

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

Section 1: Overview

Date: 12/29/2020

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.

At this time, juvenile winter-run Chinook salmon are mainly in the rearing phase of their life history and distributing downstream into the Sacramento River system, with most fish remaining upstream of Colusa. Very few juvenile winter-run Chinook salmon have been detected downstream of GCID as they migrate towards the Delta. Although fish are largely absent from detections by Delta monitoring programs, given the seasonal timing, river conditions, and efficiency of sampling apparatuses the Salmon Monitoring Team (SaMT) estimates that up to 35% of the juvenile winter-run Chinook salmon population is now present in the Delta. Precipitation events forecasted for this week and into the weekend may increase juvenile distribution into the Delta, thereby elevating exposure risk. However, overall risk of entrainment into the central and south Delta from the Sacramento River remains low. Additionally, adult winter-run Chinook salmon are entering the Delta and Sacramento River. The Delta Cross Channel (DCC) gate, that would delay upstream adult winter-run Chinook salmon migration, is closed and will potentially remain closed until mid-May 2021, per Reclamation's Proposed Action (PA) operations description for the DCC gate. Water quality concerns between now and through the end of January may necessitate a DCC gate opening. Juvenile spring-run Chinook salmon are emerging from the gravel and beginning to move downstream as fry. 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 up to 7% of the young-of-year spring-run Chinook salmon population is now present in the Delta. Condition of Approval (COA) 8.6.1 Winter-run Single-year Loss Threshold and 8.6.2 Early-season Natural Winter-run Chinook Salmon Discrete Daily Loss have been in effect since 11/1/2020. COA 8.6.2 implementation will conclude on Thursday (12/31). Beginning Friday (1/1) COA 8.3.2 Salmonid Presence and COA 8.6.3 Mid- and Late-season Natural Winter-run Chinook Salmon Daily Loss Threshold will go into effect. The SaMT anticipates only a minimal risk of exceeding any juvenile winter-run Chinook salmon cumulative or daily loss thresholds due to the current estimated distributions of fish, forecasted weather conditions, and forecasted operations for the next week. However, current seasonal timing and the distribution of winter-run Chinook salmon indicates they are rearing and holding in the middle section of the Sacramento River. Any significant precipitation events in the next couple of weeks could trigger a substantial redistribution of fish into the Delta, which will require SaMT to monitor COAs 8.6.2 and 8.6.3 more closely. Currently, the controlling factor for exports is water quality requirements in the Delta and it is anticipated to be controlling during the upcoming week.

Risk Assessment:

