Appendix 2A

Attachment 1: John E. Skinner Delta Fish Protective Facility Standard Operating Procedures for Fish Salvage

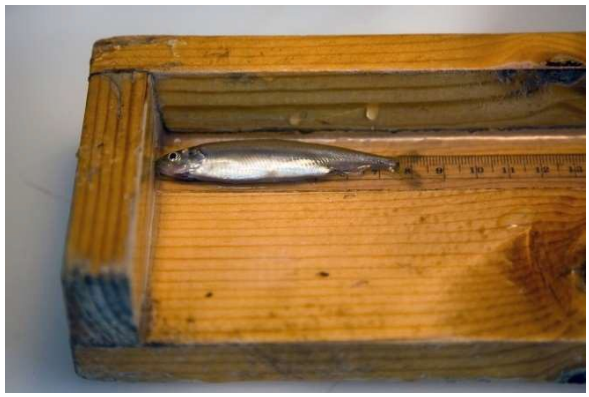
Revised September 2022; J. Miranda

State of California
The Natural Resources Agency
DEPARTMENT OF WATER RESOURCES
STATE WATER PROJECT

John E. Skinner Delta Fish Protective Facility

Standard Operating Procedures for Fish Salvage



Water Year 2023 Revision

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We would also like to offer special thanks to Jerry Morinaka who, in his long tenure as Fish Identification QA/QC biologist, provided guidance and training on the development and implementation of standard operating procedures at the John E. Skinner Delta Fish Protective Facility. Although he is no longer with us, Jerry's legacy lives on in the day-to-day operation of the facility.

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Abbreviations and Acronyms

BAPP	Harvey O. Banks Pumping Plant
CCF	Clifton Court Forebay
Delta	Sacramento San-Joaquin River Delta
DO	Dissolved Oxygen
CDFW	CA Department of Fish and Wildlife
CVP	Central Valley Project
CVTA	Central Valley Tissue Archive
CWT	Coded Wire Tag
DFD	Delta Field Division
DISE	Division of Integrated Science and Engineering
DWR	CA Department of Water Resources
FSB	Fish Science Building
HTB	Holding Tank Building
NMFS	National Marine Fisheries Service
PPE	Personal Protective Equipment
QA/QC	Quality Assurance/Quality Control
SaMT	Salmon Monitoring Team
SDS	Safety Datasheet
SMT	Smelt Monitoring Team
SFF	John E. Skinner Delta Fish Protective Facility
SWP	State Water Project
UCW	Utility Craftsworker
USBR	U.S. Bureau of Reclamation
USFWS	U.S. Fish and Wildlife Service

1.0 Introduction and Purpose

1.1 Facility History and Purpose

The Department of Water Resources (DWR) operates the John E. Skinner Delta Fish Protective Facility (SFF) as part of the State Water Project (SWP). The SWP is a water storage and conveyance system with facilities and infrastructure throughout California. A large pumping facility, the Harvey O. Banks Delta Pumping Plant (BAPP), located in Byron, CA pumps water from the southern portion of the Sacramento-San Joaquin River Delta (Delta) into the California Aqueduct. The function of the SFF is to reduce the number of fish entrained into BAPP and it has been operational since 1969. Fish are collected prior to reaching BAPP using a system of louver guidance arrays, bypass passages, and fish collection tanks. At regular intervals, fish are lifted from the collection tanks, placed into fish hauling trucks, transported to locations away from influence of the State and Federal pumping plants, and released. The process of collecting and releasing fish back into the Delta is referred to as "salvage." A full description of the facility and changes over time is available as a technical report (Morinaka 2013[1]; see also section 2.0).

While the original intent of the SFF was strictly to salvage fish, particularly juvenile sport fish such as Striped Bass and Chinook Salmon, there has been an increasing need for accurate estimates of fish salvage since the facilities original operation. Fish sampling was first initiated to record the numbers, sizes, species of fish salvaged and to optimize fish hauling loads, but more recently there has been an increasing need to understand Delta ecology and the effects of water operations on native fish populations. Salvage estimates are therefore used as an indirect measurement of fish loss due to entrainment into the SWP. Salvage estimates are frequently evaluated to determine minimization or mitigation obligations for Federal and State Endangered Species Act listed species including Delta Smelt, Longfin Smelt, Chinook Salmon, and steelhead trout. Fish salvage estimates are an important source of data for water operations impacts to the Delta ecosystem, and thus protocols have changed over time to meet the increasing management needs, particularly understanding entrainment of fishes caused by SWP operations. Not all fish that are sampled by the SFF survive the salvage process, so we more accurately refer to those data as SFF fish count data, or simply "fish counts."

[1] J. Morinaka 2013. *Acute Mortality and Injury of Delta Smelt Associated With Collection, Handling, Transport, and Release at the State Water Project Fish Salvage Facility,* Interagency Ecological Program for the San Francisco Bay/Delta Estuary. Sacramento, CA. IEP Technical Report 89

1.2 Department of Fish and Wildlife's Involvement in Fish Salvage Operations

The SFF was operated solely by DWR personnel for the first 23 years of operation. The DWR operators performed fish counts and hauls while performing all facility operations. Following the Federal or State listing of several fish species in the late 1980's, there was an increased demand for accurate reporting of fish salvage data. The Department of Fish and Wildlife (CDFW) and DWR mutually decided that the most effective method for improving accuracy was to provide additional staff. During the early 1990's, DWR contracted with CDFW to perform fish counts and transportation. CDFW's primary responsibilities were to conduct the fish sampling counts and haul the salvaged fish. At the same time, regulatory and monitoring requirements concerning listed species had increased the scope of duties and responsibilities of the fish facility staff.

In August 2000, CDFW identified the positions at the SFF for redirection. CDFW modified its current contract with DWR to return the fish count and transportation operations at the SFF back to DWR in early 2001. DWR and CDFW management implemented a transition plan to return the fish counts to DWR. CDFW staff involved with the salvage data processing, data reporting, training, Quality Assurance and Quality Control (QA/QC), and general biologist support were not redirected in this management action. Currently, DWR performs all aspects of SFF operations, with CDFW offering support with fish handling and data to conform compliance with various regulatory actions and standards.

1.3 The Fish Science Building and the Division of Integrated Science and Engineering's Involvement in Fish Salvage Operations

In 2014, DWR completed construction of the Fish Science Building (FSB) on the grounds of the SFF. The FSB was initially constructed to support fisheries research and monitoring at the SWP water export facilities as required in the 2008 U.S. Fish and Wildlife Services' (USFWS) Biological Opinion, 2009 National Marine Fisheries Service (NMFS) Biological Opinion, and 2009 CDFW Incidental Take Permit. The FSB is jointly operated and maintained by the Division of Integrated Science and Engineering's (DISE) Fisheries Infrastructure and Operations Branch (formerly Bay-Delta Office), which operates the building, and the Delta Field Division (DFD) which maintains the facility. The FSB includes aquaculture tanks and filtration systems for holding study fish, office space, a small laboratory, and a warehouse which support fisheries investigations related to the operation of the SWP.

In 2020, DWR management identified staffing and work process improvements that could be gained from transferring some biologist support functions from CDFW to onsite DWR-DISE staff at the FSB. In March 2020, larval fish processing was reassigned to DISE, and beginning in July 2020, other biologist support functions became a collaborative effort between DWR-DISE and CDFW biologist staff.

In addition, DISE biologist staff provide assistance to ensure DWR is within regulatory compliance for operations of the SFF by tracking salvage of state and federally listed species, and reporting that information in a timely manner to the regulatory agencies. This includes tracking, monitoring, and reporting of fish losses, extraction and reading of Coded Wire Tags (CWT) from salvaged fish, oversight of the genetic sampling program, and participation on technical teams for fisheries and operations management.

1.4 Purpose of these Procedures

In early 1999, the CDFW SFF staff began preparing Standard Operating Procedures (SOPs) to assist the training of employees. After the announcement of the redirection of CDFW staff, CDFW and DWR agreed that detailed Operating Procedures were needed to enhance and speed the training of DWR staff. Written documentation would help transfer CDFW experience to their DWR counterparts and provide an authoritative reference resource. A draft of these SOPs was completed in December 2000 and were the foundation of SFF operations through Water Year 2021.

In 2019 and 2020, NMFS and USFWS issued new biological opinions and CDFW issued a new Incidental Take Permit (ITP) for operation of the SWP. These opinions and permits required that DWR update the SFF Operations manual and to ensure alignment with sampling and counting procedures at the Bureau of Reclamation's (USBR) Tracy Fish Collection Facility. In compliance with these requirements, DWR, in coordination with CDFW and USBR, prepared the revised the operations manual presented herein.

In short, the purpose of this document is to provide guidance on fish handling and sampling related to the collection, sampling, transport, and release of salvaged fish from the SFF to comply with state and federal regulatory requirements. This document is also periodically updated to improve the detection, collection, and handling of species of concern at the SFF to meet increasing management needs.

