the SFHA will be considered. Food actions may include a number of implementation alternatives (e.g., water source, timing, intensity, etc.) which have been evaluated by the Delta Coordination Group (DCG) to inform future implementation plans. Food subsidy actions are hypothesized to increase localized prey availability for Delta Smelt in the North Delta and Suisun Marsh, resulting in opportunities for higher growth and survival of juvenile and sub-adult life stages. Food actions include North Delta Food Subsidy Action, Managed Wetland reoperation in Suisun Marsh, and Sacramento Deepwater Ship Channel Food Subsidy Action.

*b)* *Assigned AM Bin:* **Bin 2**
Following multiple years of implementation, data collection, and results, the DCG may suggest convening an independent workshop or review panel within the timeframe of the consultation and ITP. Results will be included in seasonal reporting and adaptive management reviews to evaluate the science and monitoring, efficacy of actions, hypothetical alternative strategies and/or actions, and potential inclusion of food subsidy actions as potential permanent action elements of the SFHA, or if appropriate, termination of actions deemed ineffective by the AMSC.

*c)* *Adaptive Management Technical Team:* Food subsidy action plans, monitoring plans, focused research and reports will be developed by the DCG, in collaboration with DCG technical teams (Science and Monitoring Workgroup and Hydrology and Operations Workgroup). Together, teams will be responsible for developing adaptive management plans specific to food actions including describing objectives, hypotheses, performance metrics for evaluation, and timeline.

6) Tidal Habitat Restoration Effectiveness for Smelt Fishes

*a) Brief Description:* DWR and Reclamation propose to carry forward habitat restoration acre targets identified from the 2008 and 2019 FWS Biological Opinions (8,000 acres) and the 2020 ITP (396.3 acres) to complete mitigation requirements for Delta Smelt and Longfin Smelt (per the 2020 ITP). DWR and Reclamation propose to meet the total acreage requirement (8,396.3 acres) through completion of habitat restoration projects. The projects identified in the PA are in different phases of completion: 1) constructed (3,584 acres), 2), in construction (3,490 acres) or 3) planned (1,662 acres). All identified restoration projects are located in the northern arc of the upper estuary and are designed to enhance food production and rearing habitat for Delta Smelt and Longfin Smelt (per the 2020 ITP). DWR and Reclamation will complete its 8,396.3 acre restoration requirements by 2026.

*b) Assigned AM Bin:* **Bins 1 and 3**

***Bin 1:*** Some actions involving treatment or clearing of invasive vegetation, use or presence of livestock, or other land management actions will be evaluated on an annual or biannual basis. These evaluations may inform revisions to site-specific Long-term Management Plans, which are required of DWR and Reclamation as part of the mitigation.

**Bin *3:*** To understand the effectiveness of tidal wetland restoration for providing a food subsidy for pelagic areas to benefit Delta Smelt as well as juvenile rearing habitat for Chinook Salmon, monitoring occurring as part of the DWR-CDFW Fish Restoration Program will continue throughout the permitted period. Monitoring will allow assessment of the biotic and abiotic capacity of restored tidal wetlands to support listed fish species, the opportunity for fish to access wetland-derived resources, and actual use of those resources. Reference wetlands will continue to be monitored concurrently to account for dynamic regional conditions that also impact restored habitats. Following multiple years of monitoring and targeted studies to address specific uncertainties regarding effectiveness of tidal wetland restoration, such as the ability of restoration locations to provide food resources to Delta Smelt at critical times of the year, observations of Delta Smelt or juvenile Chinook Salmon occupying restoration sites or utilizing restored resources, and retrospective evaluation of the tidal marsh restoration site quality and or effectiveness relative to targets identified, the AMSC will provide guidance to the AMT in prioritizing data and information for synthesis work. Syntheses for understanding efficacy of tidal wetland restoration may regard food subsidy, effects of restoration on water quality, prevalence of invasive aquatic vegetation, utilization of restored habitat by Delta Smelt and listed salmonids, as well as evaluations of site design and local geomorphology on tidal wetland function as a food web subsidy. Based on the data resources and information available, the AMT may recommend that an independent workshop or peer review panel be convened to assist with evaluation and collecting lessons learned. Information gathered through syntheses, workshops, and/or independent review panels will be used to inform future tidal wetland restoration designs and future reinitiation of consultation for the SWP and CVP with USFWS and NMFS and ITP amendments for the SWP with CDFW.