Overall risk of entrainment of juvenile winter-run Chinook salmon into the central Delta is similar to last week and is still considered to be low for this week based on minimal observations of fish in the Delta. RBDD (river mile [RM] 243) and GCID (RM 205) continue to observe juvenile winter-run Chinook salmon, indicating ongoing passage at these locations, yet minimal to no catch has been observed at the downstream monitoring locations. Cumulative catch of length-at-date (LAD) juvenile winter-run Chinook salmon at GCID is 1,177 fish with 20 LAD juvenile winter-run Chinook salmon observed over the last week (12/22/20 to 12/28/20). Two juvenile winter-run Chinook salmon were observed at the Knights Landing monitoring station over the last week. Historical RBDD passage trends, lack of detections in Delta monitoring stations, and lack of hydrological cues that are associated with triggering downstream movement indicates most of the population occupies the reaches between RBDD and Colusa. 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 estimates that most of the juvenile winter-run Chinook salmon population (65-90%) has yet to enter the Delta. However, SaMT members agree that current hydrological conditions (i.e., low turbidity and low flows) reduces the trap capture efficiencies of various downstream monitoring sites; therefore, more fish may have distributed downstream than estimated from the observations of catch from the downstream monitoring sites. An additional source of uncertainty are the effects of thiamine deficiency on natural origin fish which may be contributing to relatively low numbers of winter-run Chinook salmon reaching the Delta equating to low detections at Delta monitoring sites. 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. Flows measured at Freeport are forecasted to be slightly lower (7,500-10,500 cfs) compared to the previous week (8,500-12,500 cfs). Flows measured at Vernalis are also forecasted to be similar (900-1,200 cfs) compared to the previous week (800-1,100 cfs). Based on low flows in the Sacramento River this week, SaMT estimates a similar risk of juvenile winter-run Chinook salmon routing into the central Delta from the mainstem as was estimated for last week and remains at a medium risk level. As Sacramento River flows respond to the forecasted precipitation events, routing risk may decrease this weekend. Based on the current in-Delta distribution of juvenile winter-run Chinook salmon and seasonal timing, the overall risk of entrainment into the central Delta still remains low. Exposure risk of entrainment at the facilities remains similar to last week and still remains low. The forecasted range of operations for this upcoming week includes a high level of exports generating OMR flows of -5,000 cfs, resulting in a medium 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, exceeding a daily discrete loss threshold, or exceeding a juvenile production estimate (JPE) scaled 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 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 70 fish, with 10 juveniles observed over the past week (12/22/20 to 12/28/20). One juvenile spring-run Chinook salmon was observed at the Tisdale monitoring station over the last week, which is the first spring-run Chinook salmon observed at this station. Beginning on 10/21/20, 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 beginning 12/12/20 through 12/27/20, with the exception of 12/24/20 and 12/25/20. Monitoring in Butte Creek indicates yearling spring-run Chinook salmon are moving downstream in this tributary towards the Sacramento River. Monitoring in Butte Creek also indicate young-of-year spring-run Chinook salmon are beginning to distribute themselves downstream. SaMT estimates that most of the population of young-of-year juvenile spring-run Chinook salmon (93-96%) 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 DCC gate operations and 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. 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.

No juvenile Chinook salmon have been observed in salvage this past week. Currently the controlling factor for exports is water quality in the Delta. Controlling factors for exports for the upcoming week are still anticipated to be due to Delta water quality.

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: Low
 - CHNSR: Low
- Routing Risk:
 - CHNWR: Medium
 - CHNSR: Medium
- Overall Entrainment Risk:
 - CHNWR: Low
 - CHNSR: Low
- Change in risk of entrainment into the central Delta (increased/decreased risk compared to last week):
 - CHNWR: Exposure risk remains similar to last week based on similar hydrology and upstream distribution. Currently, 10-35% of the juvenile CHNWR population is estimated to be present in the Delta for this week. The increase in 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 lack of detections in the Delta monitoring stations. Precipitation events forecasted for this week and into the weekend may increase distribution into the Delta. However, exposure risk is estimated to remain low based on current distribution estimates. Routing risk is considered to be medium. DCC gates have been closed since 12/1/20 and are anticipated to remain closed until mid-May 2021. Sacramento flows measured at Freeport are forecasted to remain similar or slightly decrease over the following week compared to the previous week. In conjunction with anticipated tidal cycles this week, stronger tidal influence at the Georgiana Slough junction with the Sacramento River can redirect additional river flows into the Georgiana Slough route from upstream during the incoming flood tide. 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 into the central Delta remains low.
 - CHNSR: Exposure risk remains similar to last week based on low numbers of juvenile CHNSR in the system and their distribution primarily upstream of Knights Landing. Currently, 4-7% of the young-of-year CHNSR population is estimated to be present in the Delta this week. Precipitation events forecasted for this week and into the weekend may increase distribution into the Delta. However, exposure risk is estimated to remain low based on current distribution estimates. Routing risk is similar to the effects described for CHNWR based on DCC gate configuration and 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 (-1,500 cfs)
 - CHNWR: Low
 - CHNSR: Low
 - OMR (-5,000 cfs)
 - CHNWR: Medium
 - CHNSR: Medium
- 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 similar to last week based on forecasted hydrology and upstream distribution of the juvenile CHNWR population this week compared to last week (10-35% of the juvenile population are estimated to be present in the Delta this week). The high range of the forecasted level of exports is predicted to generate an OMR flow of -5,000 cfs, resulting in a medium 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 (4-7% of the juvenile population are estimated to be present in the Delta this week). 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 been 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:
 - December monthly daily loss threshold: 26 older juvenile Chinook salmon per day
 - 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).