1.5 Regulatory Requirements and Agreements

Operation of the SWP involves "take" and habitat modification of state and federal ESA- listed species, and thus permits are issued by fish and wildlife regulatory agencies to authorize the SWP's activities. The SWP has direct impacts on fish present in the South Delta since fish can be entrained into CCF and BAPP. The SFF collects a diverse assemblage of fish species including Delta Smelt, Chinook Salmon, steelhead trout, and other resident and migratory species. Fish count data collected at SFF is therefore often used to estimate entrainment and loss of species of concern, including Delta and Longfin Smelt, winter-run and spring-run Chinook Salmon, Central-Valley steelhead, and Southern Distinct Population Segment (DPS) Green Sturgeon, which informs permit requirements including mitigation measures. Fish count data from SFF also informs adaptive "triggers" used to minimize take, making fish count data an invaluable asset. The accuracy and consistency of these data are of increasing importance, and the scope has moved beyond estimating salvage to more thorough fish entrainment monitoring.

Regulatory Permits and Agreements Affecting Fish Salvage Operations (as of 2021):

1) State Water Resources Control Board; D-1485
2) National Marine Fisheries Service; 2019 Biological Opinion for the Re-initiation of Consultation on the Long-Term Operation of the Central Valley Project and State Water Project
3) U.S. Fish and Wildlife Service; 2019 Biological Opinion for the Re-initiation of Consultation on the Long-Term Operation of the Central Valley Project and State Water Project
4) California Department of Fish and Wildlife; 2020 Incidental Take Permit for Operations of the State Water Project in the Sacramento-San Joaquin Delta

1.6 Process for Revisions and Updates to these Procedures

This document and each of the accompanying Standard Operating Procedures (SOPs), datasheets, and other supporting documents will be reviewed with CDFW and other interested agencies each year, and revision requests submitted by August 15th. Authorized revisions will be implemented at the start of the next Water Year. The review process is coordinated by the DWR SWP Fish Facilities unit staff in collaboration with the SFF onsite supervisor.

Modifications to procedures will only be recommended after thorough consideration and consultation with fishery agency staff, as applicable, and with authorization from DWR and CDFW management. The reasons for the revision will be documented to ensure that the rationale is clear. After a decision to modify a procedure has been reached, the DWR SWP Fish Facilities unit supervisor will serve as the point of contact responsible for ensuring that the new procedure is properly reviewed, authorized, and recorded for use. CDFW has agreed to oversee the training of SFF staff on all new fish count procedures.

After a procedure has been revised, the following shall be identified on the document:

1) The date of revision
2) The person making the change
3) The changes made and the reasons for the revision

Supervisory personnel and fishery agency guidance may determine that a procedure must be modified before the next water year (in-season change). If the need for modification is urgent and requires that change(s) must be made before the next water year, the modified procedures should be thoroughly documented in the existing SOP. The justification for modification should be communicated to the DWR SWP Fish Facilities unit supervisor who will elevate the issue to the DWR ITP Designated Biologist who will manage consultation and communication with fishery agency staff and documentation of the modifications.

WY 2022 and 2023 Update

The WY 2022 review was done in collaboration with CDFW per Incidental Take Permit Condition of Approval 7.4.2, which states, “The updated draft operations manual shall include a new protocol for the Skinner Fish Facility, which describes the decision-making process prior to reducing sampling times and the protocol used to determine whether Covered Species are present during debris removal efforts.” Due to this requirement, the focus of this review was to improve detection of Covered Species. However, budget delays and limited staffing prevented the thorough evaluation and implementation of a new process at the start of WY 2022. Therefore, modification to this protocol, specifically with regard to Condition of Approval 7.4.2, was implemented operationally in WY 2023 will be ongoing and occur at least annually with CDWR and CDFW continuing to collaborate to improve fish count processes at the facility.

1.7 Organization of these procedures

The procedures included herein are organized in the following manner:

1) SFF Operations Manual (this document)

    a. This document includes general guidance for fish collection and salvage at the SFF. It is intended to serve as a guidance document for the SFF supervisor, journey-level salvage operations staff, and biologist staff.

2) Salvage Standard Operating Procedures (Salvage SOPs)

    a. These SOPs include step-by-step procedures for certain components of fish collection and salvage. They are intended to serve as task-specific procedures for salvage operations staff and may be posted at the count stations or other locations where detailed instructions are needed for specific work processes.

3) Laboratory Standard Operating Procedures (Laboratory SOPs)

    a. These SOPs include step-by-step procedures for certain biologist support activities at the SFF. They are intended to serve as task-specific procedures for biologist staff and may be posted at the Fish Science Building laboratory or other locations where detailed instructions are needed for specific work processes.

2.0 Procedures for Fish Collection Using the Holding Tank System

When BAPP is exporting water, the SFF collects fish simultaneously. A schematic of the SFF is shown in Figure 1. During normal operation, water and fish flow through the open primary bays into one of four bypass pipes (labeled A through D; one pipe at the end of each "V"). Primary bays are opened or closed using wing gates to regulate flows and velocities within the primary bays and to facilitate louver cleaning. The bypass pipes then guide water and fish into two secondary channels. Secondary Channel #1 receives water from bypass pipes A and B, while Secondary Channel #2 receives water from bypass pipes C and D. Water and fish leave the secondary channels through the secondary channel bypass via two, 24-inch influent "COLLECT" lines and finally enter the holding tank buildings. Under normal operations, Holding Tank Building (HTB) #1 (also known as the "Old Holding Tank Building") receives water from Secondary Channel #2, and HTB #2 (also known as the "New Holding Tank Building") receives water from Secondary Channel #1. An intertie between the two collect lines exists but is not used during normal operation as it may affect fish salvage estimation.

A 24-inch pneumatic valve in the influent for each holding tank is used as a shut-off valve. When this valve is open, water and fish flow into the holding tank. When this flow is to be stopped, the valve is closed. This valve is never to be used to throttle or restrict the flow of fish and water entering the holding tank. The cylindrical holding tank screen retains fish in the holding tank while water flows through the screen and is then pumped by effluent pumps back to the main canal. The water level in the holding tanks varies with the pumping rate of the effluent pumps, the water surface in the primary channel which rises and falls with the level of CCF and the primary channel flow rate. The number of holding tanks in operation is based on the water export rate and the flow rate to each holding tank. During normal operation, the flow rate to each active collection tank should not exceed 10 CFS. As BAPP pumping rate increases, additional primary channels, secondary channels, and holding tanks are activated.

There are 20 and 24-inch effluent lines that are used to drain water from the holding tank during fish sampling and continuous salvage. Generally, the amount of water allowed to flow into the holding tank is roughly equal to the flow of water being drained out of the tank. The effluent valve is not to be used to throttle or regulate the flow through the holding tank. A dewatering line is used to completely drain the holding tanks. When the drain valve is opened, water in the holding tank discharges to the dewatering sump where it is automatically pumped back into the main canal by the dewatering pumps. The "JACK" lever is used to lift and lower the holding tank screen.

All the pneumatic control levers for operating the holding tank valves, and the holding tank screen jack lift are located at a control panel along the side of each holding tank. This allows the operator to observe the position of the valve or lever as a holding tank is operated.