*c) Adaptive Management Technical Teams:*

*i.* DWR and CDFW will lead evaluations of land management actions to inform and develop changes to site specific Long-term Management Plans based on information gained through evaluation of specific management practices and will coordinate accordingly with Reclamation, USFWS and NMFS on plan revisions.

*ii.* An inter-agency technical team composed of scientists from DWR, Reclamation, CDFW, USFWS, and state and federal water contracting entities, as well as any consultants contracted for focused research on specific uncertainties regarding tidal wetland restoration will be responsible for data analyses and synthesis work. This team will work with the AMSC to prioritize data analyses that are responsive to specific hypotheses regarding tidal wetland restoration effectiveness as a food subsidy and juvenile salmon rearing habitat. At milestones for analysis and reporting of special studies or multi-year syntheses, the inter-agency technical team will present its findings to the Interagency Ecological Program's Tidal Wetland Project Work Team, which is an open and collaborative venue for exchange of scientific ideas and information.

7) Tributary Habitat Restoration Effectiveness for Salmonid Fishes

*a)* *Brief Description:* The Upper Sacramento River Anadromous Fish Habitat Restoration Project Monitoring Plan and Protocols (2017) are designed to determine the effectiveness of the Upper Sacramento River Anadromous Fish Habitat Restoration Project (referred to Project henceforth) in meeting identified objectives and to validate the linkage between restoration actions and the biologic response to those actions. This monitoring plan follows the framework for detecting biological responses to flow management described by Souchon et al. (2008). Monitoring methods structured as field protocols are described in the Plan and Protocols including control site selection, longitudinal profile and cross sections, juvenile habitat mapping protocols, snorkel survey protocols, seining, enclosure studies, invertebrate drift sampling, redd surveys, and stream temperatures.

*b)* *Assigned AM Bins:* ***Bin 1 and 3***

**Bin 1**: Some actions involving annual land management practices will be evaluated on an annual or biannual basis. These evaluations may inform revisions to site-specific Long-term Management Plans, which are required of DWR and Reclamation as part of the mitigation.

**Bin 3:** Monitoring and targeted studies to address specific uncertainties regarding effectiveness of tributary habitat restoration inform the Science Integration Team's decision support models. The AMT will review recommendations from decision support models to assess critical uncertainties to understand the effectiveness of tributary habitat restoration in providing spawning and refuge habitat to benefit Chinook Salmon, monitoring occurring as part of the Anadromous Fish Habitat Restoration Program throughout the permitted period.

c) *Adaptive Management Technical Team:* The existing CVPIA Upper Sacramento River Habitat Restoration Technical Team includes Reclamation, USFWS, NMFS, CDFW, consultants (e.g., Chico State University, PSMFC), and recipients of competitive funding for habitat restoration will be utilized as the AMT for this action.

8) Shasta Spring Pulse Studies

*a) Brief Description:* Reclamation will release up to 150 thousand acre feet (TAF) in pulse flow(s) each water year to benefit Chinook Salmon in the Sacramento River watershed. In 2021, a multi-year Upper Sacramento River Spring Pulse Flow Study Plan was developed by Reclamation in coordination with CDFW, USFWS, NMFS, SWRCB, UCSC, and SRSC. The timing, magnitude, duration, and frequency of the pulse flows will be evaluated and refined by the Sacramento River Group (SRG) on an annual basis and with the intent of maximizing multi-species benefits, which may include coordinating timing of pulse flows with natural flow events and/or pulse flows in tributaries. The pulse flow schedule will be planned by the agencies and stakeholders in the SRG and implemented annually by Reclamation. Reclamation will reduce the volume of a pulse flow, not release a pulse flow, or apply the water to another purpose only if CDFW, NMFS, or USFWS determines that these alternatives will be more beneficial to fish species. CDFW or NMFS would consider reducing the volume of a pulse flow or not releasing a pulse flow if, for example:

*i.* the releases would increase the forecasted winter-run Chinook Salmon mean annual temperature dependent mortality (TDM) by 10% or more, or

*ii.* the 150 TAF pulse flow volume (regardless of when it is released) would decrease the forecasted end of April Shasta storage to below 2.2 MAF using the February 90% exceedance forecast.