8.6.2 Early-season Natural Winter-run Chinook Salmon Discrete Daily Loss Threshold. 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 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:

- From November 1 – November 30: 6 older juvenile Chinook salmon*
- From December 1 – December 31: 26 older juvenile Chinook salmon*

All natural older juvenile Chinook salmon juveniles shall be identified based on the Delta Model LAD 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.

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, 8.6.2, 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 12/1/20 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): 50.1°F on 12/28/20
 - Number of days threshold exceeded: Not applicable until June.
 - Prisoners Point (PPT): 49.1°F on 12/28/20
 - 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)*
 - Inflow, tidal effects, and water quality station data are being monitored for any opportunity to modify exports this upcoming week.
- Turbidity:
 - 8.3.1 Turbidity at FPT Dec 1 to Jan 31 (3-day running average)
 - 4.75 FNU as of 12/28/20.
- Salinity: X2: > 81km
- 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: 2,000 cfs
 - CVP: 800 cfs
- Meteorological Forecast: *Precipitation, wind, air temperature. Are conditions (i.e. flow, turbidity, water temp) expected to change?*
 - Dry weather expected through Wednesday (12/30) afternoon. A weak system will bring light precipitation Wednesday night into Thursday (12/31). An active pattern is possible for the New Year's Holiday weekend.
- Storm Event Projection:
 - High pressure will remain with us through Wednesday (12/30) then a weak system will move through Wednesday night and Thursday (12/31) morning. Currently forecasting 1-3 inches of

snow. Snow levels will get down to 2,500 to 3,000 feet over Shasta County to 3,500 to 4,000 feet elsewhere. Valley rain less than a tenth of an inch.

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: 7,500 – 10,500 cfs
- San Joaquin River flow at Vernalis: 900 – 1,200 cfs
- Qwest: Not discussed.
- 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 – 3,500 cfs
 - Tracy: 800 – 1,800 cfs

Table 1: Comparison of OMR gauge and OMR Index

Date	Averaging Period	USGS gauges (cfs)	Index (cfs)
12/26/20	Daily	-3,700	-3,900
12/26/20	5-day	-3,600	-3,500
12/26/20	14-day	-2,100	-2,300
12/28/20	Daily	Not Applicable	-3,400
12/28/20	5-day	Not Applicable	-3,600
12/28/20	14-day	Not Applicable	-2,600

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:
 - Adult escapement for brood year (BY) 2020 is not yet available, although the current preliminary estimate from carcass counts is 6,392 total adults and 3,904 female spawners.
 - Adults that will contribute to BY 2021 are beginning to enter the Delta system.
- Redd distribution and fry emergence timing: BY2020 total passage at Red Bluff Diversion Dam through 12/16/20 is 1,881,286 fish. Average historic passage (2010-2019) as of 12/1/20 indicates 95.5% (one standard deviation of 3.8%) 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 brood year 2020. A final estimate will be provided approximately mid-January when more data are available.
- 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: 65-90%
 - % of juveniles in Delta: 10-35%
 - % 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 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)

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 12/16/20 is 124,278 fish.
- Hatchery release (in-river and downstream): No CHNSR hatchery releases have occurred in the Sacramento River at this time. CHNSR egg collection at the Feather River Hatchery ended on 10/2/20. 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: 93-96%
 - % of juveniles in Delta: 4-7%
 - % 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 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)

