State Water Project Incidental Take Permit Risk Assessment for Delta Smelt and Longfin Smelt

Section 1: Overview

Date: 03/08/2022

Life Stages Present:

Delta Smelt (DS): Adults, sub-adults
Longfin Smelt (LFS): Adults, sub-adults, and larvae

Advice to Water Operations Management Team (WOMT):

No Advice.

Risk Assessment:

Delta Smelt: Based on recent detections, Delta Smelt are unlikely to be prevalent in the South Delta. Detection data support Delta Smelt being present in the Sacramento Deep Water Ship Channel and Suisun Marsh. Delta Smelt are unlikely to move into the south and central delta since turbidity remains low. Ten marked individuals have been collected since 3/01/2022. A turbidity bridge avoidance action will only be possible if the OMR Index will be equal to or less negative than -2,000 cfs. The expected less negative OMR Index should maintain a low overall likelihood of entraining adults. Water temperatures are within the range for Delta Smelt spawning.

Longfin Smelt: The OMR Index is projected to be between -500 cfs and -2,000 cfs for most of the week due to compliance with D-1641, however exports may increase as delta outflow requirements change and may temporarily result in an OMRI of -3,000 cfs. As OMRI becomes more negative, risk increases for entrainment of LFS larvae into the OMR corridor. X2 is currently at 74 km and is expected to stay in the 74-78 km range over the next few days, as outflow requirements change X2 will move further upstream later in the month. Qwest is currently positive but may turn negative as outflow requirements change. The Smelt Monitoring Team (SMT) has determined that the overall risk of entrainment is low for sub-adults, and adults based on low exports and positive Qwest. LFS adults are present downstream of the confluence based on detections by Chipps Island Trawl and Enhanced Delta Smelt Monitoring (EDSM). The SMT has determined that the overall risk of entrainment is low to medium for larvae in the lower San Joaquin River, and high for larvae in the OMR corridor. Larvae were detected at the CVP Fish Collection Facility on March 4th, 6th, and 7th, providing evidence of larval fish entrainment. A particle tracking model (PTM) run was requested to help inform risk for larvae and determine if the fate of particles in the lower San Joaquin River would change if a recommendation to limit OMR was made. Spawning occurred in the central and

south Delta, due to LFS detections by Smelt Larva Survey (SLS) four and five and Larval Entrainment Pilot Study (LEPS). SLS four triggered Condition of Approval (COA) 8.4.2 and low densities of larvae were detected in the OMR corridor and SLS 5 also detected a larva in the OMR corridor. Exports are expected to remain low for most of the week and may increase as delta outflow requirements change, the requested PTM run will inform how risk may change with this change in exports. The SMT determined that a recommendation is not warranted this week.

Barker Slough: COA 8.12 was not triggered as SLS four did not detect LFS or DS larvae at station 716. COA 8.12 became active on 02/08/2022 when the Sacramento Valley Water Year Type Index (SVI) February Forecast was released. The forecasted value of 6.2 (50% exceedance) is within the range for a dry water year.

Section 1-A: Sacramento River and Confluence

Risk of entrainment into the central Delta and export facilities for DS and LFS in Sacramento River (8.1.5.2 C ii, iii, iv)

- Exposure Risk (Hydrology):
    - DS: Low. DS are expected to have made their migration in response to first flush and current temperatures are conducive to spawning as reported in Damon et al. (2016). DS were last detected in the lower Sacramento River on February 7th; however minimal exports and low turbidity create a low risk of entrainment.
    - LFS: Risk for larvae is low due to low exports and a resulting positive Qwest. See 'Routing Risk' for more information on adults and sub-adults.
- Routing Risk (Behavior and life history):
    - DS: Low. DS are unlikely to move into the central and south Delta since turbidity remains low throughout the lower San Joaquin River.
    - LFS: Low risk of entrainment. Larvae do not exhibit swimming behaviors that would result in volitional movement into areas with a higher risk of entrainment. Adult detections are declining, however spawning is ongoing as yolk sac larvae are still being detected. There is potential for adult and sub-adult movement into the central Delta however, risk remains low due to low exports.
- Overall Entrainment Risk:
    - DS: Low.
    - LFS: Low for adults, sub-adults and larvae, due to:
        - Entrainment risk remains low due to projected operations resulting in an OMR Index around -1000 cfs for most of next week, with the potential for OMRI briefly being no more negative than -3000 cfs as outflow requirements change. X2 is currently at 74 km and is expected to stay in the 74-78 km range over the next few days, as outflow requirements change X2 will move further