*b) Assigned AM Bin:* **Bins 2 and 3**

**Bin 2:** Hindcast evaluation of action effectiveness that includes technical review of the functional elements of the pulse flow (i.e., timing, magnitude, duration, and frequency) as well as an evaluation of criteria used to support beneficial use decisions.

**Bin 3:** If Bin 2 evaluations indicate a set of triggers and or the timing and magnitude of spring pulse flows are beyond what was considered in the Proposed Action or review of conditions, triggers, and effects after multiple years of implementation across a range of hydrologic conditions determines there is new understanding and/or information that is significantly different from what was applied to the effects analysis at the time of ESA consultation initiation. Reviews will also provide an opportunity to consider refined understanding and potential applications to other tributaries, divisions, or systems.

*c) Adaptive Management Technical Team:*

Bin 2 responsibilities would be assigned to the SRG.

Bin 3 responsibilities would be assigned to the SRG, SHOT, and the AMSC.

9) Winter-run Chinook Salmon Through-Delta Survival and Salvage Thresholds

*a) Brief Description:* There is considerable uncertainty surrounding the implications of facility loss of juvenile Sacramento River winter-run Chinook Salmon at CVP and SWP facilities for through-Delta survival in the Central Valley Bay-Delta. Juvenile salmon through-Delta survival, as

measured at Chipps Island (Delta exit), accounts for route-specific survival and migration routing through different migratory pathways. Field and modeling studies will address these uncertainties by conducting the following analyses: 1) an acoustic receiver network and associated real-time modeling of the data, 2) targeted acoustic telemetry studies (i.e., tag fish and release them in the Delta, 3) retrospective analyses of data to evaluate through-Delta survival due to LTO operations, 4) incorporation and consideration of any additional routing and survival data obtained, 5) evaluation of the sensitivity of winter-run Chinook Salmon population dynamics, relative to recovery and viability criteria, to through-Delta survival using lifecycle modeling, and 6) analyses of the relationship between loss at facilities and broader Delta conditions using a combination of particle tracking models. Several lifecycle models, including simplified simulation-based approaches, the CVPIA SIT DSM, and the SWFSC Winter-run Chinook Salmon Lifecycle Model, may be considered to evaluate winter-run Chinook Salmon population responses to varying Delta conditions and identify a target Delta survival. We propose using multiple particle tracking models (e.g., PTM, ecoPTM, ePTM), with competing tradeoffs related to ease of implementation and assumptions about particle movement and mortality, to assess relationships between loss at facilities and Delta survival.

b) *Assigned AM Bin:* **Bin 2**
Studies will be completed to address uncertainties in the estimation of through-Delta survival. These newly generated modeling results will be used to propose and update decision support tools for juvenile Chinook Salmon related to outmigration survival and entrainment risk and may change the triggers for export reductions. This work may be of interest to independent review panels. New information and its application may inform future reinitiation of consultation and ITP amendments.

c) *Adaptive Management Technical Team:* This work has been of interest to the Science Integration Team (SIT), which has identified these studies as critical for reducing uncertainty in entrainment risk management. Field coordination and implementation of these studies has occurred through the Interagency Telemetry Advisory Group (ITAG) since 2018. Technical review may occur through the SIT and/or ITAG.

10) Longfin Smelt Science Plan Actions
a) *Brief Description:* ITP Condition of Approval 7.8.1 and the Special Studies Section of the Proposed Action describes the continued implementation of the Longfin Smelt Science Program and updating its science plan. The science plan is a roadmap for addressing substantial gaps in our understanding of the biology and ecology of Longfin Smelt, which include management activities needed to prevent further decline of the species within the San Francisco Estuary. To accomplish this, the Longfin Smelt Technical Team (LFSTT) will continue to develop and support the ongoing activities of the Longfin Smelt Science Program. These activities will address one or more of the seven Priority Areas of the science plan and are expected to produce valuable information for resource managers. These Priority Areas are: 1) continued development of the Longfin Smelt lifecycle model, 2) providing input and guidance for the Longfin Smelt culture program, 3) improved distribution monitoring, 4) improved larval entrainment monitoring, 5) improved understanding of spawning and rearing habitat, 6) understanding migration and movement behaviors, and 7) factors which affect abundance, growth, and survival. Findings

from the scientific activities conducted within the program will inform considerations for future consultations and ITPs. However, if new information pertinent to real-time operations for Longfin Smelt entrainment or if LFSTT provides other information relevant to management actions for Longfin Smelt during the term of the BiOp or ITP, trigger re-initiation of consultation or an ITP amendment for the actions.