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*
 - No results at this time.
- 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.)*
 - No catch of CESA listed salmon.
 - Chipps Island Trawl did not occur last week.
 - 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: 20 CHNWR, 10 CHNSR, 74 CHNFR, 2 CHNLFR (12/22/20 – 12/28/20)
 - Tisdale: 1 CHNSR (12/21/20-12/27/20)
 - Knights Landing: 2 CHNWR, 1 CHNLFR (12/22/20-12/28/20)
- 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.)*
 - No catch of CESA listed salmon.
- 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.
- Distribution of hatchery produced salmon indicated by real-time acoustic tracking of AT/CWT paired releases: Not applicable
- Anticipated emigration to continue into the Delta:
 - CHNWR and CHNSR are distributing and rearing downstream of their spawning grounds. Hydrological and meteorological environmental cues could trigger movement into the Delta.
- 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 12/1/20 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 12/28/2020 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: 12/28/20	DCC	Georgiana Slough	Sacramento River	Sutter and Steamboat Sloughs
Proportion of Entrainment	0%	31%	44%	25%
Survival	Not Applicable	16%	49%	36%
Travel Time	Not Applicable	19.1 days	11.3 days	11.7 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 2005-2019 (excluding salvage) 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: 12/28	RBDD RST	Tisdale RST	Knights Landing RST	Sac Trawl	Chipps Island Trawl	Salvage (WY 2011-2020)
CHNWR	96.2% (94.2-98.1%)	70.1% (45.0-95.2%)	65.0% (38.5-91.5%)	35.4% (8.8-62.0%)	1.5% (-1.0-4.1%)	10.9% (0.4-21.4%)
CHNSR	23.5% (7.6-39.3%)	31.2% (3.2-59.3%)	18.9% (-0.8-38.6%)	4.9% (-2.3-12.0%)	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:

SaMT began discussing the Delta boundaries to help provide guidance for estimates of fish distribution. One proposed change was to modify the definition of the upstream boundary of “Yet to Enter Delta” from Knights Landing to Sherwood Harbor or the I Street Bridge in Sacramento for Sacramento River origin winter-run Chinook salmon, spring-run Chinook salmon, and steelhead. As well as modifying the definition for San Joaquin origin steelhead to appropriately reflect the San Joaquin upstream boundary. However, Sherwood Harbor does not consistently sample (only samples three days a week) and Knights Landing serves as the last daily sampling station above the I Street Bridge. Participants noted the importance of ensuring that the definition reflect the legal boundary for the Delta as described with regulatory documents such as the ITP and BO. For the Sacramento River, this boundary is the I Street Bridge and for the San Joaquin River it is the Airport Way Bridge at Vernalis. As such, participants discussed adding footnotes to the definition of “Yet to Enter Delta” as follows: [1] Sacramento River origin winter-run Chinook salmon, spring-run Chinook salmon, and steelhead: “Upstream of the I Street Bridge on the Sacramento River” and [2] San Joaquin origin for steelhead: “Upstream of the Airport Way Bridge (at Vernalis) on the San Joaquin River.” SaMT members indicated that a clarification in definition should be brought up at the next LTO Coordination Meeting before any modification is made given potential implications for the start and end of the OMR management season.

The LTO OMR Guidance Document and agenda have been updated and were finalized December 8th. The objectives of the SaMT are to assess impacts of operations on salmonids and green sturgeon and provide information to WOMT to reduce impacts. From the ITP perspective the SaMT assesses risk of entrainment in the central and south Delta as well as entrainment into the south Delta export facilities for winter-run and spring-run Chinook salmon. By the end of each SaMT call, clear advice to WOMT or a description of any disagreements will be drafted. This advice or description should be consistent with discussion during the SaMT call. SaMT members should expect to see the following weekly products: Operations Outlook, Reclamation Assessment, Meeting Notes, and ITP Risk Assessment for winter-run and spring-run Chinook salmon.