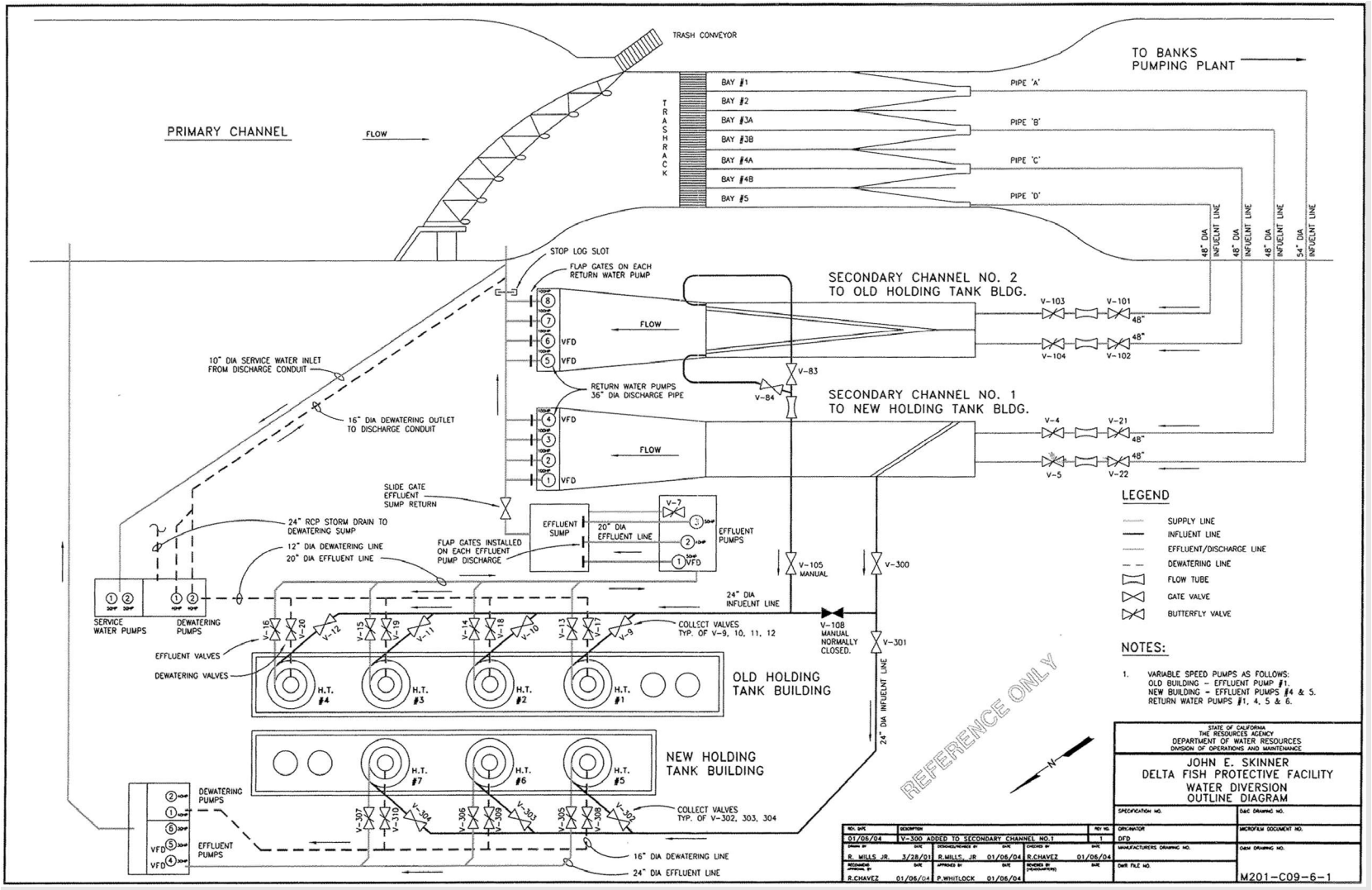

***Figure 1**- Schematic of the John E. Skinner Delta Fish Protective Facility.* The "Old Holding Tank Building" is also referred to as HTB #1, and the "New Holding Tank Building" is also referred to as HTB #2.

2.1 Purpose

The purpose of the fish collection system is to collect entrained fish before reaching BAPP, both listed and non-listed, into holding tanks for sub-sampling (counts) and later reintroduction into the Delta or monitoring purposes. Fish count data is used to help operate the facility and maintain good fish health, while also informing fish loss and population estimations to be used for management actions.

2.2 Schedule

The SFF continuously, and simultaneously, collects fish in holding tanks from the water being conveyed to BAPP.

Fish guided by the SFF louver arrays are diverted into holding tanks where they are continuously collected. The number of holding tanks in operation is determined by the total primary channel flow, and requirements to maintain appropriate flow rates (<10 CFS) in each holding tank. Any holding tank can be used for continuous collection, although use of Secondary Channel #1 and the tanks in Holding Tank Building (HTB) #2 are prioritized for use to improve collection efficiency.

Every 2 hours, or upon BAPP startup, shutdown, or flow change, fish entering each building of the SFF are diverted into a dedicated holding tank and these fish comprise the fish count (see Fish Sampling).

2.3 Fish Health Maintenance in Holding Tanks

Holding tanks are monitored for fish and debris accumulation which can potentially negatively impact fish health or facility operation. Monitoring of fish and debris accumulation is through fish sampling. Using the Fish Transportation Tables and Fish Release Datasheet for SWP, Utility Craftsworker can gauge when fish or debris loads are becoming harmful to fish or may result in mechanical issues. Failure to follow the Fish Transportation Tables will potentially result in over accumulation of fish in a holding tank and increased fish mortality.

2.4 Accumulation

Fish counts are “expanded” to estimate the total number of fish collected by the SFF during a collection period. These expanded estimates are then tracked using the hourly Fish Accumulation Logsheet. Fish accumulation in a holding tank is not to exceed 100% accumulative load. Accumulative load is the fish transportation capacity of the SFF haul trucks based on fish numbers, size, and water temperature. Exceeding 100% accumulative load will result in an increased risk of fish mortality due to hypoxia (low dissolved oxygen levels in the

water), as well as increased ammonia and carbon dioxide concentrations due to normal metabolic processes (i.e., respiration and defecation).

2.5 Secondary Channel Cleaning and Predator Flushes

Predatory fish may concentrate in the secondary channels and bypasses since they can swim against strong currents and hold their position. These fish contribute to the overall mortality of small fish such as juvenile Chinook Salmon and other listed species. In addition, debris accumulation on the secondary channel louvers and screens may affect their performance and/or impact the counting of fish or operation of pumps. Because of these impacts, secondary channel cleaning and flushes are performed at least twice a week (typically Tuesday and Thursday) when water exports are occurring continuously at the BAPP. In addition, secondary channel flushes are scheduled whenever BAPP shuts down water exports.

In addition, fish may accumulate in the secondary channels downstream of the louvers and screens. Fish in these areas may be killed during periods of prolonged shutdowns, especially during periods of prolonged maintenance projects, and when water temperatures are high and dissolved oxygen levels are low. Special efforts are needed to drain and remove fish that collect in these areas and a fish rescue is typically completed on the first day of any scheduled prolonged maintenance outage.

2.5.1 Routine Secondary Louver/Screen Cleanings and Predator Flushes

The most common method of flushing and cleaning the secondary channel involves 1) closing the primary bypass valve(s), 2) draining the channels, 3) pressure washing the louvers/screens with a fire hose, and 4) rapidly opening the bypass valve(s). This effectively results in a very high bypass ratio, which promotes downstream movement of fish, and flushes debris into a holding tank for processing and removal.

After the flush has been performed, the count tanks are drained, and debris and fish are washed into the bucket. All fish are identified and counted (see 3.0 Fish Counts), and excessive debris is removed and disposed of. A sub-sample of the first 24 fish from each species are measured. After the first 24 fish of a species are measured, a count is then taken and recorded as a “plus count” for each species[2]. All information is recorded on a Secondary Predator Removal Flushes for SWP datasheet including the time of the fish removal or debris flush. Fish must be loaded into a hauling truck and released into the Delta immediately after processing, therefore secondary channel flushes should be scheduled immediately prior to a scheduled fish haul. The time between the flush and the haul must not exceed two hours.

For fish obtained from a secondary channel flush, there may be too much debris and fish to use the routine counting bucket or the normal count station. If so, use of the 500-gallon loading bucket is permitted and its contents may be released into the rectangular 400-gallon tank stored

[2] See SOPs for specific handling and processing procedures for salmonids, sturgeon, and smelt.

in each building to facilitate sorting. The fish are examined and placed into a separate holding tank (if there is a large quantity of fish) or an existing collection tank.

2.5.2 Downstream Secondary Channel Fish Removals

To perform fish removals downstream of the louvers/screens in the secondary channel, the secondary channel is completely drained, a sump pump(s) is lowered into the downstream portion of the channel, and as much of the remaining water as possible is pumped out of the sump area. A small 20- to 40-foot-long beach seine is used to collect fish, which are then loaded into buckets, identified, counted, and placed in either a 500-gallon fish transport trailer or a standard fish haul truck. These removals should not be attempted during high water temperature periods or when large numbers of fish are present as it may result in fish mortality.

Because the secondary channels are designated as confined spaces requiring specialized training, a confined space entry permit, and a Clearance (Lockout/Tagout) are required to enter the channels in compliance with OSHA, Cal-OSHA, and DWR OP-2 safety requirements. In addition, downstream removals are labor and time intensive. A crew of four to six biologists and/or Utility Craftworkers is needed to collect the fish and process them quickly. Generally, two to three personnel will be designated as entrants and will collect the fish, while another two to three personnel will be designated as non-entrant fish processors.

All collected fish are identified and counted. All salmon, steelhead, Green Sturgeon, smelt or other listed species are set aside in an aerated bucket and measured and processed according to the procedures for each species. Non-listed species are not measured during these fish removals to avoid excessive fish handling and stress.

Fish are loaded directly into the fish haul truck or a smaller tank-trailer and returned to the Delta immediately after processing. When the 500-gallon fish transport trailer is used, fish may be released at the Antioch Public Boat Ramp or Brannan Island State Park Boat Ramp.

All fish count and processing data should be reported on the Fish Salvage Operations and Counts SWP datasheet, Fish Length datasheet, and SWP Salvage Information Sheet with notes clearly indicating that the fish were from a fish removal downstream of the secondary louvers/screens.

2.6 Operation During Periods of Heavy Debris

During periods of heavy debris, increased attention to debris management is essential to prevent impacts on fish salvage efficiency and water deliveries. During these periods, the frequency of cleaning should be increased at the trashracks, louvers/ screens, and holding tanks to prevent the excessive accumulation of debris such as aquatic weeds.