b) *Assigned AM Bin:* **Bin 2**
A Longfin Smelt Science Plan has been developed and implementation of high priority individual science actions has begun. Actions already underway include development of a Longfin Smelt lifecycle model, establishing Longfin Smelt in culture, and improved distribution monitoring. The LFSTT has prioritized science actions to allow for sequenced implementation and completion over the course of the next eight years. As a result, actions will be ready for evaluation and be available to inform development of a subsequent permit/consultation.

c) *Adaptive Management Technical Team:* The Longfin Smelt Technical Team (LFSTT) would be assigned all responsibilities for guiding implementation of each Longfin Smelt Science Action identified in the Longfin Smelt Science Plan. The LFSTT is co-lead by DWR and CDFW and includes representatives from USFWS, Reclamation, and the State/Federal Water Contractors.

11) Delta Smelt Supplementation

*a) Brief Description:* DWR and Reclamation propose to support continued experimental releases and the development of a program to conduct supplementation of the wild Delta Smelt population with propagated fish consistent with USFWS' Supplementation Strategy (USFWS 2020). Reclamation and DWR will ensure production ramps up to a minimum of 125,000 fish by water year 2024, a minimum of 150,000 fish by water year 2025 and a minimum of 200,000 fish by water year 2026 that are at least 200 days post-hatch (dph) or equivalent as informed by CDFW and USFWS. USFWS and CDFW, in coordination with Reclamation and DWR, will update the Supplementation Strategy to incorporate new findings from the program and update performance metrics used to guide production targets and methods development.

*b) Assigned AM Bin:* **Bins 1 and 2**

**Bin 1**: A process to evaluate production targets to support supplementation will be developed and implemented no less than annually via the existing Culture and Supplementation of Smelt (CASS) Steering Committee. Outcomes of the review may include but are not limited to revisions of production numbers, timeline, release methods, monitoring, and genetic management strategies. These findings will be incorporated into the Supplementation Strategy and will serve as guidance for the program.

**Bin 2:** Additionally, an independent peer review of the program may be conducted on a 5-year basis at the discretion of the AMSC.

*c) Adaptive Management Technical Team:* The CASS group was created in 2019 and is comprised of participants from Reclamation, DWR, CDFW, and USFWS. This body provides oversight in advancing science-based management activities to secure and stabilize the Delta Smelt

population through a coordinated propagation and supplementation program. The CASS Steering Committee shall continue to provide guidance to its three working groups: 1) Captive Propagation Working Group, 2) Research Working Group, and 3) Regulatory Working Group. The CASS Steering Committee may be integrated into the AMSC following formation of the AMSC.

12) Steelhead JPE

*a)* *Brief description*: Reclamation proposes to develop a steelhead JPE for tributaries with CVP facilities that will focus on the annual production of outmigrating juvenile steelhead. Data used in the JPE will inform the status and trends of Sacramento and San Joaquin basin steelhead and may also help inform actions that will increase steelhead abundance and improve steelhead survival through the Delta.

*b)* *Assigned AM Bin*: **Bin 2**
Reclamation and DWR propose to conduct the first four-year independent panel review (2024) from data generated from the Stanislaus River steelhead life-cycle monitoring program. Beginning Fall 2025 and based upon incorporated 2024 review panel feedback and recommendations, Reclamation and DWR will work with the technical team to consider implementing an expanded JPE framework to the San Joaquin and Sacramento basins. By Summer 2026, Reclamation and DWR will decide to address deficiencies in the JPE framework and/or expand the JPE framework to remaining CVP or SWP tributaries. Reclamation and DWR propose to conduct the second four-year independent panel review (2028) from data generated from the San Joaquin and Sacramento basins JPE.

*c)* *Adaptive Management Technical Team*: Reclamation and DWR, in coordination with USFWS, NMFS, CDFW, and interested stakeholders will create or use an existing technical team should one be later identified to develop the steelhead JPE framework and incorporate feedback from the 2024 and 2028 panel reviews.