upstream later in the month. Qwest is currently positive but may turn negative as outflow requirements change.

Section 1-B: Central Delta

Risk of entrainment into the export facilities for DS and LFS in the central Delta (8.1.5.2 D iii, iv, v)

- Exposure Risk (Low, Medium, High):
  - DS: Low. DS have been detected in the south Delta based on a marked fish in salvage on 01/16/2022 and EDSM caught a marked DS in the lower San Joaquin River on 02/04/2022. However, the likelihood of adult and sub-adult DS entrainment remains low due to projected operations resulting in an OMR Index around -1000 cfs for most of next week, with the potential for OMRI briefly being no more negative than -3000 cfs as outflow requirements change. There is a high degree of uncertainty regarding the response of cultured fish to environmental cues typically applied to wild DS.
  - LFS: Low risk for adult and sub-adult LFS entrainment. EDSM collected one sub-adult LFS in the lower San Joaquin River on 02/04/2022.
    - Low to medium risk for larvae observed in the lower San Joaquin River by SLS four, as OMRIs approach -3000 cfs the risk may increase. Qwest remains positive, however as outflow requirements change it is expected to turn negative. Exports have remained low since 02/01/2022 but are expected to increase as outflow requirements change which will increase risk of entrainment. X2 is currently at 74 km and is expected to stay in the 74-78 km range over the next few days, as outflow requirements change X2 will move further upstream later in the month. Qwest is currently positive but may turn negative as outflow requirements change. The risk of entrainment increases as OMRI becomes more negative and will be informed based on a PTM run requested by SMT this week.
    - High risk for LFS larvae in the OMR corridor. LFS larvae are present in the OMR corridor, in West Canal, and were detected in the qualitative larval sampling at the CVP fish facilities on March 4th, 6th, and 7th. SLS 4 detected LFS larvae at low densities at stations 901, 902, and 915 in the OMR corridor. SLS 5 has also detected one LFS larva at station 902, and processing is ongoing. Under current conditions, those fish are unlikely to make their way out of the OMR corridor based on past PTM runs and since LFS larvae are planktonic and can't volitionally move downstream once in the OMR corridor.
    - LEPS detected LFS larvae in West Canal during sampling on February 25th. Data has been quality controlled, however final data may not be available until the end of the season.

        - Low risk for adults as exports are low and adult salvage has been rare in recent years.
- Change in exposure from previous week: (Note: The change in risk compared to previous weeks is not required by the Incidental Take Permit [ITP]).
    - DS: No change from last week. X2 has remained stable compared to last week and exports remain low limiting entrainment risk.
    - LFS: We expect to see more consistent detections at the fish facilities as larvae grow. Despite low exports and low turbidity, larvae have been detected in the OMR corridor and at the facilities. Risk for LFS larvae in the south Delta may be high or increase to high as exports increase, and a PTM run will help inform risk levels for next week.
- Reporting OMRI (Number and range of OMRI bins will vary based on anticipated hydrology and operations)
    - The SMT has determined that risk of entrainment is low for adult and sub-adult DS across the range of expected OMRI values.
    - The SMT determined that risk of entrainment is low for adult and sub-adult LFS, low to medium for LFS larvae in the lower San Joaquin River, and high for LFS larvae in the OMR corridor across the range of expected OMRI values**.** Projected exports are minimal and limit the range of possible OMR Index values. A PTM run was requested to inform risk as delta outflow requirements change and exports increase, resulting in a more negative OMRI.

