State Water Project Incidental Take Permit Risk Assessment for Winter-run and Spring-run Chinook Salmon

Section 1: Overview

Date: 1/19/2021

Life Stages Present:

Winter-run Chinook Salmon (juvenile)
Winter-run Chinook Salmon (adult)
Spring-run Chinook Salmon (juvenile)

Advice to WOMT:
No advice is warranted.

The controlling factor for State Water Project (SWP) and Central Valley Project (CVP) exports is water quality under D-1641. The 2020 SWP Incidental Take Permit (ITP) Conditions of Approval (COA) for salmonids are unlikely to control exports for the week beginning 1/19/2021. Old and Middle River (OMR) flow is currently -1,900 cfs on 1/19/2021 which is more positive than the base level cfs OMR flow requirement of -5,000 cfs under (COA) 8.3 (Onset of OMR Management) and more positive than the OMR flow restrictions for daily and yearly loss thresholds (COA 8.6.3 [Mid- and Late-season Natural Winter-run Chinook Salmon Daily Loss Threshold] and COA 8.6.1 [Winter-run Single-year Loss Threshold], respectively) should those conditions be triggered. COA 8.3.2 (Salmonid Presence) and COA 8.6.3 have been in effect since 1/1/2021. COA 8.6.4 (Daily spring-run (SR)Chinook Salmon Hatchery Surrogate Loss Threshold) does not begin until February with the onset of hatchery release groups. The Salmon Monitoring Team (SaMT) anticipates only a minimal risk of exceeding any natural juvenile winter-run Chinook salmon single-year or daily loss thresholds due to the current estimated distributions of fish, forecasted weather conditions, and forecasted operations for the next week. Any significant precipitation events could trigger a substantial redistribution of fish into the Delta, which will require SaMT to monitor COA 8.6.3; however, significant events are not projected for the coming week.

This week (beginning 1/19/2021) the neap tide cycle prevails early in the week with Freeport flows higher than expected allowing CVP exports to increase to approximately 1,650 cfs tomorrow (1/20/2021) from 800 cfs today (1/19/2021). SWP exports are projected to remain steady at 1,500 cfs. Over the course of the week, temperatures will gradually cool with readings returning to around average by the end of the week. Precipitation chances return to the region beginning Friday (1/22/2021) and potentially the following week. Based on these parameters SWP exports are expected to remain steady and the increase in CVP exports is expected to be short-term unless forecasted precipitation allows the increase in exports to continue. The forecasted precipitation is not expected to be significant and unlikely to cause major changes to the overall system hydrology.

At this time, juvenile winter-run Chinook salmon are mainly in the rearing and migratory phases of their life history and distributing downstream within the Sacramento River system and Delta. Very few juvenile winter-run Chinook salmon have been detected downstream of the Glenn-Colusa Irrigation District's (GCID) monitoring site as they migrate towards the Delta and the in-Delta sampling programs. Many of the Delta

monitoring programs, including those in the south Delta, such as the Enhanced Delta Smelt Monitoring surveys, have detected minimal to no juvenile salmonids in the north and south Delta. Given the seasonal timing, river conditions, low detection, and reduced efficiency of sampling apparatuses, the SaMT has estimated a wide range in the proportion of the juvenile winter-run Chinook salmon population now present in the Delta (30-60%) to reflect uncertainty in distribution. The forecast and recent releases of hatchery late fall-run Chinook salmon into the Sacramento River may encourage winter-run Chinook salmon movement downstream, of winter-run Chinook juveniles (i.e., pied piper effect), thereby elevating exposure risk as indicated by the salvage of the first late fall-run Chinook salmon (ad-clipped) at the CVP on Monday (1/18/2021).

The distribution of the juvenile natural origin winter-run Chinook salmon population estimated to be in the Delta in conjunction with flows forecasted at Freeport, CVP and SWP exports, OMR flows, and other biotic and abiotic factors, result in an overall risk of entrainment into the central and south Delta from the Sacramento River similar to the previous week and estimated to remain medium. Although one adipose clipped late fall-run Chinook salmon was observed at the salvage facilities and seasonal timing would indicate fish are present in the south Delta, overall risk of entrainment into the facilities is estimated to remain low for natural origin winter-run Chinook salmon as they are expected to be in their juvenile the early transition phase rather than the actively emigrating smolt phase of their life history indicated by the length-at-date (LAD) range and thus less susceptible to entrainment at the facilities. Adult winter-run Chinook salmon are entering the Delta and Sacramento River on their spawning migration though this is not a factor in controlling export operations. Current operations are unlikely to have a significant impact on upstream adult migration. The Delta Cross Channel (DCC) gates, which if open would create false attraction cues to adult winter-run Chinook salmon that would delay upstream migration, are closed and will potentially remain closed until mid-May 2021, per Reclamation's Proposed Action (PA). Water quality concerns between now and through the end of January may necessitate a DCC gate opening but appear unlikely to occur. If drought conditions are observed (i.e., fall inflow conditions are less than 90% of historic flows) Reclamation and DWR will consider opening the DCC gates for up to 5 days for up to two events within this period to avoid D-1641 water quality exceedances. DWR and Reclamation will conduct an assessment, including DSM2 modeling of water quality conditions informed with recent hydrology, salinity, and tidal data to determine the need to open the gates. During a DCC gates opening between December 1 and January 31, the CVP and SWP will divert at Health and Safety pumping levels.

A preliminary winter-run juvenile production estimate (JPE) of 312,792 fish has been developed for natural winter-run Chinook salmon estimated to survive arrival to the Delta. The final winter-run JPE has been calculated by the Winter-run Chinook salmon Project Work Team and has been submitted to the agencies for final approvals and subsequent implementation. Currently, COA 8.6.1 (Winter-run Single-year Loss Threshold) and COA 8.6.3 (Mid- and Late-season Natural Winter-run Chinook Salmon Daily Loss Threshold) are being implemented based on the preliminary JPE for natural and hatchery-origin winter-run Chinook salmon[1]. The

[1] A preliminary estimate for hatchery origin winter-run Chinook salmon is included in the preliminary JPE calculation. The Winter-run Project Work Team JPE sub-team submitted a final winter-run JPE recommendation to NFMS and CDFW on January 15, 2021. NMFS and CDFW will issue a joint JPE that will be used to calculate the daily loss threshold and single-year loss thresholds for winter-run Chinook salmon once implementation is approved by WOMT. The hatchery-origin JPE is not currently applicable given that winter-run hatchery juveniles have not been released at this time. Hatchery releases are scheduled for February after the JPE will be finalized for BY 2020.

preliminary single-year loss threshold for juvenile winter-run Chinook salmon is 3,659 length-at-date winter-run juveniles and the preliminary daily loss threshold for the month of January is 19.86 older juveniles.