13) Alternative Salmonid Loss Estimation Pilot Study

*a)* *Brief description*: DWR, in coordination with Reclamation, has completed a draft updated Alternative Loss Equation (ALE-22) software tool for estimating winter-run and spring-run Chinook Salmon and Central Valley steelhead losses at the SWP and CVP export facilities. DWR, in coordination with Reclamation and the Alternative Loss Equation Technical Team (ALE-TT), a proposed new sub-team of the Central Valley Fish Facilities Review Team (CVFFRT), will further refine the parameters of this tool by developing an Alternative Loss Pilot Study Implementation Plan (ALPS-IP) to implement this tool in parallel with current loss estimation methods and incorporate SDM to prioritize the implementation of loss component studies and performance evaluation studies. The goal of this pilot study is to provide a more accurate estimates of salmonid loss, and loss parameters, at the SWP and CVP export facilities while understanding the utility of the new alternative method relative to the existing method.

*b)* *Assigned AM Bin*: **Bin 2**
Within the first year of the effective date of the ROD or ITP, DWR, in collaboration with Reclamation, will convene the ALE-TT and conduct a knowledge transfer and methods workshop for the ALE-22 tool and prepare a draft ALPS-IP for ALE-TT review. Within the second year of the

effective date of the ROD or ITP, DWR will submit the final draft ALPS-IP for both the ALE-TT and AMSC review. DWR will finalize the ALPS-IP once approved by the AMSC and establish priorities for implementation (e.g., loss parameter studies) using SDM within the ALE-TT. The ALE-TT may utilize an independent science panel review to further enhance the SDM prioritization process. In the third year of the effective date of the ROD or ITP, DWR will submit prioritized ALPS-IP recommendations, informed by the ALE-TT SDM process, to the AMSC for approval. The permittee shall then update the loss equation with refinement to the loss equation components as approved by CDFW.

c) *Adaptive Management Technical Team*:
   i. Knowledge transfer and methods workshop: DWR and Reclamation will convene the ALE-TT, with membership comprised of DWR, Reclamation, CDFW, USFWS, NMFS, and State/Federal Water Contractors representatives, as well as other interested stakeholders.
   ii. Review of the initial draft ALPS-IP: ALE-TT
   iii. Review of the final draft ALPS-IP: ALE-TT, AMSC, as well as input from the CVFFRT and Salmonid Monitoring Team (SaMT)
   iv. SDM Prioritization of ALPS-IP: ALE-TT, with support from an independent review panel if requested.

14) Shasta Cold Water Pool Management
   a) *Brief Description:* Reclamation will operate Shasta Reservoir to build a cold-water pool and use the Temperature Control Device (TCD) on Shasta Dam to blend water from different reservoir strata to protect downstream winter-run Chinook Salmon returning adults and incubating eggs from temperature stressors. An annual operation of the Shasta TCD and the development of the temperature management plan will be developed as part of real-time operations. Shasta Reservoir cold water pool management will rely on an objectives-based management framework adapted from the multi-year drought sequence experienced in Victoria, Australia (Mount et al. 2016) that considers the available hydrology to "Protect," "Maintain," "Recover," and "Enhance," protected species, habitats, and water deliveries. An initial set of objectives and metrics will be further refined according to increased understanding of species needs, interannual hydrologic conditions (e.g., drought) and operational limitations.

   b) *Assigned AM Bin:* **Bin 2**
   Hindcast evaluation of action effectiveness that includes a review of the objectives and metrics used to guide annual temperature planning. Objective-based storage targets and temperature dependent mortality will be considered with regards to their ability to support species viability and water delivery performance.

   c) *Adaptive Management Technical Team:* Evaluation of action effectiveness and objective-based criteria would be assigned to the SRG.

15) Georgiana Slough Salmonid Migratory Barrier Effectiveness for salmonid fishes
   a) *Brief Description:* DWR in coordination with Reclamation will continue to 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 salmonids. Operation of the salmonid

migratory barrier should improve the seasonally averaged through-Delta survival probability to Chipps Island compared with survival probability if the salmonid barrier were not in operation. Barrier operations and monitoring details are defined in the Georgiana Slough Salmonid Migratory Barrier (GSSMB) Operations and Monitoring Plans developed by the GSSMB Coordination Group. To further maximize seasonal survival benefits to migrating salmonids, DWR and Reclamation will continue leading the GSSMB Coordination Group, with membership comprised of DWR, Reclamation, CDFW, USFWS, NMFS, and State/Federal Water Contractors representatives. DWR and Reclamation, working with the GSSMB Coordination Group, will provide at least a triennial report and review and update, as necessary, the GSSMB Operations and Monitoring Plans.

b) *Assigned AM Bin:* **Bin 2**
Triennial report of GSSMB operations and monitoring that can be used to inform necessary changes/updates to the Operations and Monitoring Plans.

c) *Adaptive Management Technical Team:* Triennial report and updating the GSSMB Operations and Management Plan would be assigned to the GSSMB Coordination Group.

