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Ms. Diane Riddle, Assistant Deputy Director
Division of Water Rights
California State Water Resources Control Board
1001 I Street
Sacramento, CA 95814

APRIL – JUNE 2022 TEMPORARY URGENCY CHANGE PETITION REGARDING DELTA WATER QUALITY

Dear Ms. Riddle,

This letter is in response to your verbal request, consistent with Water Code section 1437, for consultation with the California Department of Fish and Wildlife (CDFW) regarding potential effects to fish and wildlife resources as a result of the April – June 2022 Temporary Urgency Change Petition Regarding Delta Water Quality (WY 2022 TUCP) submitted by the U.S. Bureau of Reclamation (Reclamation) and the California Department of Water Resources (DWR) on March 18, 2022. In the TUCP, Reclamation and DWR request modifications to requirements of Water Right Decision 1641 (D-1641) to enable changes to operation of the Central Valley Project (CVP) and the State Water Project (SWP) (collectively Projects) from April 1 to June 30, 2022. Specifically, Reclamation and DWR have requested the following modifications to the terms of the Projects' water rights permits:

Table 1: Summary of 2022 TUCP Operations Framework

Month	D-1641	Proposed Modification	Exports (CVP/SWP)
April 1 – April 30	7,100 cfs to 29,200 cfs - Habitat Protection Outflow (X2), dependent on previous months Eight River Index Flow Volume	4,000 cfs based on a 14-day average	Max exports 1,500 cfs when not meeting D-1641
May 1 – June 30	7,100 cfs to 29,200 cfs - Habitat Protection Outflow (X2), dependent on previous months Eight River Index Flow Volume	If the May 1 90% Sacramento River Index is not less than 8.1 MAF: 14-day running average of 4,000 cfs outflow as described in D-1641 Table 3, footnote 10	Max exports 1,500 cfs when not meeting D-1641

April 1 - June 30	San Joaquin River at Airport Way Bridge, Vernalis	Stanislaus will be operated to the Stepped Release Plan, which includes a spring pulse flow. Stanislaus releases will be increased, if necessary, to meet Vernalis base flow of 710 cfs	Not Applicable
April 1- June 30	Western Delta Agriculture Compliance point - Emmaton	Relocate Western Delta Agriculture compliance point from Emmaton to Threemile Slough	Max exports 1,500 cfs when not meeting D-1641

Background

The 2020, 2021, and 2022 water years (WY) have been exceptionally dry, with total precipitation in WY 2020 less than half the historic average, total precipitation in WY 2021 ranking third driest in the historic record, and the driest January and February on record in WY 2022 (Reclamation and DWR 2022a). Further compounding the impact of low precipitation levels in WYs 2020 and 2021, inflow into the reservoirs was low to very low in both years. In WY 2020 April through July runoff was approximately 65% of average and in WY 2021 statewide average runoff was estimated at only 30% of average (Reclamation and DWR 2021). In April 2021, DWR and Reclamation noted that the unexpectedly low levels of inflow observed in WY 2021 were likely due to a variety of factors including “parched watershed soils”, which led to increased ground infiltration of snowmelt, requiring revision of surface run-off projections into reservoirs and corresponding revisions to longer term Project operations planning through WY 2021 (Reclamation and DWR 2021). Although precipitation and snowfall in October and December 2021 were exceptionally high, January and February 2022 were the driest recorded in 103 years with zero measurable precipitation in the Northern Sierra from January 8 – February 25, 2022 (Reclamation and DWR 2022a).

In response to the exceptional combination of factors observed in WY 2021, Governor Newsom issued an Emergency Proclamation on drought conditions for the Sacramento-San Joaquin Delta and other watersheds on May 10, 2021. In order to ensure adequate, minimal water supplies for the purposes of health, safety, and the environment, Paragraph 4 of the Emergency Proclamation ordered the State Water Resources Control Board (SWRCB) to consider modifying requirements for reservoir releases or diversion limitations, including those implementing a water quality control plan “to conserve water upstream later in the year in order to protect cold water pools for salmon and steelhead, improve water quality, protect carry over storage, or ensure minimum health and safety water supplies.”

On May 17, 2021, DWR and Reclamation submitted a petition for a temporary urgency change to specific terms in the Projects’ water operations permit D-1641 from June 1 through August 15, 2021 (WY 2021 TUCP). On June 1, 2021 the SWRCB issued a

conditional approval of the requested WY 2021 TUCP for the June 1 – August 15, 2021 time period (SWRCB 2021).