Juvenile spring-run Chinook salmon are emerging from the gravel and migrating downstream as fry and parr towards and into the Delta. A small number of juvenile spring-run Chinook salmon have been detected at monitoring stations within the Sacramento River and upper Delta regions. SaMT estimates that 10-20% of the young-of-year spring-run Chinook salmon population is now present in the Delta. Based on monitoring data, hydrological conditions, and seasonal timing, the SaMT estimates an overall low risk of entrainment into the interior Delta from the Sacramento River as well as an overall low risk of entrainment at the facilities for young-of-year spring-run Chinook salmon.

Risk Assessment:
Winter-run Chinook salmon:

Overall risk of entrainment of juvenile winter-run Chinook salmon into the central Delta remains the same as the previous week and is considered medium based on an increased estimate of distribution of juvenile winter-run Chinook salmon into the Delta. RBDD (river mile [RM] 243) and GCID (RM 205) RSTs continue to observe juvenile winter-run Chinook salmon, indicating ongoing downstream passage at these locations, yet minimal to no catch has been observed at the downstream monitoring locations closer to the Delta. Cumulative catch of length-at-date (LAD) juvenile winter-run Chinook salmon at GCID is 1,303 fish with 18 LAD juvenile winter-run Chinook salmon observed over the last week (1/12/2021 to 1/18/2021). Two juvenile winter-run Chinook salmon were observed at the Knights Landing monitoring station between 1/12/2021 and 1/17/2021 and one observed the beach seine survey at Verona last Thursday (1/14/2021). Historical RBDD passage trends, few detections in Delta monitoring stations, and lack of hydrological cues that are associated with triggering downstream movement indicate most of the population is rearing in the reaches downstream of RBDD. In the reach between RBDD and Colusa, the river is more sinuous than the lower reaches of the Sacramento River and includes a number of side channels that increase the overall edge habitat available to rearing fish. This edge habitat may provide additional upstream rearing areas. SaMT still estimates a significant proportion of the juvenile winter-run Chinook salmon population (40-70%) has yet to enter the Delta. However, SaMT members agree that current hydrological conditions (i.e., low turbidity and low flows) reduce trap capture efficiencies of the various downstream monitoring sites and allow fish to avoid the traps. Therefore, more fish may have distributed downstream than is currently estimated from the observations of catch from the downstream monitoring sites. An additional source of uncertainty is the effect of thiamine deficiency on natural origin fish survival which may have contributed to relatively low numbers of winter-run Chinook salmon reaching the Delta. This would cause low detections at Delta monitoring sites due to low upstream survival.

DCC gates are currently closed and will remain closed through mid-May 2021, per the PA operations description for the DCC gates. Water quality concerns between now and January may necessitate a DCC gate opening, although this is unlikely to occur (see previous section regarding opening the DCC gates during December and January under drought conditions). Flows measured at Freeport are forecasted to be in the range of 7,000 to 9,000 cfs and steady for the coming week. Flows measured at Vernalis for the upcoming week are also forecasted to be similar to last week, at an approximate range of 750 to 950 cfs. Based on low

flows in the Sacramento River this week, SaMT estimates a similar risk for juvenile winter-run Chinook salmon routing into the central Delta from the mainstem as was estimated for last week which remains at a medium level. Based on the current in-Delta distribution of juvenile winter-run Chinook salmon, seasonal timing, and hydrological conditions forecasted over the next week, the overall risk of entrainment into the central Delta is considered to be a medium risk. The first steelhead for water year 2021 was observed in salvage on Monday (1/11/2021) and the first Chinook salmon salvage occurred the following Monday (1/18/2021). These observations in conjunction with seasonal timing indicate that fish are present in the south Delta. Exposure risk of entrainment at the facilities is elevated from last week yet still remains at a low level. The forecasted range of operations for this upcoming week includes a range of exports generating OMR flows of -1,000 to -3,500 cfs, resulting in a low risk of routing into the south Delta towards the export facilities for fish already present in the central and south Delta. The risk of entrainment at the facilities or exceeding a JPE scaled daily loss threshold remains in the low category. The overall low risk of entrainment into the facilities is based on the low numbers of fish believed to be in the central and south Delta at this time.

Risk Assessment:

Spring-run Chinook salmon:

Risk of entrainment to juvenile spring-run Chinook salmon into the central Delta is similar to last week and is still considered to be low. Cumulative seasonal catch of LAD juvenile spring-run Chinook salmon at the GCID RST is 92 fish, with six juveniles observed over the past week (1/12/2021 to 1/18/2021). No juvenile spring-run Chinook salmon were observed at the Delta monitoring stations over the last week. Beginning on 10/21/2020, flows in Mill Creek have been greater than 95 cfs indicating river conditions that are consistent with downstream movement of yearling spring-run Chinook salmon out of the tributaries and into the mainstem upper Sacramento River. Flows were also greater than 95 cfs in Deer Creek this week and have been since 12/26/2020. Monitoring in Butte Creek indicates young-of-year and yearling spring-run Chinook salmon are moving downstream in this tributary towards the Sacramento River. SaMT estimates that most of the population of young-of-year juvenile spring-run Chinook salmon (80-90%) has yet to enter the Delta. Routing risk of juvenile spring-run Chinook salmon into the central Delta remains in the medium risk level, consistent with juvenile winter-run Chinook salmon risk regarding forecasted hydrology. Based on the current distribution and seasonal timing, overall risk of entrainment into the central Delta remains low. Exposure risk to entrainment at the facilities remains similar to last week and continues to remain low for young-of-year spring-run Chinook salmon. The range of exports and more negative OMR forecasted will have similar effects upon juvenile spring-run Chinook salmon as described for juvenile winter-run Chinook salmon. Based on fish distribution in the central and south Delta, the overall risk of entrainment at the facilities remains in the low category. Note that approximately 66,912 brood year 2020 late fall-run Chinook salmon that function as surrogates for yearling spring-run Chinook salmon to inform their distribution were released from Coleman National Fish Hatchery on 1/8/2021.