16) Spring Outflow

a) *Brief Description:* Reclamation and DWR will supplement Delta outflow during spring months per the terms of the Voluntary Agreements (VAs) as described in the March 2022 Voluntary Agreement Term Sheet, revised in November 2022. Actions that will support the additional Delta outflow include Reclamation and DWR south of Delta export modifications, Reclamation reoperating upstream reservoirs to advance and allow for scheduling of water made available by contractors in CVP watersheds and passing Delta inflow from water made available by VA Parties. In the latter case, spring flow pulses on VA tributary systems (Sacramento, American, Feather, Mokelumne, Yuba, and Tuolumne rivers and Putah Creek) are intended to benefit juvenile Chinook Salmon growth and survival in the tributaries while also contributing to increased Delta outflows. The increased Delta outflows are intended to benefit Chinook Salmon outmigration survival in the Delta and enhance habitat for native estuarine fishes, including Delta Smelt and Longfin Smelt. The amount of supplemental Delta outflows will vary by water year type, with 750 – 825 TAF provided in Dry, Below Normal, and Above Normal years, and approximately 150 TAF provided in Critical and Wet years. The supplemental flows will occur during the months of March through May and prioritized during the period of April 1 – May 31. The details of flow amounts by source and water year type are provided in ITP Condition of Approval 8.12.2 and the PA and in the November 2022 revision of the March 2022 Voluntary Agreement Term Sheet. Supplemental spring Delta outflows are proposed as part of a path of implementation for an updated SWRCB Bay-Delta Water Quality Control Plan. In advance of the SWRCB's decision regarding the VA proposal, the supplemental Delta outflows will occur as an early implementation action and continue if and when the SWRCB incorporates the VA actions into an updated Water Quality Control Plan. During implementation, supplemental spring flows will be managed by real-time operation groups to determine the source, schedule, and amount of water to ensure consistency with proposed flow levels as described in the Voluntary Agreement Term Sheet.

b) *Assigned AM Bin:* **Bin 3**

For a synthetic, multi-year evaluation of the performance of increased spring Delta outflows to inform the next reinitiation of consultation for long-term operations of the SWP and CVP and development of a California Endangered Species Act ITP.

c) *Adaptive Management Technical Team:* The Voluntary Agreement Science Committee (VASC) is facilitated by an independent third party and is comprised of scientists and science managers from DWR, Reclamation, CDFW, NMFS, USFWS, and the Public Water Agency organizations of the VA Parties, with staff from the SWRCB participating in an advisory capacity. The Voluntary Agreement Term Sheet includes provisions for a VA Science Program to support adaptive management of VA actions, including increased spring flows on tributaries and Delta outflow. The VASC intends to use quantitative decision-support tools (e.g., lifecycle models for Chinook Salmon) and SDM processes to provide recommendations to the VA Program's decision-making body, the Systemwide Governance Committee. To support the VA program's adaptive management process, the VASC has developed a draft VA Science Plan, which contains hypotheses, metrics, and baselines for evaluating increased spring Delta outflows and pulse flows on tributaries. The draft VA Science Plan thus provides a framework for a multi-year evaluation of whether supplemental spring flows are performing according to expectations and will inform the SWRCB evaluation of the VA Program in Years 6 – 8 of the program, including how and whether the VA Program should continue after Year 8. The VASC will support adaptive management of spring outflows for the Biological Opinion by providing the multi-year, synthetic evaluation developed for the VA Program to the AMSC to inform future major reinitiation of consultation and ITP amendments.