Subsequently, on May 18, 2021, DWR submitted a request for a minor amendment to Incidental Take Permit No. 2018-2019-066-00 for long-term operation of the State Water Project facilities in the Sacramento-San Joaquin Delta (SWP ITP) to account for the requested change in SWP operations associated with the WY 2021 TUCP submitted to the SWRCB. On June 2, 2021, after the SWRCB issued its order conditionally approving the WY 2021 TUCP (SWRCB 2021), CDFW issued a minor amendment to the SWP ITP to DWR (ITP No. 2081-2019-066-00-A2).

On October 19, 2021, in an additional Emergency Proclamation, Governor Newsom stated that as 2021 continued, "sustained and extreme high temperatures have increased water loss from reservoirs and streams, increased demands from communities and agriculture, and further depleted California's water supplies," expanded the scope of the Emergency Proclamation statewide, and maintained his earlier orders and their provisions in full force and effect.

On December 1, 2021 Reclamation and DWR submitted a TUCP to the SWRCB. However, in a letter to the SWRCB dated January 18, 2022 Reclamation and DWR withdrew this TUCP citing "marked improvement" in October and December hydrology "from conditions experienced in 2021", but also noted that "storage levels at Shasta and Trinity reservoirs continue to be low with relatively lower runoff projections than seen in the central and southern watersheds."

On March 18, 2022 Reclamation and DWR submitted a TUCP to the SWRCB. In their submittal Reclamation and DWR cite the need for a TUCP from April - June 2022 because projected storage and inflow in January and February were not sufficient to meet D-1641 requirements and:

> "additional operational flexibility of the Projects is needed to support Reclamation and DWR's priorities, which include: operating the Projects to provide for minimum health and safety supplies (defined as minimum demands of water contractors for domestic supply, fire protection, or sanitation during the year); preserve upstream storage for release later in the summer to control saltwater intrusion into the Sacramento-San Joaquin Delta (Delta); preserve cold water in Shasta Lake and other reservoirs to manage river temperatures for various runs of Chinook salmon and steelhead; maintain protections for State and federally endangered and threatened species and other fish and wildlife resources; and meet other critical water supply needs."

In addition, on March 18, 2022, DWR submitted a request for a minor amendment to the incidental take permit covering the operations of the SWP, to address the operational changes requested in the TUCP. CDFW is currently reviewing this amendment request.

CDFW also acknowledges that on March 11, 2022 and March 14, 2022, Judge Dale A. Drozd of the U.S. District Court for the Eastern District of California issued orders requiring implementation of an Interim Operations Plan (IOP) for WY 2022. The orders were issued in two pending cases that challenge the 2019 biological opinions and related review and approval processes for the long-term coordinated operations of the

SWP and CVP.[1] The IOP states that it includes commitments to ensure operational alignment between CVP and SWP for WY 2022, and specific measures limited to critical, dry, or below normal water years. Among other things, the IOP requires Reclamation's adherence to Delta Smelt, winter-run and spring-run Chinook Salmon Old and Middle River (OMR) operational criteria from the SWP ITP, reduced CVP exports in April and May in the event WY 2022 is classified, based on the San Joaquin Valley 60-20-20 index, as critical, dry, or below normal to ensure a volumetric reduction consistent with DWR's implementation of ITP Condition of Approval 8.17, and prioritizes winter-run Chinook salmon habitat criteria for the benefit of winter-run egg incubation and survival,. By improving Shasta temperature management, CDFW believes that implementation of the IOP would improve conditions for fish and wildlife above those that otherwise would occur as discussed in this letter.

CDFW focuses this letter on our area of scientific and management expertise for fish species, consistent with the Water Code requirement that the SWRCB consult with CDFW on the effects of temporary urgency changes on fish and wildlife, with a focus on species listed under the California Endangered Species Act (CESA), in particular. Notwithstanding this focus, CDFW acknowledges these proposed temporary urgency changes are designed to be responsive to the unprecedented and compounding hydrological and climate challenges observed to date in WYs 2020, 2021, and 2022, and the need to plan Project operations to conserve storage in the event that below normal storage conditions persist through WY 2022, or into subsequent WYs, to preserve supplies for human health and safety and fish and wildlife resources.

Assessment of Effects on Listed Fish Species in the Bay-Delta

Four fish species listed as endangered or threatened under CESA are known to occur in portions of the Sacramento-San Joaquin Delta and San Francisco Bay (Bay-Delta): Delta Smelt (*Hypomesus transpacificus*), Longfin Smelt (*Spirinchus thaleichthys*), and winter- and spring-run Chinook Salmon (*Oncorhynchus tshawytscha*). As a part of their WY 2022 TUCP, Reclamation and DWR conducted a biological review to assess the potential impacts of the requested changes to D-1641 (WY 2022 TUCP Biological Review, Reclamation and DWR 2022b). CDFW staff have reviewed the WY 2022 TUCP, and the WY 2022 TUCP Biological Review.