When operating the count and haul buckets, excess weeds and debris should be removed from the buckets before dumping the bucket into the count basin or haul truck (refer to Salvage SOP

5-2). As weeds and debris are removed from the bucket, it should be thoroughly examined for fish, as they tend to cling to debris. Fish entangled in the weeds and debris should be enumerated (if in a count) or returned to the bucket (if loading out).

Important note: Do not get behind on weed and debris management. Increase staffing during daylight hours, when possible. If you fall behind, call the Area Control Center (ACC) to request a temporary reduction in pumping rate to catch up so that the facility can stay within criteria.

2.7 Procedures

SOP 2-1: (RESERVED FOR FUTURE USE)

SOP 2-2: Downstream Secondary Channel Fish Removal

3.0 Fish Count (Sub-Sampling) Procedures

Fish salvage is generally estimated by collecting a 30-minute subsample of fish every two-hour period. This subsample is called a “count” or “fish count.” A fish count must be performed by a Utility Craftworker (UCW) or Fish Biologist trained in fish identification and fish handling and count procedures.

A fish count is collected in each holding tank building (holding tank building 1 [HTB1] and holding tank building 2 [HTB2]). If both buildings are in operation, a count is collected simultaneously in each building; however, the samples are processed in succession and not at the same time. The count data are then combined at the end of the sampling hour.

Detailed instructions for the collection of a fish sample are provided in *SOP 3-2 Fish Sampling Procedure.*

3.1 Purpose

The fish count is the primary sampling method by which the number of fish collected, and species composition is estimated during normal operations. Fish counts are also used to estimate the number and types of fish that are entrained into the SWP. The frequency of counts and count durations are important factors which influence the accuracy of the data. This data is used to manage operation of the SWP and CVP; therefore, monitoring data are collected according to scientific standards with a high degree of care.

In addition, this information is used along with the Fish Transport Tables and Fish Accumulation Log to determine when transport of fish is necessary.

3.2 Schedule and Count Duration

A fish count takes place every two-hour period, whenever water is being exported. The fish count sample shall be collected towards the end of the 2-hour period and generally reported on the odd hour. For example, for the 1300 fish count, the 30-minute sample is collected from 1230-1300. Fish counts also take place any time the primary flow is changed (flow change) including shut down and startup, and when the secondary channels are flushed.

Current agreements, permits, and biological opinions specify the minimum total count duration will be 30 minutes every two hours. Counts longer than 30 minutes are permissible with management approval only when flow in the count tank is less than 10 cfs for the entire duration of the count.

When large numbers of fish are collected, the count periods can be shortened according to the procedures in *SOP 3-3 Procedure for Managing High Fish Counts.*

When large amounts of debris are collected, the count may be reduced only with approval from the onsite supervisor.

If a fish count **cannot** be taken every two hours, the justification must be documented in both the daily and supervisor's logs, and CDFW notified. Documentation must include date, time, **justification**, and **relevant factors**.

3.3 Fish Species Counts (Non-Length Counts)

Fish Species Counts are collected every day 0100, 0500, 0700, 1100, 1300, 1700, 1900, and 2300 when pumping is occurring continuously. Fish Species Counts also take place when the primary flow is changed (flow change) including shut down and startup, and when the secondary channels are flushed. For example, if a flow change is scheduled for 0900, fish counts would be completed at 0900 (just prior to the flow change period), 1000 (60-minute post-flow change period), and then again at 1100 to get back to the odd hour schedule.

After a shutdown period and when BAPP resumes pumping, the first count will occur in the first hour after the start of pumping. For example, if pumping starts at 2100, the count will be labeled as the 2200 count.

All fish in the bucket are identified to species and counted. These fish are reported on the Fish Salvage Operations & Counts SWP Datasheet. This datasheet includes only raw catch of fish and not expanded fish counts (see section 3.6).

3.3.1 Counting of Dead Fish

All protected fish species (Green Sturgeon, Delta Smelt, Longfin Smelt, Chinook Salmon, and steelhead), including any dead fish, are to be retained and reported. Any unusual observations on these fish, including but not limited to unusual injuries, unusual mortality events, or evidence of mortality well prior to collection, should be recorded in the comments and reported to supervisory staff.

For non-protected species, generally, only fish that are collected alive should be counted. Some fish, particularly sensitive species such as shad, may die during the collection and counting process. However, all fish alive at the start of the count shall be counted including fish that die during processing. In the event of an unusual fish mortality event including but not limited to collection of an unusually large number of dead fish or accidental mortality of a large number of fish due to equipment malfunction, the onsite supervisor should be noted and the event reported to CDFW in accordance with the notification protocols listed in Salvage SOP 6-5.

3.4 Length Counts

Fish length counts occur four times daily, **typically** at 0300, 0900, 1500, and 2100 when pumping is occurring continuously. If no fish are present at these times, measure fish from the next count that has fish present. A length count may be taken at a different hour to adapt to specific start up or shut down times. For instance, if the facility is shutting down at 0800, measure fish from the 0800 count. If the facility is starting up at 2100, then measure fish from the 2200 count.

All fish with fork lengths equal to or greater than 20 mm are identified, counted, and the first 24 fish of each species are also measured. If many fish of a single species are obtained in a sample, measure 24 fish which represent the size composition of the entire sample. For example, do not attempt to pick only the largest fish in the sample. Fish lengths are generally measured from snout to fork of the tail fin (fork length [FL]), although some fish do not have a forked tail and are measured from snout to the tip of the tail (total length [TL]).

Record the length measurements on a hand-written Datasheet. If possible, record fish lengths from both buildings on a single side of the datasheet. Use both sides of the datasheet (one side per building) if there are too many species to fit both buildings' data on a single side of the form. These data will then be immediately key entered.

3.5 Larval Fish Counts

Larval sampling at the SFF occurs during each of the fish length counts. The larval counts are typically conducted at 0300, 0900, 1500, and 2100 hours when pumping is occurring continuously. A larval count may be taken at a different hour to adapt to specific start up or shut down times. For instance, if the facility is exporting water from 0900 to 1600, larval counts are conducted at 1000 (startup count), 1500 (normal larval count time), and 1600 (shutdown count).

A Larval Fish Sampling Datasheet and a Larval Sample Chain of Custody Log are filled out by the UCW showing the date, time, operators, processing time, and the number of fish in the sample vial. The larval samples are then processed by DWR biologist staff.

Refer to Section 4.9 for further information about collecting larval fish samples.

3.6 Expansion Factor

Since the SFF subsamples the fish that are collected in the facility, the total number of fish need to be estimated based on that subsample. Fish sample numbers are multiplied by an expansion factor to estimate the number of each fish species that was collected during that sample period. The expansion factor can be determined by dividing the Total Minutes Pumping by the Length of Count (min), which are both recorded on the Fish Salvage Operations and Counts SWP Datasheet.

An expansion factor of 4 (120 minutes ÷ 30-minute counts = 4) is most common and is used for a standard 30-mintue fish count. For example, if 8 Chinook Salmon and 3 White Catfish were collected from a 30-minute fish sample, the expanded salvage total for the two-hour period will be 32 Chinook Salmon and 12 White Catfish.

The method for estimating the total number of fish entering the holding tanks during each period assumes that the number of fish entering the system is constant over time. For example, if 50 fish are collected in a 30-minute period, it is assumed that 200 fish will be collected in 2 hours.

Expanded fish count data is reported on the SWP Salvage Information Datasheet and is used along with the Fish Transport Tables and Hourly Accumulation Log to estimate the cumulative percent of a truck load present in a holding tank and determine when transport of fish is necessary.

3.7 Outages

A fish facility outage is defined as the inability to (1) properly screen the entire flow (e.g., due to mechanical breakdown or excessive debris conditions) and (2) conduct fish salvage operations according to mandated operational criteria. When a fish facility outage occurs, and exports at BAPP continue, fish counts are potentially missed depending on type of equipment that malfunctioned. If salvage ceases and it is certain that fish counts will be missed, shortened, or if salvage inefficiency occurs due to operational issues, the Skinner Fish Facility Supervisor must notify the ACC and CDFW. Staff from DWR-DISE and the CDFW Salvage Monitoring unit will further convey information regarding the outages through the Salmon Monitoring (SaMT) and the Smelt Monitoring Technical (SMT) teams.

3.7.1 Unplanned outages

In the event of an unplanned salvage outage, the SFF operations staff must notify the ACC who will assist with immediately resolving the source of the outage (e.g., switching to an alternative power source). If the issue can be resolved within 1 hour, the SFF staff may shorten the count duration, if needed, to collect the next count within the normal fish collection period. A comment must be included in the Fish Salvage Operations and Counts SWP Datasheet indicating the time and reason for the outage.

For unplanned outages greater than 1 hour, export of water at BAPP must cease unless continued water export is authorized by the DFD Division Manager such as when there is an emergency and there is no available source of water for direct deliveries. In these instances, the Skinner Fish Facility Supervisor must notify the CDFW Salvage Biologist by phone immediately (see SOP 6-5). If discussion by phone is not possible, leave a message detailing the source and estimated duration of the outage.