Section 1-A: Sacramento River and Confluence

Assessment of risk of entrainment into the central Delta and CVP/SWP facilities for CHNWR and CHNSR in the Sacramento River: (8.1.5.1 C ii, iii, iv and 8.1.5.1 B iii)

- Exposure Risk:
  - CHNWR: Medium
  - CHNSR: Low
- Routing Risk:
  - CHNWR: Medium
  - CHNSR: Medium
- Overall Entrainment Risk:
  - CHNWR: Medium
  - CHNSR: Low
- Change in risk of entrainment into the central Delta (increased/decreased risk compared to last week):
  - CHNWR: Exposure risk is similar to last week based on the estimated percentage of the population expected to be in the Delta and is still considered to be medium this week. Currently, 30-60% of the juvenile CHNWR population is estimated to be present in the Delta for this week. The wide range of estimated distribution of juvenile CHNWR in the Delta is intended to characterize the uncertainty associated with the evaluation of historical timing and the few detections in the Delta monitoring stations. Precipitation is projected for Friday (1/22/2021) and potentially next week, but these events are not deemed to be significant and likely will not increase river flows substantially. However, the ongoing maturation of juveniles for this time of year coupled the recent releases of hatchery late fall-run Chinook salmons may increase the distribution of CHNWR into the Delta by encouraging natural origin fish movement downstream. Routing risk is medium. DCC gates have been closed since 12/1/2020 and are anticipated to remain closed until mid-May 2021. Sacramento River flows measured at Freeport are forecasted to remain similar over the next week compared to the previous week and remain below levels that would be expected to move the transition zone between riverine and tidal reaches downstream of the vicinity of key junctions. The neap tide cycle this week should reduce redirection of additional Sacramento River flows into Georgiana Slough during an incoming tide compared to the previous week. Vernalis flows are forecasted to be similar compared to the previous week. Based on the current in-Delta distribution, seasonal timing, and forecasted operations, overall risk of entrainment for juvenile CHNWR into the central Delta is medium.
  - CHNSR: Exposure risk remains similar to last week based on low numbers of juvenile CHNSR in the mainstem Sacramento River system and their distribution primarily upstream of Knights Landing. Currently, 10-20% of the young-of-year CHNSR population is estimated to be present in the Delta this week. Precipitation events as described above may increase distribution into the Delta. However, exposure risk is estimated to remain low based on current population distribution estimates. Routing risk is similar to the effects described for CHNWR based on forecasted Sacramento River flows at Freeport, resulting in a medium risk level. Based on the current in-Delta distribution, seasonal timing, and forecasted operations, overall risk of entrainment into the central Delta remains low.

Section 1-B: Facilities Risk

CVP/SWP facilities entrainment risk for CHNWR and CHNSR in the central Delta over the next week (8.1.5.1 D iii, iv, v)

- Exposure Risk:
  - CHNWR: Low
  - CHNSR: Low
- Reporting OMR/Export Risk: (Number and range of OMR bins will vary based on anticipated hydrology and operations)
  - OMR (-1,000 cfs)
    - CHNWR: Low
    - CHNSR: Low
  - OMR (-3,500 cfs)
    - CHNWR: Low
    - CHNSR: Low
- Overall Entrainment Risk:
  - CHNWR: Low
  - CHNSR: Low
- Change in risk of entrainment into the facilities (increased/decreased risk compared to last week):
  - CHNWR: Exposure risk is anticipated to be higher this week than last week but remains in the low category. This elevation in risk is supported by the seasonal timing of winter-run Chinook salmon maturation, multiple releases of hatchery produced late fall-run Chinook salmon into the upper Sacramento River system, and the observation of this season's first hatchery Chinook salmon and hatchery steelhead in salvage last week and this season's first hatchery produced late fall-run Chinook salmon in salvage this week, indicating the presence of salmonids from the upper Sacramento River in the south Delta. The range of the forecasted level of exports is predicted to generate an OMR flow of -1,000 to -3,500 cfs, resulting in a low risk of entrainment of CHNWR into the export facilities for fish already present in the central and south Delta. No CHNWR have been observed in salvage for water year 2021 and based on fish distribution in the central and south Delta, overall risk of entrainment at the facilities remains in the low category.
  - CHNSR: Exposure risk is similar to last week based on forecasted hydrology and upstream distribution of the juvenile CHNSR population this week compared to last week and remains low. The range of exports forecasted over the upcoming week are the same as those described for CHNWR. No CHNSR have been observed in salvage for water year 2021 and based on fish distribution in the central and south Delta, overall risk of entrainment at the facilities remains in the low category.

Section 1-C: Annual Loss Threshold Risk

- Annual loss threshold risk and Alternative Actions (8.1.5.1. E I, ii, iii and 8.1.5.1 F I, ii)
  - Salvage loss at the SWP and CVP facilities compared to the estimated remaining population in Delta and upstream of the Delta: No salvage of CESA-listed Chinook salmon has occurred over the past week.

- Define risk of hitting a threshold, 50%, or 75%, or 100%, and likelihood of exceeding a threshold:
    - Natural origin CHNWR: 3,659 (1.17% of the interim natural origin CHNWR JPE)
        - Current Annual Loss: 0
        - 50% Threshold based on natural CHNWR JPE: 1,829
            - Risk of exceeding threshold: Not likely.
        - 75% Threshold based on natural CHNWR JPE: 2,744
            - Risk of exceeding threshold: Not likely.
        - 100% Threshold based on natural CHNWR JPE: 3,659
            - Risk of exceeding threshold: Not likely.
    - Hatchery CHNWR: 117 (0.12% of the interim LSNFH hatchery release JPE)
        - Current Annual Loss: Not applicable. Releases have not yet occurred.
        - 50% Threshold based on hatchery CHNWR JPE:
            - Risk of exceeding threshold: Not applicable. Releases have not yet occurred.
        - 75% Threshold based on hatchery CHNWR JPE:
            - Risk of exceeding threshold: Not applicable. Releases have not yet occurred.
        - 100% Threshold based on hatchery CHNWR JPE:
            - Risk of exceeding threshold: Not applicable. Releases have not yet occurred.