All four listed species are expected to be present in the Bay-Delta during the time period of the requested WY 2022 TUCP operations. As demonstrated through Reclamation and DWR (2022b) modeling results and qualitative analyses, as well as our additional analyses, the requested operations are expected to result in impacts to all four species. The nature and degree of impacts is expected to vary depending on the life history

[1] *California Natural Resources Agency, et al. v. Raimondo* (E.D.Cal. Case No. 1:20-cv-00426-DAD-EPG); *Pacific Coast Federation of Fishermen's Associations v. Raimondo* (E.D.Cal. Case No. 3:19-cv-07897-LB).

stage of each species present in the Delta from April – June. Below we describe the expected distribution and abundance of each species from April - June and briefly summarize potential effects of requested WY 2022 TUCP operations.

Delta Smelt

Life history: Adult, juvenile, and larval and egg life stages of Delta Smelt are expected to be present in the Delta during the requested WY 2022 TUCP period (April – June). Adult Delta Smelt are expected to be spawning during this time and will predominantly be within the freshwater reaches of the Delta and Suisun, with a small contingent of fish in low salinity conditions. Spawning begins when water temperatures reach about 12^{o}C, which can be as early as February, and continues until water temperatures surpass 18^{o}C (Baskerville-Bridges et al. 2005; Bennett 2005). Thus, Delta Smelt spawning is typically completed by May.

After hatching, both larvae and early juveniles are primarily distributed upstream of the location of X2 (Dege and Brown 2004). By June, most of the young of year Delta Smelt have grown to juvenile size and their distribution in the estuary becomes strongly related to freshwater outflow and the location of the low salinity zone (Moyle 2002; Dege and Brown 2004). Larval and juvenile Delta Smelt are expected to have a more eastward distribution under drier conditions in response to eastward shifts in X2 from April – June associated with proposed WY 2022 TUCP operations. Therefore, during the requested 2022 WY TUCP, we anticipate spawning of adult Delta Smelt to occur, and that eggs, larvae, and juveniles will be present in the Delta from April through June as spawning completes and young of the year fish rear and grow.

Water year 2022 abundance and distribution: Delta Smelt abundance suffered a steep decline in the early 1980s followed by an unexplained sharp drop in the early 2000s, a phenomenon commonly referred to as the Pelagic Organism Decline (Baxter et al. 2010; Sommer et al. 2007; Thomson et al. 2010). The species abundance has since dropped to record lows (Hobbs et al. 2017), reaching the most recent extremes in the past few years, with indices of relative abundance equal to zero from 2018 onward. Together, this trajectory indicates that the population may have limited resilience to expected dry conditions in WY 2022.

Data reported in 2021 from long-term monitoring and surveys in the Sacramento-San Joaquin Delta indicate continued record low detections of Delta Smelt across all life stages. CDFW's 20 mm survey[2] detected one Delta Smelt in the Sacramento Deep Water Ship Channel throughout all spring-time sampling in 2021. Summer and fall

[2] https://wildlife.ca.gov/Conservation/Delta/20mm-Survey

sampling between CDFW's Townet[3] and Fall Midwater Trawl[4] were unable to detect Delta Smelt in 2021. Catches in the USFWS Enhanced Delta Smelt Monitoring (EDSM)[5] have been sparse, with six detections for the year: two adults in January 2021, one juvenile in August 2021, and recently, one unmarked adult in January 2022. Additionally, 74 marked adults (part of the recent experimental release) have been detected as of March 25, 2022. Marked Delta Smelt were detected in Bay Study, Chipps Island Trawl, Spring Kodiak Trawl, EDSM, and in CVP salvage. CDFW's 20 mm survey began sampling for WY 2022 the week of March 21 – 25, and has detected 5 juvenile Delta Smelt.

Potential impacts as a result of requested WY 2022 TUCP operations: All life stages of Delta Smelt are expected to be present within the Delta during the April - June time period and experience effects to varying degrees. Potential effects to Delta Smelt could include:

- Reduced food availability as X2 and the low salinity zone are moved away from areas with high productivity as a result of reduced Delta outflow;
- Reduced availability of the copepod *Eurytemora affinis*, a preferred prey item for Delta Smelt, as a result of reduced Delta outflow;
- Potentially increased risk of entrainment into unfavorable habitats in the central and south Delta, and the Project facilities, although the magnitude of impact is uncertain and exports will be held to health and safety.