Section 2: Basis for Advice

The 2020 ITP (Incidental Take Permit for Long-Term Operation of the State Water Project in the Sacramento-San Joaquin Delta 2081-2019-066-00) states that advice to WOMT shall be based on the following Conditions of Approval:

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

8.3.1 Integrated Early Winter Pulse Protection. Between December 1 and January 31 each year Permittee shall reduce south Delta exports for 14 consecutive days to maintain a 14-day average OMR index no more negative than -2,000 cfs, and convene the Smelt Monitoring Team within one day of triggering the following criteria:

- Three-day running average daily flows at Freeport greater than, or equal to, 25,000 cfs, AND
- Three-day running average of daily turbidity at Freeport greater than, or equal to, 50 Nephelometric Turbidity Units (NTU), OR
- The Smelt Monitoring Team determines that real-time monitoring of abiotic and biotic factors indicates a high risk of DS migration and dispersal into areas at high risk of future entrainment.

After maintaining a 14-day average OMR index no more negative than -2,000 cfs for 14 days, Permittee shall maintain a 14-day average OMR index no more negative than -5,000 cfs, initiating the OMR Management season, until the OMR Management Season ends (Condition of Approval 8.8).

The Integrated Early Winter Pulse Protection Action may only be initiated once during the December 1 through January 31 time period each year.

8.3.3 Adult Longfin Smelt Entrainment Protection. After December 1, if an Integrated Early Winter Pulse Protection (Condition of Approval 8.3.1) has not yet initiated, Permittee shall reduce south Delta exports to maintain a 14-day average OMR index no more negative than -5,000 cfs and initiate OMR Management (Condition of Approval 8.3) if:

- Cumulative combined LFS salvage (total estimated LFS counts at the CVP and SWP salvage facilities beginning December 1 through February 28 exceeds the most recent Fall Midwater Trawl (FMWT) LFS index[1] divided by 10, OR

[1] The Fall Midwater Trawl (FMWT) Survey annual abundance index for LFS is calculated as the sum of September through December monthly abundance indices and is typically reported at about the same date as adult salvage begins in December. The FMWT Index available beginning on December 1 each year shall be used to establish this threshold.

- Real-time monitoring of abiotic and biotic factors indicates a high risk of LFS movement into areas at high risk of future entrainment, as determined by DWR and CDFW Smelt Monitoring Team staff.

When evaluating the possibility of LFS movement into areas that may be subject to an elevated risk of entrainment, the Smelt Monitoring Team shall evaluate catch of LFS with fork length ≥ 60 mm by the Chipps Island Trawl (conducted by USFWS) as an early warning indicator for LFS migration movement into the Delta, in addition to other available survey and abiotic data. The Smelt Monitoring Team shall communicate the results of these risk assessments and advice to the WOMT (Condition of Approval 8.1.3), and operational decisions shall be made as described in Condition of Approval 8.1.4 (Collaborative Approach to Real-time Risk Assessment).

8.4.1 OMR Management for Adult Longfin Smelt. From the onset of OMR Management (Condition of Approval 8.3) through February 28, the Smelt Monitoring Team shall conduct weekly, or more often as needed, risk assessments (see Condition of Approval 8.1.5.2) and decide whether to recommend an OMR flow requirement between -5,000 cfs and -1,250 cfs to minimize entrainment and take of adult LFS. The Smelt Monitoring Team may provide advice to restrict south Delta exports for seven consecutive days to achieve a seven-day average OMR index within three risk categories:

- Low risk: OMR between -4,000 cfs to -5,000 cfs
- Medium risk: OMR between -2,500 cfs to -4,000 cfs
- High risk: OMR between -1,250 cfs to -2,500 cfs

If a risk assessment conducted by the Smelt Monitoring Team determines that a more restrictive OMR flow requirement is needed to minimize take of adult LFS, the Smelt Monitoring Team shall provide its advice to WOMT (Condition of Approval 8.1.3) and operational decisions shall be made following the process described in Condition of Approval 8.1.4 (Collaborative Approach to Real-time Risk Assessment).