3.8 Daylight Savings Time

During spring, the time changes on the second Sunday in March at 0200. Time is advanced by one hour. Perform the 0100 fish count as normal. The 0300 fish count will only include 60 pumping minutes and 60 salvage minutes due to the time change. Therefore, the sample collection should begin at 0130 for the 0300 fish count. The expansion factor for the 0300 fish count will be 2.

During fall, the time changes on the first Sunday in November at 0200. Time is moved back one hour. For the 0300 fish count, the pumping minutes and the salvage minutes will include an additional 60 minutes due to the time change. Therefore, the pumping minutes and the salvage minutes will be 180 minutes. In order to achieve the required 25% sampling, perform a 45-minute fish count.

3.9 Lost Sample

A lost sample occurs when a collected 30-minute fish count sample cannot be transferred from the holding tank to the fish count station and the sample cannot be recovered. Examples of scenarios when samples are lost include: 1) holding tank screen jack remaining in the lifted position during the sampling period and, 2) sampling bucket ball check valve left in the open position during sample lifting. When a sample is lost, a new 30-minute fish count sample must be collected immediately. In the Salvage Information Sheet and the Operations and Counts Datasheet, write 150 in the “Salvage Minutes” column since 30 minutes of fish collection time were lost during that period. The collection period for the following count should be shortened to put the count schedule back on the normal schedule.

If a lost sample occurs, make a detailed note on the Fish Salvage Operations and Counts SWP Datasheet, and the SFF Supervisor must follow the outage notification protocol (section 6.5) for reporting outages.

3.10 Equipment Malfunction

If a 30-minute fish count sample has been collected but cannot be immediately recovered due to a mechanical malfunction (e.g., broken hoist), the sample can be left in the holding tank until the mechanical issue is resolved. The SFF Supervisor must notify the DFD Division Manager to resolve the issue. If the mechanical issue persists for more than 6 hours, or fish counts will be missed, the situation must be treated as an outage. The SFF Supervisor must follow the outage notification protocol (section 6.5) for reporting outages.

3.11 Procedures

SOP 3-1: Hoist and Sampling Bucket Operations Procedure

SOP 3-2: Fish Sampling Procedure

SOP 3-3: Procedures for Managing High Fish Counts

SOP 3-4: (RESERVED) Procedures for Managing Heavy Debris in Fish Counts

4.0 Fish Handling and Processing Procedures

Fish collected in counts are handled and processed to collect data and samples for monitoring needs. This includes identifying fish, measuring fish, examining fish for tags, collecting tissue samples, and preserving fish. Limiting the stress due to handling and crowding will decrease mortality and increase survival.

4.1 Purpose

The information and procedures in this section outline which samples will be taken and include techniques to limit stress-induced fish injury and mortality from fish processing.

4.2 Use and Preparation of Anesthesia

The SFF uses Tricaine methanosulfonate (MS-222) to temporarily anesthetize fish. Refer to the Safety Datasheet (SDS) for hazards and chemical exposure control including recommended Personal Protective Equipment (PPE) related to the use of MS-222. An anesthetic bath is used to prevent injury to fish and personnel processing the fish. The anesthetic bath is used for fish that require special processing such as Chinook Salmon, steelhead, Delta Smelt, Longfin Smelt, and Green Sturgeon, but may be used for all fish.

A high concentration MS-222 stock solution (100 g/L) is prepared by the biologist staff, and stored in brown,1-L bottles kept at each fish count station. If anesthesia is needed for a fish count, add 3 mL of high concentration MS-222 solution using a syringe to 2.5 gallons of water (~10 liters) to create a solution of 30 ppm anesthetic solution (bath). Use freshwater from the service water hose for the bath. Prepare a fresh bath for each fish count. This will ensure that the water in the bath is at the correct water temperature, has sufficient oxygen, low bacterial count, less debris, and has low amounts of ammonia. Do not reuse bath from the previous fish count.

Refer to *SOP 4-1 Procedure for the Use of Anesthesia (MS-222)* for further instructions on anesthesia use. CDFW staff can provide further training on proper use of MS-222 for fish sedation, including recognizing signs of distress and how to revive fish.

4.3 Handling and Processing During Non-Length Counts

Non-length counts involve identifying and counting fish. Use a dip net, gloved hand, or the perforated stainless-steel scoop to remove fish and debris from the count station basin**.** As vegetation and debris are removed, they should be checked for entangled fish. **Do not use a rag to handle live fish.** Identify, count, and record fish 20 mm in length and greater. Fish less than 20 mm in length can be dropped into the collection tank without being documented or

counted (except during larval counts). Place debris into a trash can or bucket for measurement and/or disposal.

If a listed fish species is collected during a non-length count sample, place the fish in a separate bucket of freshwater and a bubbler and complete the non-length count sample. Determine the type of listed fish species and follow the corresponding species procedure. All listed fish species from a non-length count sample are measured and recorded.

4.4 Handling and Processing During Length Counts

Length counts involve identifying, measuring, and counting fish. Use a dip net, gloved hand, or the perforated Stainless-Steel scoop to remove fish and debris from the count station basin. As vegetation and debris are removed, they should be checked for entangled fish. **Do not use a rag to handle live fish.** Identify, measure, count, and record fish 20 mm in length or greater; fish less than 20 mm in length can be released without being documented or counted (except during larval counts). Measure the first 24 individuals of each species, the rest should be counted. Place debris into a trash can or bucket for measurement and/or disposal.

If a listed fish species is collected during a length count sample, place the fish in a separate bucket of freshwater add a bubbler and complete the length count sample. Determine the type of listed fish species and follow the corresponding species procedure. All listed fish species from a length count sample are measured and recorded.

4.5 Processing Chinook Salmon

All salmon recovered in any count or secondary channel flush will be measured for fork length. Record the data on the Fish Salvage Length Datasheet for SWP and on the Listed Species Log.

Chinook Salmon may also be retained or released, have samples taken, and/or be examined for the presence of tags. Refer to *SOP 4-2 Salmon Processing Guide*. Use the procedures in this SOP to determine whether and how to euthanize, label, and preserve salmon samples.

Ready the metal detector (CWT) wand, a PIT tag wand, MS-222 anesthetic bath, ethanol vials, pair of scissors, forceps, iodine, zip seal or Whirl-Pak plastic bag, sample labels, measuring board and Chinook Salmon datasheets including “Fish Salvage Length Datasheet for SWP” and “SWP Salmon DNA-Tissue Collection Form.” Process Chinook Salmon at the dry table of the fish count station; wet the measuring board before use.

4.6 Processing Steelhead Trout

All steelhead trout recovered in any count or secondary channel flush will be measured for fork length. Record the data on the lengths datasheet and on the Listed Species Log.

Steelhead may also be retained or released, have samples taken, and/or be examined for the presence of tags. Refer to Salvage SOP 4-4 Steelhead Processing Guide. Use the procedures in this SOP to determine whether and how to euthanize, label, and preserve steelhead samples.

Ready a PIT tag wand, MS-222 anesthetic bath, ethanol vials, pair of scissors, forceps, iodine, sample labels, measuring board and datasheets including “Fish Salvage Length Datasheet for SWP ” and “SWP Steelhead DNA-Tissue Collection Form.” Process steelhead at the dry table of the fish count station; wet the measuring board before use.

4.7 Processing Delta Smelt, Longfin Smelt, and Wakasagi

All Delta Smelt, Longfin Smelt, and Wakasagi recovered in any count or secondary channel flush will be measured for fork length. Record the data on the “Fish Salvage Length Datasheet for SWP” and on the “Listed Species Log”

All Delta Smelt, Longfin Smelt, and Wakasagi will be retained (euthanized) for verification of species, biologist examination, and further scientific use.

Refer to the protocols for saving Delta Smelt, Longfin Smelt, and Wakasagi (Salvage SOP 4-5 and 4-6). Use the procedures in these SOPs to determine how to euthanize, label, and preserve these samples.

Ready an MS-222 anesthetic bath, ethanol vials, perforated sealable baggies, sample labels, and datasheets including “Fish Salvage Length Datasheet for SWP.” Process smelt at the dry table of the fish count station.

4.8 Processing Sturgeon

All sturgeon (Green Sturgeon and White Sturgeon) recovered in any count or secondary channel flush will be measured for fork length. Record the data on the “Fish Salvage Length Datasheet for SWP” and on the Listed Species Log.

All sturgeon less than 300 mm FL will be retained (alive) for verification of species. The identification of sturgeon measuring less than 300 mm FL must be confirmed by at least two biologists. If there is disagreement or a second biologist is not available, a DNA sample should be taken. Once verification is completed, the fish may be released into a collection tank for transport and release.

Sturgeon greater than 300 mm FL may be identified, counted, and released without biologist verification.

If there is any doubt about the identification of any size class of sturgeon, salvage staff should retain the specimen (alive) and contact a biologist for secondary verification.