Section 1-D: Daily Loss Threshold Risk

- Daily loss threshold risk and Alternative Actions
    - Salvage loss at the SWP and CVP facilities compared to estimated remaining population in Delta and upstream of the Delta:
        - Daily loss thresholds hit and subsequent loss and associated operations:
            - Natural origin CHNWR:
                - January monthly daily loss threshold: 19.86 (0.00635% of the natural origin CHNWR JPE) older juvenile Chinook salmon per day.
                - Highest daily loss: 0
            - Hatchery origin CHNWR:
                - Highest daily loss: Currently not applicable. Releases have not yet occurred.
            - Hatchery origin CHNSR:
                - Highest daily loss: Currently not applicable. Releases have not yet occurred.
            - Hatchery origin CHNSR surrogates:
                - Highest daily loss: Currently not applicable. Releases have not yet occurred.

Section 2: Basis for Advice:

The 2020 Incidental Take Permit for Long-Term Operation of the State Water Project in the Sacramento-San Joaquin Delta 2081-2019-066-00 (ITP) states that advice to Water Operations Management Team (WOMT) shall be consistent with the Project Description, COA in the ITP, and the applicable ESA authorizations. This week's advice is based on the following COAs which are currently applicable:

List relevant COA number and title based on species/life stage, time of year, etc.

8.1.4 Collaborative Approach to Real-time Risk Assessment. Beginning no later than October 1 through the end of OMR Management (see Condition of Approval 8.8) the Smelt and Salmon Monitoring Teams shall meet weekly, or more often as required, to consider survey data, salvage data, and other pertinent biotic and abiotic factors and prepare risk assessments as described in Conditions of Approval 8.1.1, 8.1.2, 8.1.5.1 and 8.1.5.2.

The Smelt and Salmon Monitoring Teams shall prepare operations advice for the WOMT as required by Conditions of Approval 8.3.1, 8.3.3, 8.4.1, 8.4.2, 8.5.1, 8.5.2, 8.6.1, 8.6.2, 8.6.3, 8.6.4, 8.7, and 8.8, including advice on operations. The Smelt and Salmon Monitoring Teams shall each prepare risk assessments and operations advice. Within each team, staff jointly develop the risk assessment and supporting documentation to accompany operations advice (see Conditions of Approval 8.1.5.1 and 8.1.5.2). DWR and CDFW Smelt and Salmon Monitoring Team staff may conclude different operations advice is warranted, in which case the difference shall be noted and elevated as described in this Condition of Approval.

The Smelt and Salmon Monitoring Teams shall communicate their advice to WOMT. The 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. If the WOMT does not reach a resolution, the CDFW Director may require Permittee to implement an operational recommendation provided by CDFW. CDFW will provide its operational decision to Permittee in writing. Permittee shall implement the operational decision required by CDFW. Permittee shall ensure that its proportional share (see Condition of Approval 8.10) of the OMR flow requirement as a part of the operational decision is satisfied.

8.1.5 Real-time Risk Assessments. The Smelt and Salmon Monitoring Teams (Conditions of Approval 8.1.1 and 8.1.2) shall prepare weekly risk assessments, or more often as required, and operations advice (as required by Conditions of Approval 8.3.1, 8.3.3, 8.4.1, 8.4.2, 8.5.1, 8.5.2, 8.6.1, 8.6.2, 8.6.3, 8.6.4, and 8.7) during their discussions and analyses. The Smelt and Salmon Monitoring Teams shall provide the risk assessments and pertinent supporting information to the WOMT (Condition of Approval 8.1.3) within one business day of each meeting.

8.3.2 Salmonid Presence. After January 1 each year, if Conditions of Approval 8.3.1 or 8.3.3 have not already been triggered, the OMR Management season shall begin when the Salmon Monitoring Team first estimates that 5% of the CHNWR or CHNSR population is in the Delta whichever is sooner. Upon initiation of the OMR Management season, Permittee shall reduce exports to achieve, and shall maintain a 14-day average OMR index no more negative than -5,000 cfs, until the OMR Management season ends (see Condition of Approval 8.8). In the event that a salmon daily or single-year loss threshold is exceeded (Conditions of Approval 8.6.1, 8.6.2, 8.6.3, or 8.6.4) prior to the start of OMR Management season the requirements in those Conditions shall control operations.

8.6.1 Winter-run Single-year Loss Threshold. In each year, Permittee shall, in coordination with Reclamation, operate the Project to avoid exceeding the following single-year loss thresholds:

- *Natural CHNWR (loss = 1.17% of natural CHNWR JPE)*
- *Hatchery CHNWR (loss = 0.12% of hatchery CHNWR JPE)*

The loss threshold and loss tracking for hatchery CHNWR does not include releases into Battle Creek.

Loss of CHNWR at the CVP and SWP salvage facilities shall be calculated based on LAD criteria for run assignment.

Annual loss of natural and hatchery CHNWR at the CVP and SWP salvage facilities shall be counted cumulatively beginning November 1 each calendar year through June 30 the following calendar year.

CHNWR shall be identified based on the Delta Model LAD criteria. Loss shall be calculated for the South Delta Export Facilities using the 2018 CDFW loss equation (Attachment 6).

During the water year, if cumulative loss of natural or hatchery CHNWR exceeds 50% of the annual loss threshold, Permittee shall restrict south Delta exports to maintain a 14-day average OMR index no more negative than -3,500 cfs through the end of OMR Management (see Condition of Approval 8.8). After 14 days of operations to maintain an OMR index no more negative than -3,500 cfs, Permittee may convene the Salmon Monitoring Team to conduct a risk assessment (Condition of Approval 8.1.5.1) and determine whether the risk of entrainment and loss of natural and hatchery CHNWR is no longer present. Risks shall be measured against the potential to exceed the next single-year loss threshold. The results of this risk assessment and associated OMR advice shall be provided to WOMT according to Condition of Approval 8.1.3 and the decision-making process shall follow the process described in Condition of Approval 8.1.4.

The -3,500 cfs OMR flow operational criteria, adjusted and informed by this risk assessment, shall remain in effect until the end of OMR Management (Condition of Approval 8.8).