Uncertainty in potential impacts to Delta Smelt: The degree to which elements of the requested WY 2022 TUCP would impact Delta Smelt when compared to existing critically dry conditions is difficult to quantify, and assessment of effects involves uncertainties because: 1) mechanisms underlying zooplankton abundance and outflow are not well understood, 2) the extent of changes in X2 as a result of TUCP operations is not fully known, and 3) requested changes in SWP and CVP exports are relatively small and below health and safety limits of 1,500 cfs.

Longfin Smelt

Life history: Spawning occurs primarily from December through March but periodically extends from November through April (CDFG 2009a). Therefore, only a few spawning adults may be present by the time the requested 2022 WY TUCP operations would begin. Larval Longfin Smelt begin hatching as early as December, peaking in February, and are present in the Delta into April (CDFG 2009b). The initial distribution of hatching larvae is determined by the location of X2 immediately prior to adult spawning (CDFG

[3] https://wildlife.ca.gov/Conservation/Delta/Townet-Survey
[4] https://wildlife.ca.gov/Conservation/Delta/Fall-Midwater-Trawl
[5] https://www.fws.gov/lodi/juvenile_fish_monitoring_program/

2009a). Later larval distribution is also influenced by hydrology, as larval fish are generally passive swimmers and easily transported by river flow. Despite slow growth rates in recently hatched Longfin Smelt (CDFG 2009a), most individuals are expected to grow to juvenile size in the April – June period. Juvenile Longfin Smelt will eventually emigrate into more saline conditions and rear in the lower estuary or nearshore habitats within the ocean. However, even as competent swimmers, larvae and small juveniles must determine which direction leads to the lower estuary to emigrate from the central and south Delta by early summer before water temperatures reach lethal levels (Eakin et al. 2020).

Because the proposed 2022 WY TUCP will occur at the tail end of the adult spawning period, it is expected that some adults, eggs, and larvae may be present. However, the majority of fish in the Suisun and Delta regions are expected to be age-0 juvenile (> 20 mm) throughout the April – June period, and they will be actively leaving these areas during the implementation of the TUCP.

Water year 2022 abundance and distribution: This year's Longfin Smelt spawning population is expected to be dominated by fish that were hatched in the winter and spring of WY 2019, the most recent wet year, because Longfin Smelt typically return at age-2 to spawn. Fall Midwater Trawl catches occurred predominately in the San Pablo Bay and the Carquinez Strait regions in November 2021. By December 2021 catches shifted to Suisun Bay and San Pablo Bay, indicating that a relatively large population of older fish were moving into, and up, the estuary in fall 2021. These catches have factored into one of the highest indices of relative abundance in the past 15 years (323), second only to the fall of 2011 (477).[6] By March 2022, EDSM detections of adult Longfin Smelt were mostly in Suisun Bay and the physical confluence of the Sacramento and San Joaquin Rivers.

Adult Longfin Smelt (> 98 mm) were detected in the Chipps Island Trawl[7] in late November, indicating that adult migration into the upper estuary had begun for WY 2022. The Smelt Larva Survey (SLS)[8] conducted its first survey from December 13-17, 2021 and detected small densities of larvae, indicating that spawning was underway. As of March 25, 2022, low densities of larvae continue to be detected in the SLS within the lower San Joaquin River, lower Sacramento River, Cache Slough complex, the physical confluence of the Sacramento and San Joaquin Rivers, Suisun Bay, and Suisun Marsh. These detection locations indicate a more eastward distribution of spawning in WY 2022, which is consistent with described spawning distributions under dry conditions (Eakin et al. 2020). Although the SLS is still ongoing, current data suggests an increase in Longfin Smelt larval densities as compared to 2020 and 2021. Larval Longfin Smelt

[6] https://www.dfg.ca.gov/delta/data/fmwt/indices.asp
[7] https://www.fws.gov/lodi/juvenile_fish_monitoring_program/
[8] https://wildlife.ca.gov/Conservation/Delta/Smelt-Larva-Survey

have been detected in larval sampling at the salvage facilities as recently as March 24, 2022. As of March 24, 2022, 218 juvenile Longfin Smelt have been salvaged between the SWP and CVP facilities, indicating continued presence of young of the year fish within the South Delta.