Appendix 1: SaMT Monitoring Program Data

Table 4: Fish Monitoring Data for 12/29/20 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 ²	Knights Landing RST ²	Beach Seines ³	Sacramento Trawl ³	Chippis Is. Midwater Trawl ³	Mossdale Kodiak Trawl ³
Sample Date	12/22-12/28	12/21-12/27	12/22-12/28	12/21, 12/22, 12/24	12/20-12/24	Not Sampled	Not Sampled
Fall-run Chinook	74 juveniles	0	0	0	0	Not Available	Not Available
Spring-run Chinook	10 juveniles	1	0	0	0	Not Available	Not Available
Winter-run Chinook	20 juveniles	0	2	0	0	Not Available	Not Available
Late Fall-run Chinook	2 smolts	0	1	0	0	Not Available	Not Available
Chinook (ad-clip)	0	0	0	0	0	Not Available	Not Available
Steelhead (wild)	0	0	0	0	0	Not Available	Not Available
Steelhead (ad-clip)	24	0	0	0	0	Not Available	Not Available
Green Sturgeon	0	0	0	0	0	Not Available	Not Available
Flows (avg. cfs)	214	4,328	4,606	Not Applicable	Not Applicable	Not Applicable	Not Applicable
W. Temp. (avg. °F)	49.7	48.2	47.8	Not Applicable	Not Applicable	Not Applicable	Not Applicable
Turbidity (avg. NTU)	4.5	6.1	5.4	Not Applicable	Not Applicable	Not Applicable	Not Applicable

Table 5: Delta Sturgeon Tagging and Monitoring

Date Range	Comments
12/22/20	<ul style="list-style-type: none"> No new tags applied this past week to juvenile GS in the Sacramento River north of Sherman Lake. 14 juvenile GS, 1 juvenile WS, and 1 adult WS detected in the Sacramento River north of Sherman Lake.

¹ GCID running at ½ cone all week.

² Tisdale and Knights Landing trapping stopped for the Christmas holiday on 12/24 and resumed on 12/26.

³ DatCall data reported in the 12/20-12/26 DJFMP sampling summary. Mossdale and Chippis Trawl sampling have ceased due to COVID. Sac Trawl and Chippis 5 days/week. Sac seine continuing as normal.

Table 6: CDFW Adult Monitoring Surveys

Location	American River Carcass Survey ¹	Stanislaus River Carcass Survey
Sample Dates	12/21/20-12/23/20	Not Sampled
Live Fish	Not Available	Not Available
Redds	Not Available	Not Available
Carcasses	2,504	Not Available
Ad-clipped	520	Not Available
Spawn Condition	Prespawn Mortality: 26% (73/276)	Not Available
Flows (avg. cfs)	1,273	Not Available
W. Temp (avg. °F)	52.0	Not Available

¹ Sections 1 and 2 were not surveyed this week due to the Christmas holiday.

Appendix 2: Salvage Data

Table 7: SaMT Update. Reporting period is 12/21/20 through 12/27/20. Prepared by Geir Aasen on 12/28/20 at 1537 hours. These are preliminary results and are subject to revision.

Criteria	21-Dec	22-Dec	23-Dec	24-Dec	25-Dec	26-Dec	27-Dec	Trend ¹	Weekly Summary
Wild older juvenile CS Loss	0	0	0	0	0	0	0	→	0
Wild Steelhead Loss	0	0	0	0	0	0	0	→	0
SWP daily export (acre-feet)	2,960	3,817	6,150	6,393	6,987	6,880	5,917	↗	5,586
CVP daily export (acre-feet)	1,645	1,652	1,647	1,639	1,648	1,638	1,649	→	1,645
SWP reduced counts ²	None	None	None	None	None	None	None	Not Applicable	Not Applicable
CVP reduced counts ⁶	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 12/28/20 at 1537 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	0	0	→
Hatchery fall-run	0	0	→
Total	0	0	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 12/28/20 at 1537 hours. These are preliminary results and are subject to revision.

Category	Salvage ⁷	Loss ⁸	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	0	0	→
Hatchery fall-run	0	0	→
Total	0	0	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 12/28/20 at 1537 hours. These are preliminary results and are subject to revision.

Category	Salvage ⁷	Loss ⁸	Trend
Wild steelhead	0	0	→
Hatchery steelhead	0	0	→
Total	0	0	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 12/28/20 at 1537 hours. These are preliminary results and are subject to revision.

Category	Salvage ¹	Loss ²	Trend
Wild steelhead	0	0	→
Hatchery steelhead	0	0	→
Total	0	0	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.