During the water year, if cumulative loss of natural or hatchery CHNWR at the CVP and SWP salvage facilities exceeds 75% of the single-year loss threshold, Permittee shall restrict OMR to a 14-day moving average OMR flow index that is no more negative than -2,500 cfs through the end of OMR Management (Condition of Approval 8.7). After 14 days Permittee may convene the Salmon Monitoring Team to conduct a risk assessment (Condition of Approval 8.1.5.1) and determine whether the risk of entrainment and take of natural and hatchery CHNWR is no longer present. The results of this risk assessment and associated OMR advice shall be provided to WOMT according to Condition of Approval 8.1.3 and the decision-making process shall follow the process described in Condition of Approval 8.1.4.

The -2,500 cfs OMR flow operational criteria adjusted and informed by this risk assessment shall remain in effect until the end of OMR Management (Condition of Approval 8.8).

During the water year, if natural or hatchery CHNWR cumulative loss at the CVP and SWP salvage facilities exceeds the single-year loss threshold, Permittee shall immediately convene the Salmon Monitoring Team to review recent fish distribution information and operations and provide advice regarding future planned Project operations to minimize subsequent loss during that year. The Salmon Monitoring Team shall report the results

of this review and advice to the WOMT (see Condition of Approval 8.1.3). Operational decisions shall be made following the process described in Condition of Approval 8.1.4 (Collaborative Real Time Risk Assessment).

If the single-year loss threshold is exceeded, Permittee and Reclamation shall also convene an independent panel to review Project operations and the single-year loss threshold prior to November 1, as described in Condition of Approval 8.2. The purpose of the independent panel is to review the actions and decisions contributing to the loss trajectory that lead to an exceedance of the single-year loss threshold, and make recommendations on modifications to Project implementation, or additional actions to be conducted to stay within the single-year loss threshold in subsequent years.

Permittee shall, in coordination with Reclamation, continue monitoring and reporting salvage at the CVP and SWP salvage facilities. Permittee and Reclamation shall continue the release and monitoring of yearling Coleman National Fish Hatchery (NFH) late fall-run and yearling CHNSR surrogates. The Salmon Monitoring Team shall use reported real-time salvage counts along with qualitative and quantitative tools to inform risk assessments (see Condition of Approval 8.1.5.1).

8.6.3 Mid- and Late-season Natural Winter-run Chinook Salmon Daily Loss Threshold. To minimize entrainment, salvage, and take of natural CHNWR during the peak and end of their migration through the Delta. Permittee shall restrict south Delta exports for five days to achieve a five-day average OMR index no more negative than - 3,500 cfs when daily loss of natural older juveniles at the SWP and CVP salvage facilities exceeds the following thresholds based on the JPE reported in January of the same calendar year:

- *January 1 – January 31: 0.00635 % of the CHNWR JPE*
- *February 1 – February 28: 0.00991 % of the CHNWR JPE*
- *March 1 – March 31: 0.0146 % of the CHNWR JPE*
- *April 1 – April 30: 0.00507 % of the CHNWR JPE*
- *May 1 – May 31: 0.0077 % of the CHNWR JPE*

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 6). This Condition of Approval may be modified through the process described in Condition of Approval 8.6.6 and an amendment to this ITP.

Discussion of Conditions of Approval

Provide sentence or two addressing criteria for each Condition of Approval listed in "Basis for Advice" section. Refer to data below where appropriate.

Per Conditions of Approval 8.1.4 and 8.1.5, SaMT has provided advice and accompanying risk assessment to WOMT.

Per Conditions of Approval 8.6.1 and 8.6.3 SaMT does not believe these conditions are at risk of exceeding thresholds.

Section 3: Hydrology and Operations

Assessment of hydrologic, operational, and meteorological information. 8.1.5.1 A

Section 3-A: Water operations conditions 8.1.5.1 A. i, iii:

- Antecedent Actions: *(e.g. DCC gate closure and actions such as integrated early winter pulse protection, etc.)*
  DCC gates were closed 12/1/2020 and will remain closed until mid-May 2021 per Reclamation's PA description of DCC operations.
- Current Controlling Factor(s):
  - SWP: Delta water quality
  - CVP: Delta water quality
- Water Temperature:
  - Mossdale (MSD): 52.6°F on 1/19/2021
    - Number of days threshold exceeded: Not applicable until June.
  - Prisoners Point (PPT): 50.5°F on 1/19/2021
    - Number of days threshold exceeded: Not applicable until June.
- Tidal Cycle: *(Spring/Neap. Note if tidal cycle has potential to affect south Delta hydrology or X2)*
  - Neap tides prevail 1/20/2021 allowing the opportunity to increase exports at the CVP to 1,650 cfs.
- Turbidity:
  - *8.3.1 Turbidity at FPT Dec 1 to Jan 31 (3-day running average)*
    - 4.82 FNU as of 1/19/2021.
- Salinity: X2: > 81km on 1/20
- Hydraulic Footprint *(Provide brief description of hydrologic footprint and summary of relevant DSM2 results)*:
  - DSM2 runs did not occur this week and results were not provided to SaMT.

Section 3-B: Water Operations Outlook 8.1.5.1 A. ii:

- Outages:
  - SWP: None, no reported reductions in fish salvage counts
  - CVP: None, no reported reductions in fish salvage counts
- Exports
  - SWP: 1,500 cfs
  - CVP: 800 cfs
- Meteorological Forecast: *Precipitation, wind, air temperature. Are conditions (i.e. flow, turbidity, water temp) expected to change?*
  - Dry weather with less windy conditions expected through Thursday (1/21/2021) then rain and snow chances return for the end of the week into next week.
- Storm Event Projection:
- There is enough model agreement that a seasonably cold upper trough will move into Northern California on Friday (1/22/2021) giving the Central Valley Weather Advisory a chance of precipitation. The heaviest amounts of precipitation are forecasted over the Sierra Nevada range (liquid amounts up to a half inch , and 3 to 6 inches of snow), but only a few hundredths to a tenth of an inch in the Valley.

The system may linger into Saturday (1/23/2021), especially over the Sierra Nevada range, but the Valley is likely to clear from north to south as the system drops southward during the day. However, model differences create some uncertainty as to the exact timing, i.e., afternoon or evening. The Central Valley may see a thunderstorm or two late Friday afternoon over the southeast corner of the forecast area as daytime heating coincides with the upper trough passage.