The abundance of Longfin Smelt has been in decline for decades (Rosenfield and Baxter 2007; Sommer et al. 2007) only interrupted by short periods of high spring outflow and subsequent population increases (Thomson et al. 2010). Longfin Smelt experienced record low abundance during the 2014 – 2016 drought. Drought periods generally impact Longfin Smelt survival due to increased physiological stress related to exposure to warmer water temperatures (Jefferies et al. 2016) and reduced juvenile survival resulting from reduced spring flows (Nobriga and Rosenfield 2016). However, relative abundance increased since 2015 in response to favorable, high outflow, winter-spring conditions in 2017 and 2019. WY 2022 is likely to become the third consecutive dry year since WY 2020, and despite increases in spawning stock and larval abundance, Longfin Smelt recruitment and survival are expected to be poor for a third consecutive year due to reduced flows and elevated water temperatures in the Delta.

Potential impacts as a result of requested WY 2022 TUCP operations: All life stages of Longfin Smelt are expected to be present within the Delta during the April - June time period and experience effects to varying degrees. Potential effects to Longfin Smelt could include:

- Negative impact to Longfin Smelt abundance and recruitment as a result of requested reductions in Delta outflow;
- Impacts to food resources for all life stages of Longfin Smelt, including *E. affinis* and *Neomysis mercedes*, as a result of requested reductions in Delta outflow;
- Larval and juvenile Longfin Smelt that hatch and rear in the south Delta would remain at high risk of entrainment under both baseline and TUCP scenarios without additional inflows into the Delta.

Uncertainty in potential impacts to Longfin Smelt: The degree to which elements of the requested WY 2022 TUCP would impact Longfin Smelt when compared to existing critically dry conditions is difficult to quantify, and assessment of effects involves uncertainties, because: 1) mechanisms underlying key outflow abundance relationships for both zooplankton and Longfin Smelt are not well understood and 2) requested changes in SWP and CVP exports are relatively small and below health and safety limits of 1,500 cfs.

Winter-run Chinook Salmon

Life history: Juvenile winter-run Chinook Salmon emerge as fry in the upper Sacramento River, rear, and migrate downstream into the Delta. While the timing of emigration varies in response to changes in river flows, dam operations, and WY type, juvenile winter-run Chinook Salmon have been detected at Knights Landing as early as

August and as late as April (CalFish 2022; Allison et al. 2020), with Delta entry at Sherwood Harbor beginning as early as September and ending in late April (Allison et al. 2020). Long-term monitoring at Chipps Island shows juvenile winter-run Chinook Salmon leaving the Delta from December to May, with a peak in March and April (del Rosario et al. 2013; SacPAS 2022). Historically, winter-run Chinook Salmon salvage at the CVP and SWP has started as early as November and has extended through June (Allison et al. 2020).

Adult winter-run Chinook Salmon enter the Bay-Delta in November to begin their upstream spawning migration and continue to proceed up the Sacramento River through August (Allison et al. 2020; Yoshiyama et al. 1998; NMFS 1998; Moyle 2002). Adult presence in the Delta may extend through June and potentially into July at very low numbers (NMFS 2019; Moyle 2002; Yoshiyama et al.1998).

Water year 2022 abundance and distribution: On January 14, 2022, the Interagency Ecological Program's Winter-run Chinook Salmon Project Work Team (WR PWT) recommended a final natural-origin winter-run Chinook Salmon production estimate (JPE) of 125,038 fish and a hatchery-origin JPE of 151,544 fish (WR PWT 2022). Although not directly included in either JPE calculation, the WR PWT recommendation included estimates of Sacramento River escapement (9,956 in-river spawners) and an egg-to-fry survival at Red Bluff Diversion Dam (2.56%). CDFW estimates that winter-run Chinook Salmon total spawning escapement (hatchery and natural-origin adults) for 2021 was 10,269 fish, which is nearly three times higher than in previous drought years including WYs 2014 and 2015 (CDFW 2021a&b). As of February 25, 2022, total unmarked juvenile winter-run Chinook Salmon passage at Red Bluff Diversion Dam was estimated as 572,041 fish (USFWS 2022a). The brood year 2021 passage estimate is higher than the historic mean total passage estimates from previous drought years; however, it is important to note that the passage estimate is the lowest passage observed since brood year 2016 (USFWS 2022b). Livingston Stone National Fish Hatchery has conducted two in-river production releases (dated February 9 and March 2, 2022) of winter-run Chinook Salmon, totaling 520,285 fish (CDFW 2022).

The Salmon Monitoring Team (SaMT) documented the presence of adult winter-run Chinook Salmon migrating through the Sacramento River in mid-November 2021 (CDFW 2022). On March 22, 2022, SaMT estimated that 75-89% of natural-origin, brood year 2021 young-of-year juveniles were present in the Delta and 10-15% have exited the Delta. SaMT also estimated that 75-85% of hatchery-origin, brood year 2021 juveniles remained upstream of the Delta and 14-20% were present in the Delta.