17) Clear Creek

*a) Brief Description:* A draft proposal from Reclamation for long term Clear Creek/Whiskeytown Reservoir operations includes a novel approach to exerting desirable intra-annual flow variability. A draft new flow regime would implement variable flows over the course of a year that would range from flow releases as low as 100 cfs in late summer, adapting flow needs during spring-run Chinook Salmon spawning/the onset of fall-run spawning in September/October, and (ultimately) slowly ramping up to 300 cfs in the winter when fry could benefit from seasonally inundated surfaces, then ramping back down to 100 cfs the following summer to start again. This flow variability will create a more natural seasonally variable hydrograph and is expected to provide opportunity for gravel augmentation or other restoration to target surface elevations and channel form for seasonal inundation to benefit salmon rearing. There are expected benefits and potential consequences from these changes. Continuation of existing, and some proposed, monitoring efforts including but not limited to RBFWO maintained temperature loggers, Potential Spawning Area Mapping (PSAM), Spawn Area Mapping (SAM), rotary screw trapping, spawning surveys, snorkel surveys, video weir, redd mapping, and proposed habitat monitoring will be important for evaluation of these management actions.

*b) Assigned AM Bin:* **Bin 2**

An adaptive management and monitoring approach to the new flow regime and/or temperature criteria will be useful for determining if the flow variability indeed provides viable opportunity to contribute to restoring channel form and floodplain elevations to targeting rearing habitat and improved growth and survival for juvenile salmon, and for guiding adjustments to flow and temperature criteria if necessary. It is anticipated that adaptive management refinements would

occur at approximately three-year intervals, although more frequent refinements may be necessary in the first few years of implementing the new flow regime.

c) *Adaptive Management Technical Team:* Field coordination and implementation of monitoring studies would occur though the existing Clear Creek Technical Team (CCTT) work team. The CCTT, with representatives from Reclamation, USFWS, NMFS, DWR, CDFW and others, provides Central Valley Operations with an annual pulse flow and temperature management proposal. This proposal details the CCTT's request for pulse flow releases from Whiskeytown Dam (e.g., flow schedule, ramping rates, peak flow) and water temperature management, as well as background information on fish monitoring and proposal rationale. It is anticipated that the CCTT will continue to provide annual proposals and that they will include details on how best to implement the variable flow regime and meet water temperature criteria. Additionally, the CCTT is anticipated to review outcomes of the flow regime and make suggestions to improve future management actions for the benefit of fish and wildlife on Clear Creek. Additionally, the CCTT provides Reclamation with an annual summary of management activities on Clear Creek. These reports highlight the past water year's conditions, management actions and results, habitat restoration projects, fisheries monitoring data, and the CCTT's meeting discussions. It is anticipated that these annual summaries will continue to provide evaluations and potential refinements for future year's implementation of flow and temperature management.

# Chinook Salmon Loss Estimation
# for
# Skinner Delta Fish Protective Facility and Tracy Fish Collection Facility

7/9/2018

## I. Introduction

Estimates of salmon loss are based on fish salvage and operational data collected at the John E. Skinner Delta Fish Protective Facility (Skinner) and the Tracy Fish Collection Facility (Tracy). Loss calculations utilize estimates based on DFG studies of screening efficiency, handling and trucking mortality due to operation of the Skinner facility, and pre-screening losses occurring in Clifton Court Forebay (CCF) and the intake channel.

## II. Loss Estimation

There are 4 essential components of loss estimation: salvage, pre-screen loss (predation), screen (louver) efficiency, and handling and trucking loss. Losses are estimated from the time salmon enter Clifton Court Forebay (at Skinner) or across the trash racks (at Tracy) to the time they are released back into the Delta. Salmon are lost in two ways before they are collected in the facility: 1) they might be eaten by predatory fish, or 2) they might pass through the louvers and then exported along with Delta water. Once collected, fish loss occurs when some fish die in the process of being handled or trucked.

### A. Salvage Estimation

The first step in estimating loss is to estimate fish salvage. Salvage is estimated from samples (counts) of fish collected at least every two hours while water is being pumped.

SALVAGE = Observed number of fish x (Total minutes pumping ÷ Count length)

Exceptions: If the fish is observed in a predator removal, then SALVAGE = Observed number of fish x 1. Count length is also adjusted for time that the secondary is shut down and no salvage took place
If the fish is observed during a special study, then SALVAGE = 0.

Example: 1 salmon in count * (120 min. pumping / 10 min. count length) → SALVAGE = 12

## B. Entrainment Estimation

The number of fish that are entrained into the facilities is estimated in two steps. First we estimate how many fish encountered the screens, the second step is to estimate how many fish entered the facility.