Section 3-C: Projected Conditions 8.1.5.1 A. iii:

- DCC Gates position: Closed 12/1/20 until mid-May 2021 per PA DCC gate operations.
- Sacramento River flow at Freeport: 7,000 – 9,000 cfs but should be stable at approximately 8,500 cfs.
- San Joaquin River flow at Vernalis: 750 – 950 cfs but expected to be stable at 850 cfs.
- QWEST: QWEST has been around 0 cfs but may approach -800 cfs on 1/20-21/2021
- Old River at Bacon Island Turbidity: *Is turbidity at Bacon Island (OBI) expected to change due to precipitation, wind, operations, or other factors?* Not discussed.
- Freeport Turbidity: *Is turbidity at Freeport (FPT) expected to change due to precipitation, wind, operations, or other factors?* Not discussed.
- Expected changes in South Delta Exports:
    - CCF: 1,000 – 2,000 cfs
    - Tracy: 800 – 1,800 cfs

Table 1: Comparison of OMR gauge and OMR Index

Date	Averaging Period	USGS gauges (cfs)	Index (cfs)
1/16/2021	Daily	-2,500	-1,900
1/16/2021	5-day	-2,100	-1,900
1/16/2021	14-day	-2,600	-2,600
1/18/2021	Daily	Not Applicable	-1,900
1/18/2021	5-day	Not Applicable	-1,900
1/18/2021	14-day	Not Applicable	-2,500

Section 4: Distribution and Biology

8.1.5.1.B Assessment of biological information for CHNWR and CHNSR.

Section 4-A: CHNWR population status 8.1.5.1.B i

- Adult escapement estimate:
    - Estimate from carcass counts for adults contributing to brood year (BY) 2020 is 6,195 natural origin total adults and 4,093 female spawners.
    - Adults that will contribute to BY 2021 have entered the Delta system and are appearing in the Keswick area.
- Redd distribution and fry emergence timing:
    - BY 2020 total passage at Red Bluff Diversion Dam through 1/14/21 is 1,972,734 fish. Average historic passage (2010-2019) as of 1/14/2020 indicates 97.6% (one standard deviation of 2.9%) have passed Red Bluff Diversion Dam.
- Juvenile production estimate:
    - A draft interim JPE has been provided by the Winter-run Chinook Salmon Project Work Team for BY 2020 which estimates 312,792 natural-origin juvenile CHNWR will reach the Delta. The Work Team provided a final estimate to the agencies for approval (see footnote 1).
- Livingston Stone National Fish Hatchery release:
    - Not applicable. Releases have not occurred. Preliminary information from the Livingston Stone National Fish Hatchery indicates issues potentially related to thiamine deficiency in returning adults may impact the final supplemental goal. Releases are tentatively planned for early February.
- Distribution of natural CHNWR:
    - % of juveniles upstream of the Delta: 40-70%
    - % of juveniles in Delta: 30-60%
    - % of juveniles past Chipps Island: 0%
- Distribution of Livingston Stone National Fish Hatchery CHNWR:
    - % of juveniles upstream of the Delta: Not applicable. Releases have not occurred.
    - % of juveniles in Delta: Not applicable. Releases have not occurred.
    - % of juveniles past Chipps Island: Not applicable. Releases have not occurred.
- Distribution of Battle Creek CHNWR:
    - % of juveniles upstream of the Delta: Not applicable.
    - % of juveniles in Delta: Not applicable.
    - % of juveniles past Chipps Island: Not applicable.
- Change in risk of entrainment into the central Delta:
    - See Section 1-A: Sacramento River and Confluence

Section 4-B: CHNSR population status 8.1.5.1.B ii

- Adult escapement estimate: Not available
- Redd distribution and fry emergence timing: Adult CHNSR are likely to have completed their spawning by mid-November. Egg incubation and fry emergence is currently occurring. BY2020 total passage at Red Bluff Diversion Dam through 1/14/2021 is 145,027 fish.
- Hatchery release (in-river and downstream): No CHNSR hatchery releases have occurred in the Sacramento River system at this time. CHNSR egg collection at the Feather River Hatchery ended on 10/2/2020. Preliminary information from the Feather River Hatchery indicates issues potentially

related to thiamine deficiency in returning adults which has impacted the final production goal. In addition, reduced numbers of tagged CHNSR adults returned to the hatchery this fall and remained in-river to spawn which may also contribute to the low hatchery production this year.

- Distribution of natural CHNSR:
    - % of juveniles upstream of the Delta: 80-90%
    - % of juveniles in Delta: 10-20%
    - % of juveniles past Chipps Island: 0%
- Distribution of Feather River Fish Hatchery CHNSR:
    - % of juveniles upstream of the Delta: Not applicable. Releases have not occurred.
    - % of juveniles in Delta: Not applicable. Releases have not occurred.
    - % of juveniles past Chipps Island: Not applicable. Releases have not occurred.
- Change in risk of entrainment into the central Delta:
    - See Section 1-A: Sacramento River and Confluence

Section 4-C: Additional data sources to assess sensitivity to entrainment into the central and south Delta 8.1.5.1.C & D