Low juvenile passage at Red Bluff coupled with reduced survival estimates resulting from the WY 2022 TUCP would further increase the vulnerability of the species and cause declines in the population that also experienced low juvenile survival in WY 2021. Protection of winter-run Chinook Salmon, which follow a predominantly three-year lifecycle, is of particular concern given declining trends in population estimates of an imperiled species as prolonged drought exacerbates poor conditions in the Delta.

Potential impacts as a result of requested WY 2022 TUCP operations: Juvenile and adult winter-run Chinook Salmon are expected to be present within the Delta during the April – June time period and experience effects to varying degrees. Potential effects to winter-run Chinook Salmon could include:

- Reduction in the quality and quantity of rearing habitat for juveniles;
- Reduced channel margin habitat along with longer residence and travel times due to lower outflow may increase predator densities and predation of juveniles;
- Reduced Delta flows may increase juvenile susceptibility and exposure to pathogens and parasites in the Delta;
- Greater entrainment of juveniles into the interior Delta via Georgiana Slough and the Delta Cross Channel gates in June as Sacramento River flows decrease;
- Reduced through-Delta survival of juveniles;
- Increased risk of entrainment of juveniles into Project facilities in the south Delta;
- Increased straying and migratory delays for adults.

Uncertainty in potential impacts to winter-run Chinook Salmon: The degree to which elements of the requested WY 2022 TUCP would impact winter-run Chinook Salmon when compared to existing critically dry conditions is difficult to quantify, and the assessment of effects involves uncertainties, because: 1) there is insufficient monitoring to quantify effects of disease on juvenile salmon populations, 2) accurate temperature models and forecasts were not available for the April – June time period when Reclamation and DWR completed their analysis for this TUCP, 3) assumptions included in survival and routing models introduce uncertainty in results, and 4) requested changes in SWP and CVP exports are relatively small and below health and safety limits of 1,500 cfs.

Spring-run Chinook Salmon

Life history: Sacramento River origin juvenile spring-run Chinook Salmon emigrate from upstream natal tributaries into the Sacramento River system and the Delta as either young-of-year or yearlings. Young-of-year spring-run Chinook Salmon have been detected at Knights Landing from November through May (CalFish 2022; Allison et al. 2020) with historical presence at Delta entry beginning as early as November and ending in late June (Allison et al. 2020). Long-term monitoring at Chipps Island shows young-of-year spring-run Chinook Salmon leaving the Delta from December through June, with a peak in April and May (Brandes and McLain 2001; Williams 2006; SacPas 2022). Historical salvage data at the CVP and SWP salvage facilities show young-of-year spring-run Chinook Salmon loss beginning as early as January and extending through June (Allison et al. 2020).

Adult spring-run Chinook Salmon enter the Bay-Delta in late January to begin their upstream spawning migration and continue to proceed up the Sacramento River through October (Allison et al. 2020; Yoshiyama et al. 1998; NMFS 1998; Moyle 2002).

Adult spring-run Chinook Salmon presence in the Delta may extend through June and potentially into September at very low numbers (NMFS 2019; Johnson et al. 2011; Moyle 2002; Yoshiyama et al. 1998).

Natural-origin spring-run Chinook Salmon were extirpated from the San Joaquin River in the late 1940s, with only remnants of the run persisting through the 1950s in the Merced River (Yoshiyama et al. 1998). Beginning in 2014, the San Joaquin River Restoration Program has released juvenile hatchery origin spring-run Chinook Salmon into the lower San Joaquin River with the goal of reestablishing an experimental spring-run Chinook Salmon population in the basin. The spring-run Chinook Salmon broodstock for the hatchery juvenile releases are from the Feather River Fish Hatchery; therefore, juveniles and adults ae expected to return to exhibit similar migration timing as spring-run Chinook Salmon from the Sacramento River basin (NMFS 2019). Juvenile spring-run Chinook Salmon entrainment data from CVP and SWP salvage facilities shows loss of experimental releases occurring as early as December (following early hatchery releases) and extending through May (SacPAS 2022). Adult experimental spring-run Chinook Salmon returning to the San Joaquin River have been documented beginning in WY 2019 (NMFS 2019), with adult immigration into the San Joaquin River beginning in April (Sutphin and Root 2021).