4.9 Processing Larval Fish Samples

Larval sampling at the Skinner Fish Facility occurs at each of the fish length counts. The fish length counts are conducted at 0300, 0900, 1500, and 2100 hours. A 0.50 mm Nitex larval fish count screen is used to retain larval fish when the contents of a 30-minute sub-sample are released from a sample bucket at the fish count station. Large fish and debris are removed before a 0.39 mm fine mesh net is used to remove larval fish from the remaining sample. The larval fish are stained with a 100 ppm Rose Bengal bath for several minutes. Stained larval fish are placed in a Pyrex dish sitting on top of a light table. Larval fish are removed and placed into a 20 ml sample vial containing a 10% formalin solution using forceps. A waterproof label is inserted into the sample vial containing the facility name, date, time, holding tank building number, and operator's initials. A round, salmon colored label is placed on the lid of the sample vial with date, time, and holding tank building number. A "Larval Fish Sampling Datasheet – State Facility" and a "Larval Sample Chain of Custody Log" are filled out by the salvage staff showing date, time, operators name, processing time, holding tank building number and the number of fish in the sample vial. Refer to Salvage SOP4-8 Larval Fish Sampling Procedure for further instructions on collecting a larval sample.

Larval fish samples are transferred to the DWR SWP Fish Facilities Unit. Refer to Laboratory SOP 4-3 Larval Fish Identification, for biologist's procedures on how to process and report these samples.

4.10 Handling and Processing of Other Tagged Fish

In some instances, a fish may be collected with a tag or mark other than those previously listed. Past examples have included dyed fish, fish with fluorescent marks, or external tags (e.g., Floy, dart, disc tags). If a fish is collected with one of these marks, they must be noted and reported to CDFW with a comment on the Salvage Operations and Counts SWP Datasheet, and any study-specific protocols for retention or processing should be followed.

If the fish has a tag with a serial number on it record the number. Enter a comment on the Salvage Operations and Counts SWP Datasheet indicating the species, when the fish was collected, and the tag serial number (if any) or description of the mark.

4.11 Handling and Processing of Unknown Fish Species

On very rare occasions, an unknown or extremely rare fish species may be encountered in the salvage counts. In these instances, the salvage staff should attempt to identify the fish before retaining it, preferably alive, for biologist examination. An aquarium is available in HTB1 for this purpose. In addition, an onsite biologist may be available at the Fish Science Building during regular working hours and may be consulted while the count is being processed. If an onsite biologist is not available for immediate consultation, notify the onsite supervisor who will ensure that the fish is examined by CDFW or DWR biologist staff as soon as possible.

4.12 Handling and Processing of Invasive Aquatic Species

On very rare occasion, an invasive aquatic species may be encountered in the salvage counts. If one these organisms are collected during a count or sighted, they should be retained (if possible) and CDFW staff informed as soon as possible. These species include, but are not limited to:

- Northern Pike
- Piranhas/Pacu
- Snakeheads
- Carps (Grass, Black, Silver, and Bighead)
- Gars
- Mitten Crabs
- Snails (Channeled Apple Snail and New Zealand Mud Snail)
- Nutria*

CDFW will provide training on identification of these and other invasive species of concern. If you suspect the specimen is one listed above, place it in the aquarium, take pictures and contact the CDFW Fish ID QA/QC Biologist, including the pictures in a message. Keep the specimen in the aquarium or if deceased freeze and wait for identification confirmation.

*For suspected Nutria sightings, staff should follow Department protocol and report sightings to the CDFW Invasive Species program at the contact information below, in addition to the DWR nutria team at nutria@water.ca.gov.

Further information on invasive organisms can be found on the web here: https://wildlife.ca.gov/Conservation/Invasives/Species

The CDFW invasive species program can be contacted at: (866) 440-9530 or Invasives@wildlife.ca.gov.

4.13 Tissue, Whole Fish, and Specimen Storage

Tissue (DNA) or whole fish will be retained in accordance with the procedures for each species outlined in this manual.

4.13.1 Whole Fish in Ethanol (smelt)

All species and life stages of Osmerids (smelt) must be retained in ethanol for verification if collected during a count. These fish will be placed in prefilled vials of ethanol according to the

listed procedures for each species/life stage. These sample vials will be retained in the building in which they were collected and placed in each building's designated specimen storage location at the dry station until transferred to the Fish Science Building for further processing.

When processing these fish, biologist staff will log the samples on the "Smelt Collection Log Sheet" posted on the flammable's cabinet at the Fish Science Building. Biologist staff should contact the Senior Biologist for guidance on logging non-smelt samples.

Once verification is completed, the fish carcass and tag will be returned to the individual fish sample vial, and the vial placed in the storage tray designated for this purpose in the flammables cabinet at the Fish Science Building. At least annually, specimens will be transferred to the CDFW Fish Facilities unit for archive and/or dissemination to other researchers. A comprehensive list of samples will be included in this transfer, and Senior Biologists in the DWR and CDFW Fish Facilities Units notified. If the transfer includes Delta Smelt, additional notification will be provided to USFWS in accordance with Biological Opinion requirements.

4.13.2 Whole Fish in Bags (frozen)

Salmonids

Salmonids requiring CWT extraction are individually euthanized, bagged, tagged, and labeled before being frozen. Fish should be placed in the Fish Facility sample freezer in HTB1 and logged into the "Freezer Inventory and Chain of Custody" log posted on the freezer door.

When processing fish, CWT readers will log the samples out on the "Freezer Inventory and Chain of Custody Log" and transfer them to the Fish Science Building for processing. Once the CWT is extracted, the fish carcass and all tissue will be returned to the individual fish sample bag, grouped by month and year in gallon bags, and placed in the laboratory freezer at the Fish Science Building. The laboratory freezer is equipped with an alarm system to alert staff of freezer failures.

All carcasses are to be saved for the duration of the water year before disposal. In October of every water year, Fish Science Building staff will contact the DWR Office of Regulatory Compliance staff who will verify with fishery agency staff that the carcasses are no longer needed and can be disposed of or transferred. Carcasses will be offered to other researchers prior to disposal.

Other Specimens

Unusual or rare specimens retained dead at the Fish Facility, such as Green Sturgeon mortalities, Northern Pike and other invasive fish, will be immediately transferred to the Fish Science Building. All carcasses will be photographed, examined by a biologist, and individually bagged and labeled before being placed in the Fish Science Building laboratory freezer. Fish

Science Building staff will contact the DWR Office of Regulatory Compliance staff who will make notifications, if needed, and provide further guidance on specimen transfer or disposal.

4.13.3 Coded Wire Tags

Coded wire tags extracted from salvaged Chinook Salmon are archived in the CWT data binder stored at the CWT processing station at the Fish Science Building. During tag extraction and processing, tags are bagged and attached to their respective CWT datasheet and placed in the binder.

4.13.4 Tissue Sample Vials

The CDFW Central Valley Tissue Archive (CVTA) provides prefilled and labeled vials of ethanol and blank datasheets for the collection of tissue samples. Tissue samples will be immediately placed in the sample vials and the datasheet filled in with the pertinent information. Sample vials awaiting processing are then placed in the appropriate storage box in the DNA sample drawer in the Fish Facility Control Room.

Sample vials will be collected from the Fish Facility by CVTA staff when notified by the onsite supervisor, when processing is needed to meet water management needs, or at regular intervals. During transfer, an electronic chain of custody sheet will be prepared by the CDFW CVTA, and electronically signed by the onsite supervisor. A copy will be retained by both the CDFW CVTA and the onsite supervisor. The CVTA will further distribute tissue samples, as needed, in accordance with Interagency Agreement requirements for this purpose.

4.13.5 Larval Fish Sample Vials

A Larval Fish Sampling Datasheet – State Facility and a Larval Sample Chain of Custody Log will be posted in each HTB. The salvage operator collecting the larval sample will fill out the log, indicating which samples and datasheets have been prepared, and place the larval sample vials and datasheets in the designated storage location for each building. Biologist staff taking custody of the samples and datasheets will then sign the samples out prior to transferring them to the Fish Science Building for processing.

Once larval fish species identification is completed, the sample contents and tag will be returned to the individual sample vial, and the vial placed in the storage tray designated for this purpose in the flammables cabinet at the Fish Science Building. At least annually, specimens will be transferred to the CDFW Fish Facilities unit for archive and/or dissemination to other researchers. A comprehensive list of samples will be included in this transfer, and Senior Biologists in the DWR and CDFW Fish Facilities Units notified. If the transfer includes Delta Smelt, additional notification will be provided to the USFWS in accordance with Biological Opinion requirements.

4.14 Procedures

General

SOP 4-1: Procedures for the Use of Anesthesia (MS-222)

Laboratory SOP 4-1: Fish ID Verification

Salmon

SOP 4-2: Salmon Processing Guide

SOP 4-3: Tissue (DNA) Collection Procedure

Laboratory SOP 4-2: Processing of Coded Wire Tags (CWT) from Adipose Fin Clipped Chinook Salmon

Steelhead

SOP 4-4: Steelhead Processing Guide

SOP 4-3: Tissue (DNA) Collection Procedure

Delta Smelt, Longfin Smelt, and Wakasagi

SOP 4-5: Protocol for Saving Adult/Sub-Adult Delta Smelt, Longfin Smelt, and Wakasagi

SOP 4-6: Protocol for Saving Juvenile Delta Smelt, Longfin Smelt, and Wakasagi

Sturgeon

SOP 4-7: Protocol for Verification of Sturgeon Identification

Larval Fish

SOP 4-8: Larval Fish Sampling Procedure

Laboratory SOP 4-3: Larval Fish Identification

5.0 Fish Loading, Transportation, and Release Procedures

Fish are accumulated in holding tanks during salvage operations and must be removed and transported to prevent mortality due to injuries from holding in the collection tanks and suffocation from exceeding the allowable capacity of the holding tanks and transport trucks.