- In-Delta distribution of CHNWR and CHNSR: See Section 4-A: CHNWR population status 8.1.5.1.B i and Section 4-B CHNSR population status 8.1.5.1.B ii.
- Acoustic telemetry: *Summary of acoustic telemetry tracking*
    - Two groups of late fall-run Chinook salmon were released from Coleman National Fish Hatchery on 1/4/2021 and 1/5/2021. A subset of each group were acoustic tagged, 460 and 141 fish respectively. The first tag detected from the first release group at Tower Bridge occurred five days later (1/9/2021). As of 1/19/2021, 66 fish have been detected at the I-80/50 Bridge and 12 have been detected at the Benicia east and west sites.
- Trawls: *List all relevant trawl surveys and brief overview of data. Insert tables, PDFs or other information as attachment at end of document. Include interruptions to sampling or other relevant information (e.g. canceled surveys, dropped stations, etc.)*
    - 3 clipped Chinook salmon were observed in the Sacramento Trawl, 1 clipped rainbow trout/steelhead was observed in the Chipps Island trawl over the past week (1/10/21 – 1/16/21. Sacramento Trawls: 3 ad-clipped CHN (These are presumed to be fish from the Coleman National Fish Hatchery late fall-run Chinook salmon releases that occurred 1/4/2021, 1/5/2021, or 1/8/2021).
    - Mossdale Kodiak Trawl is suspended indefinitely due to COVID restrictions.
- Rotary Screw Traps: *List all relevant rotary screw trap surveys and brief overview of data. Insert tables, PDFs or other information as attachment at end of document. Include interruptions to sampling or other relevant information (e.g. canceled surveys, dropped stations, etc.)*
    - GCID: 18 CHNWR, 6 CHNSR, 490 CHNFR, 18 ad-clipped CHNFR, 26 ad-clipped CHNLFR, 2 ad-clipped SH (1/12/2021 – 1/18/2021)
    - Tisdale: 1 CHNWR, 1 CHNFR, 2 CHNLFR, 1 CHNFR, 17 ad-clipped CHNLFR, and 77 ad-clipped SH 1/12/2021 – 1/18/2021)
    - Knights Landing: 2 CHNWR, 2 CHNFR, 4 ad-clipped SH (1/12/2021 – 1/18/2021)
    - Feather River: RST monitoring has been suspended due to COVID-19 related issues.

- Seines: *List all relevant seine surveys and brief overview of data. Insert tables, PDFs or other information as attachment at end of document. Include interruptions to sampling or other relevant information (e.g. canceled surveys, dropped stations, etc.)*
    - Beach Seines: 1 CHNWR, 1 CHNFR (1/10/2021 – 1/16/2021)
- Additional hatchery release notifications: *List all relevant hatchery release notifications.*
    - *Note: This information may be deemed relevant as there is a potential emigration influence on CESA listed species present upstream of the Delta.*
- New monitoring (as required by Condition of Approval 7.5.1, 7.5.2, and 7.5.3): *Upstream monitoring results during transfer window, additional rotary screw trap monitoring updates, additional acoustic tag study results, genetic identification results, trap capture efficiency trial results, and pathology results if available and relevant*
    - Not applicable at this time.
- Anticipated emigration to continue into the Delta:
    - CHNWR and CHNSR are distributing and rearing downstream of their spawning grounds and throughout the Delta. Hydrological and meteorological environmental cues could trigger additional accelerated movement into the Delta but sans environmental cues these fish will begin to move more steadily into the Delta based on seasonal timing.
- Flows in the Sacramento River predicted with upcoming storm events:
    - See Section 3-A: Water operations conditions 8.1.5.1 A. i, iii and the routing analysis below.
- DCC gate position:
    - Closed 12/1/2020 until late May 2021 per Reclamation's PA description for DCC gate operations.
- Prediction of tidal interaction at Georgiana Slough *(Inflow to Delta from Sacramento River and the interaction of the muting of tidal effects around Georgiana Slough)*:
    - See Section 3-A: Water operations conditions 8.1.5.1 A. i, iii and the routing analysis below.
- Precipitation in the forecast for the week and river flows affecting routing into central Delta:
    - See Section 3-B: Water Operations Outlook 8.1.5.1 A. ii: Storm Event Projection.
- Routing analysis:
    - STARS analysis was conducted on 1/20/2021 with results presented in Table 2 below. These results are reflective of the latest DCC gate change order and reflect the gate closure through mid-May.

Table 2: STARS Model Output

Date: 1/20/2021	DCC	Georgiana Slough	Sacramento River	Sutter and Steamboat Sloughs
Proportion of Entrainment	0%	30%	44%	25%
Survival	Not Applicable	15%	47%	35%
Travel Time	Not Applicable	19.06 days	11.63 days	12.08 days

- Trend analysis: *Provide brief description of historic trends if relevant (e.g. salvage patterns, onset of spawning, etc.). Refer to data or publications as needed*:

Table 3: Historic Migration and Salvage Patterns for unclipped CHNWR and CHNSR averaged from 2011-2019 as reported on SacPAS (http://www.cbr.washington.edu/sacramento/data/query_hrt.html) with associated 95% confidence interval. These values are provided for context only.

Date: 1/18/2021	RBDD RST	Tisdale RST	Knights Landing RST	Sac Trawl	Chipps Island Trawl	Salvage
CHNWR	97.3% (95.3%,99.4%)	73.0% (43.5%,102.5%)	70.0% (40.3%,99.6%)	37.7% (8.7%,66.7%)	2.5% (1.3%,6.4%)	19.8% (3.2%,36.4%)
CHNSR	20.5% (5.3%,35.6%)	34.6% (2.0%,67.1%)	23.4% (-3.0%,49.7%)	4.6% (-3.4%,12.5%)	0.0% (0.0-0.0%)	0.0% (0.0-0.0%)

- Survival analysis *(e.g. Zeug and Cavallo CWT model)*: Not available
- Tillotson entrainment model or other entrainment models as they become available: Not applicable
- Salvage trends in relation to OMRI: *Provide overview of salvage data and insert salvage table as attachment at end of document*: Not applicable as there has been no salvage of CESA listed salmon for water year 2021.
- Future export modifications: *Describe anticipated or potential changes to exports*: Not applicable at this time.

Notes:

The SaMT noted that it needs clarification from WOMT as to when to start operating to the final winter-run JPE. The Winter-run Project Work Team JPE Sub-team Recommendation Letter has been released but it may be several weeks before the official letter from NMFS and CDFW is issued.

Paired releases of acoustic and CWT tagged fish allows for potential Rotary Screw Trap efficiency testing at low-flows. CDFW requests any interested SaMT members contact Ken Kundargi.

Appendix 1: SaMT Monitoring Program Data

Table 4: Fish Monitoring Data for 1/19/2021 Meeting. The following table presents fish monitoring data summarized over the past week. Unless otherwise noted, reported sizes are fork length.