Water year 2022 abundance and distribution: Spring-run Chinook Salmon spawning escapement estimates for 2021 are currently not available (CDFW 2021b). As of February 25, 2022, total unmarked juvenile spring-run Chinook Salmon passage at Red Bluff Diversion Dam is estimated as 110,655 fish (USFWS 2022a). This estimate is higher than in previous drought years; however, this may be a reflection of October and December storm events that may have pushed juvenile spring-run Chinook Salmon downstream earlier than in years without early storms (USFWS 2022b). Current passage estimates do not include other spring-run Chinook Salmon natal rearing areas below Red Bluff, including Butte Creek and Feather River. As of March 17, 2022, rotary screw trap monitoring on Butte Creek has observed 8,610 unmarked spring-run Chinook Salmon juveniles (CalFish 2022). As of March 19, 2022, rotary screw trap monitoring on the lower Feather River has observed 29 unmarked spring-run Chinook Salmon juveniles. There is currently no means to estimate juvenile production for young-of-year spring-run Chinook Salmon. However, the Spring-Run JPE Team, established as part of the SWP ITP, is actively developing additional monitoring and studies to inform the development of a spring-run Chinook Salmon JPE by 2025.

Feather River Fish Hatchery is currently planning to release two in-river production releases of spring-run Chinook Salmon in late March and mid-April 2022, totaling approximately 2 million fish. As part of the San Joaquin River Restoration Program, the Salmon Conservation and Research Facility (SCARF) has conducted three WY 2022 San Joaquin River releases (dated December 7, 2021, February 14, 2022, and March 18, 2022) of spring-run Chinook Salmon, totaling 81,849 fish (CDFW 2022).

SaMT documented the presence of adult spring-run Chinook Salmon migrating through the Sacramento River in early-February 2022 (CDFW 2022). On March 22, 2022, SaMT estimated that 70-90% of natural-origin, brood year 2021 young-of-year juveniles were present in the Delta and 0% have exited the Delta. Yearling spring-run Chinook Salmon downstream emigration occurs in the fall and winter (Allison et al. 2020). However, yearlings can effectively avoid monitoring stations, limiting information on their exact timing and distribution in the Delta (Allison et al. 2020).

Due to current gaps in monitoring and the lack of a spring-run Chinook Salmon JPE, impacts to juvenile spring-run Chinook Salmon are difficult to determine. However, in-river impacts assessed for winter-run Chinook Salmon may help inform risks to spring-run Chinook Salmon as a result of requested WY 2022 TUCP operations.

Potential impacts as a result of requested WY 2022 TUCP operations: Juvenile and adult spring-run Chinook Salmon are expected to be present within the Delta during the April – June time period and experience effects to varying degrees. Potential effects to spring-run Chinook Salmon could include:

- Reduction in the quality and quantity of juvenile rearing habitat;
- Reduced channel margin habitat along with longer residence and travel times due to lower outflow may increase predator densities and predation of juveniles;
- Reduced Delta flows may increase juvenile susceptibility and exposure to pathogens and parasites in the Delta;
- Reduced through-Delta survival of juveniles;
- Increased risk of entrainment of juveniles into Project facilities in the south Delta;
- Increased straying and migratory delays for adults;
- Increased routing of San Joaquin-origin juveniles into the south Delta and Project facilities;
- Greater entrainment of Sacramento River-origin juveniles into the interior Delta via Georgiana Slough and the Delta Cross Channel gates (in June consistent with D-1641) as Sacramento River flows decrease.

Uncertainty in potential impacts to spring-run Chinook Salmon: The degree to which elements of the requested WY 2022 TUCP would impact spring-run Chinook Salmon when compared to existing critically dry conditions is difficult to quantify, and the assessment of effects involves uncertainties, because: 1) there is insufficient monitoring to quantify effects of disease on juvenile salmon populations, 2) accurate temperature models and forecasts were not available for the April – June time period when Reclamation and DWR completed their analysis for this TUCP, 3) assumptions included in survival and routing models introduce uncertainty in results, and 4) requested changes in SWP and CVP exports are relatively small and below health and safety limits of 1,500 cfs.

Summary of uncertainty associated with analysis of potential benefits and effects to fish and wildlife: CDFW notes that there is uncertainty in an assessment of impacts associated with the requested changes to Delta outflow and salinity standards included in the WY 2022 TUCP. It is difficult to discern impacts as a result of requested WY 2022 TUCP operations and impacts associated with baseline conditions during a critically dry year following successive dry and critically dry water years. Reduced reservoir releases upstream associated with reduced net Delta outflow can cause impacts to winter- and spring-run Chinook salmon present upstream of the Delta. However, reducing reservoir releases has the benefit of preserving storage throughout the remainder of the water year, which would benefit all four species in subsequent water years. And, the restriction of combined SWP and CVP exports to no more than 1,500 cfs at any time that D-1641 standards are not being met is consistent with the minimum export rate set out in the SWP ITP's project description. These biological and operational factors create sources of uncertainty in our analysis of potential effects because the potential level of impacts to listed fish species as a result of low Delta outflow, changes in salinity distribution in the Delta, south Delta hydrodynamics, and entrainment risk are in part determined by such factors.