5.1 Purpose

For the safe removal of fish from collection tanks, transportation, and live release in the Delta.

5.2 Schedule

Fish are transported to a release site at least once a day when BAPP is operating. Fish will be transported as determined by:

A) At least once daily

B) The Fish Transport Tables (Fish Loading Tables)

C) Presence of listed species

   a. If a Chinook Salmon is detected in a fish count, fish will be transported at least every 12 hours until 48 hours after the last salmon is detected.

   b. If a Delta Smelt is detected in a fish count, fish will be transported at least every 8 hours until 48 hours after the last Delta Smelt is detected.

D) BAPP Shutdown

   a. Fish will be transported any time that BAPP shuts down water exports within two hours of shut down.

E) An extreme accumulation of debris (e.g., aquatic vegetation) at the salvage facility.

5.3 Salt Addition

In accordance with regulatory requirements, common salt (NaCl) must be added to the water to reduce fish stress. When Delta Smelt are observed in fish counts, a salinity of 8 parts per thousand (ppt) must be maintained. If Delta Smelt are not present, add enough salt to maintain salinity of 3 ppt. Quantities of salt needed to produce the required transport salinities and additional instructions for adding salt are included in Salvage SOP 5-2 Fish Truck Loading Procedures.

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5.4 Fish Release Site Selection

Fish are released at fixed release sites owned by DWR and the U.S. Bureau of Reclamation (USBR) in the western Delta. These sites include:

DWR Sites

1) Curtis Landing, located on the San Joaquin River on Sherman Island
2) Horseshoe Bend, located on the Sacramento River on Sherman Island
3) Manzo Ranch, located on the Sacramento River on Sherman Island
4) Little Baja, located on the Sacramento River on Sherman Island

USBR Sites

1) Antioch; located on the San Joaquin River in Antioch. Also known as Delta Base.
2) Emmaton; located on the Sacramento River on Sherman Island
3) Brannan Island State Park; located on Threemile Slough. Currently mothballed.

Use of USBR-owned release sites is currently limited and permission must first be granted on a case-by-case basis by the Tracy Fish Collection Facility. As of March 2022, an agreement and plan for shared use of both agencies' sites is under development.

In the absence of a shared use plan, releases should be rotated at each release between the operational DWR sites.

5.5 Fish Transport Tables

The Fish Transport Tables are used to calculate the number of fish that may be transported in the fish haul trucks. The tables factor in the size of fish being salvaged, water temperature, and truck volume to estimate the number of fish that can be transported. When a truck load of fish, as determined by the fish counts and Fish Transport Tables, has been collected in the holding tanks, the accumulated fish must be transported for release in the Delta.

The Fish Transport Tables are used in conjunction with the Fish Salvage Hourly Accumulation Log and the Fish Release Datasheet for SWP to track the number of accumulated fish. Procedures for calculating fish loads are included in Salvage SOP 5-1 Calculation of Full Truckloads for Fish Hauling.

5.6 Procedures

SOP 5-1: Calculation of Full Truckloads for Fish Hauling

SOP 5-2: Fish Truck Loading Procedure

SOP 5-3: Fish Release Procedure

6.0 Communication and Reporting Procedures

6.1 Purpose

Data gathered from the fish counts undergo a quality assurance and quality control (QA/QC) process before being transmitted. The purpose of this section is to detail the steps taken to assure salvage data integrity and instructions on how to disseminate salvage data.

6.2 Distribution of Raw Salvage Data

6.2.1 Schedule

Raw operational, fish count, and fish length data are collected at the Skinner Fish Facility during all water export periods and compiled and transmitted daily. Operational and fish count data are collected on a hand-written datasheet at the count stations, then immediately inputted into an internal electronic database (Skinner Fish Facility Database), and daily reports/datasheets including the SWP Operations and Counts - SWP Datasheet and Fish Salvage Length Datasheet for SWP, are provided to CDFW and DWR/USBR water managers. Additional information regarding the salvage of listed species is reported on the Preliminary SWP Salvage Information Sheet and transmitted more broadly.

All daily data are summarized and emailed according to the schedule shown below in Table 1 using the Skinner Fish Facility Database report function. In the event of an issue with the Skinner Fish Facility Database, a data transfer scanner and computer are on site at the fish facility which enables the operators to send this information using paper datasheets.

Table 1. Daily schedule for salvage data distribution.

Time	Datasheets	Recipients
Midnight (no later than 0200)	Preliminary SWP Salvage Information Sheet	SWP recipients
8 AM	Fish Salvage Operations and Counts – SWP and Fish Salvage Length Datasheets	SWP, USBR, CDFW, and other recipients
10 AM	Preliminary SWP Salvage Information Sheet	Other recipients

6.2.2 Distribution Lists

The on-site supervisor manages the salvage data distribution lists, and they are maintained on the salvage data distribution computer. Requests for raw salvage data or to be added to a salvage data distribution list must be submitted to the on-site supervisor and approved by the Superintendent and Field Division Chief.

6.3 Salvage Data Archive

All raw data is maintained electronically in the cloud using the Skinner Fish Facility Database system. All other datasheets and logs, including the hand-written datasheets, are stored in the supervisor's office for the entirety of the water year before being moved to the Fish Facility datasheet archive at the end of each water year.

6.4 Fish Salvage Communication Strategy

Issues and planned maintenance outages affecting fish salvage are reported and discussed at the DWR DISE-Operations Coordination meetings which are scheduled weekly during the sensitive fish season (October through June). Any issue, planned maintenance outages, or other pertinent information pertaining to fish salvage are reported to the DWR representatives on the Smelt Monitoring Team (SMT), Salmon Monitoring Team (SaMT), and Water Operations Management Team (WOMT) for communication to these teams and fishery agency representatives, as necessary.

Scientific studies, major improvement projects, and technical issues regarding fish salvage operations are coordinated with the Central Valley Fish Facilities Review Team (CVFFRT) and Tracy Technical Advisory Team (TTAT) for peer review.

The interagency Long-Term Operations (LTO) Coordination meeting serves as additional nexus for information exchange and discussion on Salvage operations, studies, and improvement projects. In addition, biologist staff from CDFW and DWR meet monthly with operations staff from the SFF to discuss salvage issues, training, data, procedures, and special studies.

All fish salvage data are considered preliminary until reviewed and posted publicly on the CDFW Fish Facilities Monitoring Program website and FTP server.

6.5 Emergency Notification Procedures

6.5.1 DWR Emergency Notification Procedures

To notify the appropriate staff of a deficiency or to gain access to the fish facility, contact the onsite supervisor. In an emergency, all calls should be placed to the Area Control Center for the appropriate response. Safety and security measures are in place to provide a secure work

environment for the fish facility staff and persons visiting or working for outside agencies or private contractors at the site.

6.5.2 CDFW Emergency Notification Procedures

For unplanned outages greater than 1 hour, notify the CDFW Salvage Biologist by phone immediately. If discussion by phone isn't possible, leave a message detailing the source and estimated duration of the outage.

For all planned salvage outages to be conducted for normal maintenance and repair work (e.g., predator clean-outs, normal maintenance procedures, repairs to valves and controls) contact the CDFW Salvage Biologist at least 1 business day in advance of outages.

6.6 Procedures

SOP 6-1: Datasheet Tips

SOP 6-2: Datasheet Checks

SOP 6-3: Data Transfer Procedure (Paper Datasheets)

SOP 6-4: DWR Emergency Notification

SOP 6-5: CDFW Emergency Notification

7.0 Training and Quality Assurance/Quality Control (QA/QC)

Training and Quality Assurance/Quality Control (QA/QC) processes are essential for maintaining the integrity and quality of data collected at the Skinner Fish Facility. The training and QA/QC program at the Skinner Fish Facility is a collaborative effort between the DWR Delta Field Division, the DWR Division of Integrated Science and Engineering, and the CDFW Fish Facilities Monitoring Program.

7.1 Training

SFF personnel will be trained on general salvage operations, background information on why the SDD data is important, use of fish collection equipment, fish sampling procedures, fish hauling and release methods, data recording, and data key entry. If a new employee does not possess a valid commercial Class A driver's license, individualized training will be provided to allow the employee the opportunity to earn the required vehicle license. Most of the training will consist of on-the-job training under the direct guidance of an experienced salvage operator or manager. Additional training may be provided by biologist staff from DWR-DISE and the CDFW for fish identification, fish handling, fish processing including tissue sampling and sample preservation, and seasonally relevant general fish biology throughout the year. Handouts and written standard operating procedures will be provided and posted to reinforce oral instructions.