### 1. Encounter Estimation

We have already estimated how many salmon were collected (salvage), but since the screens are not 100% efficient, we know some fish passed through and were lost. Estimating the number of fish encountering the screens depends on fish size. Efficiency is generally higher for fish < 100 mm than for fish > 100 mm. The fish's ability to avoid the louvers and enter the bypass also depends on the water velocity through the louvers. For small fish, higher velocities will make it more difficult for them to avoid the louvers and will increase the likelihood that they will pass through the louvers and will be lost. The number of fish encountering the screens (ENCOUNT) is calculated by dividing the salvage (SALVAGE ) by the screen efficiency (EFF).

If Length < 101 mm ⟶ ENCOUNT = SALVAGE/EFF1;
If Length > 100 mm ⟶ ENCOUNT = SALVAGE/EFF2;

EFF1 = 0.630 + (0.0494 * (Primary Channel Flow /(Primary Channel Depth * Width)))
EFF2 = 0.568 + (0.0579 * (Primary Channel Flow /(Primary Channel Depth * Width)))

Note: Channel width at Skinner depends on the number of bays open. As the pumping rate changes, bays are opened and closed to maintain primary channel approach velocities and bypass ratios within established criteria. Channel width at Tracy is fixed (84 ft).

### 2. Entrainment Estimation

The number of fish entrained (ENTRAIN) is calculated by dividing the number of fish encountering the screens (ENCOUNT) by the proportion of fish assumed to survive the journey to the louvers (1 – P). The pre-screen loss rate (P) is the rate of loss to entrained salmon during movement from the radial gates (Skinner) or trash racks (Tracy) to the louvers. The pre-screen loss at Skinner is based on an average of measured pre-screen loss rates in CCF for chinook salmon (75%). The pre-screen loss rate at Tracy is an agreed-upon value (15%).

ENTRAIN = ENCOUNT / (1 – P)

For Skinner: P = 0.75
For Tracy: P = 0.15

**C. Live Release Estimation**

We then estimate the number of salvaged fish that will survive the process of being transferred from the holding tanks to the truck and transported back to the Delta. This estimate is based on studies with salmon at the Skinner facility and depends on salmon length. Mortality during the transport process has been referred to as handling and trucking loss. For salmon less than or equal to 100 mm, mortality is assumed to be 2% and for salmon larger than 100 mm, mortality is assumed to be 0.

If length < 101 mm ⟶ RELEASE = SALVAGE x (1 – 0.02)
If length > 100 mm ⟶ RELEASE = SALVAGE

Note: Trucking and handling loss is combined into a single rate (2% for smaller fish).

**D. System Loss Estimation**

The final step in loss estimation is to subtract the estimated number of fish released alive from the estimated number of fish entrained.

LOSS = ENTRAIN – RELEASE

Exceptions:
If the fish is observed in a Skinner predator removal, then LOSS = SALVAGE x 4.33
If the fish is observed in a Tracy predator removal, then LOSS = SALVAGE x 0.569
If the fish is observed in a special study, then LOSS = 0
If a Non Clipped salmon is accidentally killed and not released, then 1 is added to the loss number to account for the lost salmon

**III. Loss Calculation Examples**:

A. Skinner:

1 salmon observed in count * (120 min. pumping / 10 count length) ⟶ Salvage = 12, but some fish went through louvers and were not salvaged, so...

If < 101 mm, # fish encountering screens = 12 / (0.63 + (0.0494 * (2260 cfs / 20 ft.* 106 ft))) = 17.6

But, most of the salmon were eaten before they got to the louvers, so... # fish entrained = 17.6 / (1-.75) = 70.4

But, we were able to release some of these fish back into the delta alive, so if fish < 100 mm... # fish released = 12 * (1 – .02) = 11.8

So, loss is the number of fish entrained minus the number of fish released alive... # fish lost = 70.4 - 11.8 = 58.6

B. Tracy:

1 salmon observed in count * (120 min. pumping / 10 count length) ⟶ Salvage = 12, but some fish went through louvers and were not salvaged, so...

If < 101 mm, # fish encountering screens = 12 / (0.63 + (0.0494 * 2806 cfs / (16.7 ft.* 84 ft))) = 16.4

But, most of the salmon were eaten before they got to the louvers, so... # fish entrained = 16.4 / (1-.15) = 19.3

But, we were able to release some of these fish back into the delta alive, so if fish < 100 mm... # fish released = 12 * (1 – .02) = 11.8

So, loss is the number of fish entrained minus the number of fish released alive... # fish lost = 19.3 - 11.8 = 7.5