Recommended Actions to Reduce Uncertainty and Provide a Foundation for Long-term Drought Planning

CDFW recognizes the urgent and ongoing challenges the current drought conditions present, as described in the 2022 WY TUCP. The State of California is grappling with a historic set of circumstances to ensure water for minimum health and safety supplies while maintaining protections for endangered and threatened fish species, other fish and wildlife resources, and the San Francisco Bay-Delta that are already impacted by two preceding dry years. The compounding effects of 1) historically low observed precipitation and runoff in WYs 2020 and 2021, 2) an almost complete absence of precipitation in January, February, and March of WY 2022, 3) uncertainties in precipitation and temperature forecasts for WY 2022, and 4) the known near and long-term challenges facing California as a result of climate change, present an exceptional challenge for water and fish and wildlife managers.

The Emergency Proclamation requires monitoring and evaluation of modified requirements, such as the requested WY 2022 TUCP, to inform future actions. CDFW supports ongoing monitoring, evaluation, and reporting to continue to better understand the links between precipitation, water management, hydrology, and the ecosystems of California. In addition to ongoing monitoring and evaluation, CDFW suggests additional actions that will serve to further bolster near-term response and learning, while just as importantly providing support for long-term drought planning.

CDFW recommends continuing to convene multi-agency drought synthesis team(s) in association with the Interagency Ecological Program, and funded by the Projects, to collaboratively develop and conduct the following data synthesis efforts:

1. CDFW requests that Reclamation and DWR provide CalSim modeling assumptions and results for upstream areas associated with the WY 2022 TUCP request to better understand the tradeoffs associated with reducing outflows to meet the priorities identified in the 2022 WY TUCP, including improved storage conditions. For example, this would include CalSim modeling used to demonstrate improvements in cold water pool storage anticipated to be achieved as a result of the requested WY 2022 TUCP operations. Combined with modeling of temperature dependent winter-run Chinook Salmon mortality using the Martin et al. (2017) model this effort would elucidate the benefits of the WY 2022 TUCP on subsequent temperature dependent mortality of eggs. Additionally, utilizing the Salvage-Density Method to model changes in winter- and spring-run Chinook Salmon salvage as a result of WY 2022 TUCP operations, relative to baseline, would augment our understanding of impacts associated with in-Delta hydrology. Both these efforts would serve to inform long-term drought planning for future exceptionally dry conditions.
2. It is common practice to develop design scenarios for potential future flood situations, and plan accordingly. Our suggestion is to develop an analogous effort for future potential drought scenarios. CDFW recommends initiating a drought modeling effort to support ongoing SWP and CVP operations' consultation and permitting processes, including long-term operations of the SWP and CVP. A collaborative drought modeling effort lead by DWR and Reclamation, with engagement by CDFW, USFWS, NMFS, and SWRCB, could 1) develop new operational assumptions consistent with observed operations during this current drought and prior droughts, 2) simulate alternative SWP and CVP operational scenarios under a range of drought conditions (varying in severity and duration), and 3) investigate the relative importance of drivers of drought conditions (for example low precipitation, low snow pack, reduced run off, increased temperatures, etc.) and anticipated operational responses to droughts driven primarily by one factor or another. This modeling effort should also be informed by current climate change projections in California to provide forward thinking description of SWP and CVP operations during drought conditions with associated minimization and mitigation measures. This effort would also be consistent with the Governor's 2020 California Water Resilience Portfolio Section 26.3, which calls for development of "strategies to protect communities and fish and wildlife in the event of a drought lasting at least six years."
3. CDFW recommends leveraging the USFWS Delta Smelt Life Cycle Model and the Winter-run Life Cycle Model to conduct a comparative analysis between scenarios with and without the WY 2022 TUCP. This could provide a quantitative method for understanding Delta Smelt and winter-run Chinook Salmon response to both the WY 2021 and 2022 TUCPs that is more informative than relying upon infrequent detections in field survey data. This

modeling would also inform needed long-term drought planning for future dry and critically dry conditions.

CDFW appreciates the coordination and communication between our two departments during these exceptionally dry conditions. If you have questions regarding this letter, please contact Brooke Jacobs, Environmental Program Manager, at (916) 903-6426, or by email at Brooke.Jacobs@wildlife.ca.gov.

Sincerely,

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