Location	GCID RST[1]	Tisdale RST	Knights Landing RST	Beach Seines[2]	Sacramento Trawl[2]	Chipps Is. Midwater Trawl[2]	Mossdale Kodiak Trawl[2]
Sample Date	1/12-1/18	1/12-1/18	1/12-1/18	1/14	1/10, 1/12-1/15	1/10, 1/12-1/15	Not Sampled
Fall-run Chinook	490 juveniles	1	2	1	0	0	Not Available
Spring-run Chinook	6 juveniles	0	0	0	0	0	Not Available
Winter-run Chinook	18 juveniles	1	2	1	0	0	Not Available
Late Fall-run Chinook	0	2	0	0	0	0	Not Available
Chinook (ad-clip)	22 LFR smolts 4 LFR juveniles 18 FR juveniles	17 LFR	0	0	3 LFR	0	Not Available
Steelhead (wild)	0	0	0	0	0	0	Not Available
Steelhead (ad-clip)	2	7	3	0	0	1	Not Available
Green Sturgeon	0	0	0	0	0	0	Not Available
Flows (avg. cfs)	396	4679	4752	Not Applicable	Not Applicable	Not Applicable	Not Applicable
W. Temp. (avg. °F)	52.6	51.0	50.4	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Turbidity (avg. NTU)	7.6	5.8	6.9	Not Applicable	Not Applicable	Not Applicable	Not Applicable

[1] GCID running at ½ cone all week. Adclipped CHNFR are most likely CHNLFR from CNFH releases.

[2] DatCall data reported in the 1/10/2021-1/16/2021 DJFMP sampling summary. Mossdale Trawl sampling have ceased due to COVID.

Table 5: Delta Sturgeon Tagging and Monitoring

Date Range	Comments
1/12/2021, 1/14/2021	• No new tags applied this past week. • 16 juvenile GS, 1 juvenile WS, and 1 adult WS detected in the Sacramento River north of Sherman Lake.

Table 6: CDFW Adult Monitoring Surveys

Location	American River Carcass Survey[1]	Stanislaus River Carcass Survey
Sample Dates	1/11/2021-1/14/2021	Not Sampled
Live Fish	Not Available	Not Available
Redds	Not Available	Not Available
Carcasses	457	Not Available
Ad-clipped	90	Not Available
Spawn Condition	Prespawn Mortality: 5% (2/37)	Not Available
Flows (avg. cfs)	1,248 cfs	Not Available
W. Temp (avg. °F)	50.4	Not Available

[1] Due to continued high counts of fresh carcasses, CDFW is extending the American River carcass surveys to 1/22/2021.

Appendix 2: Salvage Data

Table 7: SaMT Update. Reporting period is 1/11/2021 through 1/17/2021. Prepared by Geir Aasen on 1/19/2021 at 1411 hours. These are preliminary results and are subject to revision.

Criteria	11-Jan	12-Jan	13-Jan	14-Jan	15-Jan	16-Jan	17-Jan	Trend[1]	Weekly Summary
Wild older juvenile CS Loss	0	0	0	0	0	0	0	→	0.00
Wild Steelhead Loss	2.72	0	0	0	0	0	0	↗	0.39
SWP daily export (acre-feet)	5,128	3,879	2,550	2,939	2,972	2,654	2,977	↘	3,300
CVP daily export (acre-feet)	1,648	1,656	1,650	1,651	1,657	1,655	1,654	↘	1,653
SWP reduced counts[2]	None	None	None	None	None	None	None	Not Applicable	Not Applicable
CVP reduced counts**Error! Bookmark not defined.**	None	None	None	None	None	None	None	Not Applicable	Not Applicable

[1] Trend is the current value compared to the previous week.

[2] Reduced counts are the percentage of time that routine salvage sample times were less than 30 minutes per two hours of salvage and export operations.

Table 8: Chinook salmon weekly salvage and loss combined for both the SWP and the CVP fish collection facilities. Race is determined by LAD on the date of capture. Hatchery origin fish are determined by the lack of adipose fin. Prepared by Geir Aasen on 1/19/2021 at 1411 hours. These are preliminary results and are subject to revision.

Category	Salvage[1]	Loss[2]	Trend
Wild winter-run	0	0	→
Wild spring-run	0	0	→
Wild late Fall-run	0	0	→
Wild fall-run	0	0	→
Hatchery winter-run	0	0	→
Hatchery spring-run	0	0	→
Hatchery late Fall-run	4	4	↗
Hatchery fall-run	0	0	→
Total	4	4	Not Applicable

Table 9: Chinook salmon cumulative salvage and loss for Water Year 2021 combined for both the SWP and the CVP fish collection facilities. Race is determined by LAD on the date of capture. Hatchery origin fish are determined by the lack of adipose fin. Prepared by Geir Aasen on 1/19/2021 at 1411. These are preliminary results and are subject to revision.

Category	Salvage	Loss	Trend
Wild winter-run	0	0	→
Wild spring-run	0	0	→
Wild late Fall-run	0	0	→
Wild fall-run	0	0	→
Hatchery winter-run	0	0	→
Hatchery spring-run	0	0	→
Hatchery late Fall-run	4	4	↗
Hatchery fall-run	0	0	→
Total	4	4	Not Applicable

Table 10: Steelhead weekly salvage and loss combined for both the SWP and the CVP fish collection facilities. Hatchery origin fish are determined by the lack of adipose fin. Prepared by Geir Aasen on 1/19/2021 at 1411 These are preliminary results and are subject to revision.

Category	Salvage	Loss	Trend
Wild steelhead	4	3	→
Hatchery steelhead	0	0	→
Total	4	3	Not Applicable

[1] Salvage is equal to the estimated number of fish collected by the CVP and SWP fish protective facilities per unit of time.
[2] State Water Project loss is equal to salvage multiplied by 4.33. Central Valley Project loss is equal to salvage multiplied by 0.68.

Table 11: Steelhead cumulative salvage and loss for Water Year 2021 combined for both the SWP and the CVP fish collection facilities. Hatchery origin fish are determined by the lack of adipose fin. Prepared by Geir Aasen on 1/19/2021 at 1411. These are preliminary results and are subject to revision.

Category	Salvage[1]	Loss[2]	Trend
Wild steelhead	4	3	→
Hatchery steelhead	0	0	→
Total	4	3	Not Applicable

[1] Salvage is equal to the estimated number of fish collected by the CVP and SWP fish protective facilities per unit of time.
[2] State Water Project loss is equal to salvage multiplied by 4.33. Central Valley Project loss is equal to salvage multiplied by 0.68.