7.1.1 General Training Program

The on-site supervisor, with support from CDFW and DISE, is responsible for developing and implementing the staff training program. The supervisor or their designated instructor can use brief exams to verify the trainee's knowledge of operational procedures after initial training or instruction. The supervisor will record the completion of training modules to ensure that all employees receive the required training. An example of the salvage operation training outline is given in the Salvage Training Program Checklist below.

7.1.2 Fish Identification Training

Fish identification training will consist of initial training provided by the on-site supervisor or experienced salvage operation staff. Additional fish identification training will be provided by the CDFW Fish Identification QA/QC Biologist. Fish identification training refreshers will be performed seasonally throughout the year by the Fish Identification QA/QC Biologist.

Most training will be performed on an individual basis due to the complexity of the work schedule. Staff will be trained to identify the various fish species salvaged during specific times of year and on the use of dichotomous keys and other reference materials. Training will involve

the use of live specimens, preserved specimens, fish identification manuals and keys, computer-based presentations, and handouts.

7.1.3 Salvage Training Program Training Checklist

1) Facility Orientation
    a. Purpose of the Skinner Fish Facility
    b. Responsibility of Skinner Fish Facility Staff
    c. Importance of Skinner Fish Facility Activities
    d. Staff Scheduling
    e. Procedures for Unexpected Schedule Changes
    f. Emergency Procedures
    g. Important Reference Materials and Contact Persons
2) Overhead Hoist
    a. Safety Procedures
    b. Operation
3) Facility Operations Data
    a. Definitions (e.g. Velocity, Ratios, Flow, Depth)
    b. How to interpret computer readings and operate the control system
    c. Fluctuation of readings after flow changes
    d. Important facility criteria and guidelines
    e. How to record the operation data correctly
4) Fish Collection Tank Operations
    a. How to fill a tank
    b. How to drain a tank
    c. How to perform fish collection
    d. Screen operation
    e. Methods to reduce fish mortality and/or stress
5) Fish Count Procedures
    a. Fish Identification Training
    b. Frequency and duration of fish counts
    c. When to perform fish counts
    d. How to perform a fish count
    e. How to fill out datasheets
6) Fish Length and Larval Counts
    a. When to do length and larval counts
    b. How to measure fish
    c. How to fill out a length datasheet
    d. How to perform a larval count
    e. Methods to reduce fish mortality and/or stress
7) Fish Processing Procedures
    a. General
        i. How to use anesthesia (MS-222)
        ii. How to take DNA (tissue) samples
    b. Chinook Salmon
        i. How to process salmon
        ii. Identifying adipose fin-clipped salmon

iii. How to use CWT and PIT tag wands
iv. How to identify sutured (acoustic tagged) fish

c. Steelhead Trout
i. How to process steelhead
ii. Identifying adipose fin-clipped steelhead
iii. How to use CWT and PIT tag wands
iv. How to identify sutured (acoustic tagged) fish

d. Smelt
i. How to process juvenile smelt
ii. How to process adult/sub-adult smelt

e. Sturgeon
i. How to process sturgeon

8) Fish Load Estimation
a. Using the Fish Transport (Bates) tables and what they mean
b. Determining when to haul fish

9) Fish Loading Procedures
a. Switching Buckets
b. Truck preparation
c. Switching collection tanks
d. Salt addition
e. Managing heavy debris

10) Fish Hauling and Release Procedures
a. Hauling schedule and release site locations
b. Haul truck operation
c. Oxygen use
d. How to release salvaged fish
e. Problem situations
f. Methods to reduce fish mortality and stress

11) Data Entry and Transmission
a. Datasheet editing and proofing
b. How to enter data from the operations computer
c. How to transmit data

7.2 Quality Assurance/Quality Control

7.2.1 Fish Identification Program

The CDFW Fish Identification QA/QC Biologist will verify and ensure the Skinner Fish Facility staff's ability to accurately identify and measure the various fish species present in the salvage collections. Quarterly checks by the CDFW Fish Identification QA/QC Biologist will be performed on all fish facility staff on their regular work shifts. Fish identification training and other training as necessary will be provided for all new fish facility employees and current staff (as seasonal refresher courses).

The Fish Identification Biologist will record and document staff performance on fish identification. Summary reports will be provided on a quarterly basis throughout the year in memorandum format to DWR. The on-site supervisor will review oral and written reports on staff performance and will implement appropriate corrective actions (e.g. training) if needed.

Fish QC Samples

Saved fish from routine fish length counts will be used for the fish QC samples. In the presence of the Fish Identification Biologist, the Skinner Fish Facility staff will be asked to place all identified and measured fish from a routine fish length count or a flush into a bucket of water. Following the fish length count, the biologist will identify and measure all fish saved in the bucket of water and record the results onto a datasheet. The biologist's results will be compared with the fish facility employee's data on the Length Datasheet. The biologist will review any misidentified fish or large discrepancies in length measurements with the fish facility employee and provide suggestions for identification and measuring accuracy. A quarterly memo will also be sent to DWR cataloging the results of the QA/QC assessments.

Fish Identification Reports

Memorandum reports summarizing fish facility staff fish identification performance will be produced quarterly throughout the year. Each report will include a table with results of everyone's performance check during that quarter. The reports will also include which fish species the staff had problems identifying and what types of training was given to resolve the identification problems. Reports may also include notes on unusual circumstances during QA/QC check, such as, low fish numbers, missed QC checks (due to illness, injury related absence), exporting schedule, and the size of fish species occurring in counts.

Fish Identification Biologist

Any questions concerning fish identification at the Skinner Fish will be directed to the CDFW Fish ID QA/QC Biologist.

7.2.2 Data Entry (DWR)

Operational, fish count, and fish length data are collected at the Skinner Fish Facility during all water export periods. Operational, fish count, and fish length data are directly inputted into the Skinner Fish Facility Database at the end of each fish count. A hand-written datasheet, in the form of a standard Fish Salvage Operations and Counts SWP datasheet, is used to transfer data from the count stations to the control room computer.

All data are compiled and emailed to the CDFW Fish Facilities Database Biologist each day according to the schedule in section 6.2.1. Data are reported directly from the Skinner Fish Facility Database. A data transfer scanner and computer are also available on site in the event of issues requiring that traditional paper datasheets be used. The CDFW Fish Facilities Database Biologist may contact the salvage operators or supervisor to resolve any discrepancies or missing data.

There are three phases of QA/QC after the data have been collected before it is entered in the CDFW fish salvage database:

First Check of the Datasheet (DWR)

Immediately after inputting the data electronically for a count, the operator that recorded the data should review the inputted information against the hand-written datasheet to determine if all parts of the datasheet have been inputted completely and accurately. At the end of the shift, all data collected should be reviewed.

Second Check of the Datasheet (DWR)

After 2400 hours of that day, the data is checked by another person, usually the person coming on the following shift or the on-site supervisor, to ensure that the data have been inputted completely and accurately.

Third Check of the Sheet (CDFW)

After the data have been checked by the salvage operators and transmitted to CDFW, the data is visually scanned and edited before data entry to make sure all data is present, correct, and clear.

Any errors or missing data are flagged, revised (where possible), or filled in (where possible). If an error or missing data cannot be resolved by CDFW or if an entry is illegible, a revised datasheet is requested from DWR.

7.2.3 Data Entry (CDFW)

After the datasheets have been checked, the data is key entered into a computer using MS Access. The MS Access data entry program is relational, which means that operational, fish count, and fish length data are all linked to each other in the database. This eliminates certain errors that might have occurred with previous software, such as date and time mismatches between different datasets. Some data ranges are preprogrammed into the entry program, limiting some fields to specific ranges that are unlikely to be encountered during normal operation.

After entering the data, the key entry person prints out all the data entered and does a line-by-line QC against the datasheets to check that the data has been entered completely and accurately.

7.2.4 CDFW Database Management and Error Reporting

Once errors have been corrected, the data file for that day is backed up on the CDFW FTP server. Daily data files are appended to the historical database and weekly replica files are created for data checking. In addition, an outlier query of the salvage database is run to identify potential errors in the database. Some errors are resolved by communication with the person who collected the data or the on-site supervisor.

All errors and omissions are noted in a weekly error report which is distributed to the salvage operators and the on-site supervisor. Weekly error reports provide feedback on data collection and of on-site QA/QC. After data have been corrected, salvage files are posted on the CDFW salvage data FTP site for public access.

CDFW Fish Facilities Database Biologist

Any questions concerning the salvage data processing and reporting should be directed to the CDFW Fish Facilities Database Biologist.

7.3 Procedures

Laboratory SOP 7-1: Fish Identification QA/QC Procedures

Laboratory SOP 7-2: SWP Protocol for Data Entry (CDFW)

Laboratory SOP 7-3: QC Audit Report Protocol for Daily Salvage Data

Laboratory SOP 7-4: Protocol for Running Outlier Queries in the Salvage Database