This Condition will terminate when a high-flow off-ramp occurs (Condition of Approval 8.4.3), or when LFS spawning has been detected in the system, as determined by the Smelt Monitoring Team, or, if there is disagreement and resolution is not reached within WOMT, as determined by CDFW. The Smelt Monitoring Team shall consider results from Additional LFS Larval Sampling (Condition of Approval 7.6.1) to inform its assessment of the start of LFS spawning. After LFS spawning has been observed, Permittee shall implement Condition of Approval 8.4.2 to minimize take of larval and juvenile LFS.

8.4.2 Larval and Juvenile Longfin Smelt Entrainment Protection. From January 1 through June 30, when a single Smelt Larva Survey (SLS) or 20 mm Survey (20 mm) sampling period exceeds one of the following thresholds:

- LFS larvae or juveniles found in four or more of the 12 SLS or 20 mm stations in the central Delta and south Delta (Stations 809, 812, 815, 901, 902, 906, 910, 912, 914, 915, 918, 919), or

• LFS catch per tow exceeds five LFS larvae or juveniles in two or more of the 12 stations in the central Delta and south Delta (Stations 809, 812, 815, 901, 902, 906, 910, 912, 914, 915, 918, 919).

Permittee shall restrict south Delta exports for seven consecutive days to maintain a seven-day average OMR index no more negative than -5,000 cfs. Permittee shall also immediately convene the Smelt Monitoring Team to conduct a risk assessment (see Condition of Approval 8.5.1.2) to assess the risk of larval and juvenile LFS entrainment into the South Delta Export Facilities, determine if an OMR flow restriction is warranted, and recommend an OMR flow limit between -1,250 and -5,000 cfs. The Smelt Monitoring Team risk assessment and operational advice shall be reviewed by the WOMT (Condition of Approval 8.1.3) via the Collaborative Real-time Decision-making process (Condition of Approval 8.1.4). Permittee shall operate to the export restriction and OMR flow target approved through Conditions of Approval 8.1.3 and 8.1.4. Each week the Smelt Monitoring Team shall convene to conduct a new risk assessment and determine whether to maintain, or off ramp from, export restrictions based on the risk to LFS, or until the DS and LFS off-ramp has been met as described in Condition of Approval 8.8 (End of OMR Management).

From January 1 through June 30, DWR and CDFW Smelt Monitoring Team staff shall conduct weekly, or more often as needed, risk assessments (see Condition of Approval 8.5.1.2) to assess the risk of larval and juvenile LFS entrainment into the South Delta Export Facilities. As a part of the risk assessment the Smelt Monitoring Team shall provide advice on the appropriate OMR flow targets to minimize LFS entrainment or entrainment risk, or both. The Smelt Monitoring Team shall provide its advice to WOMT (Condition of Approval 8.1.3) and use the Collaborative Approach to Real-time Risk Assessment process described in Condition of Approval 8.1.4 to determine if an OMR flow restriction is warranted and determine OMR flow limit between -1,250 and -5,000 cfs. The OMR flow limit shall be in place until the next risk assessment conducted by the Smelt Monitoring Team determines that it is no longer necessary to minimize take or related impacts to LFS, or until the DS and LFS off-ramp has been met as described in Condition of Approval 8.8 (End of OMR Management).

8.4.3 High Flow Off-Ramp from Longfin Smelt OMR Restrictions. OMR management for adult, juvenile, or larval LFS as described in Conditions of Approval 8.4.1 and 8.4.2 are not required, or would cease if previously required, when river flows are (a) greater than 55,000 cfs in the Sacramento River at Rio Vista or (b) greater than 8,000 cfs in the San Joaquin River at Vernalis. If flows subsequently drop below 40,000 cfs in the Sacramento River at Rio Vista or below 5,000 cfs in the San Joaquin River at Vernalis, the OMR limit previously required as a part of Conditions of Approval 8.4.1 and 8.4.2 shall resume.

8.5.1 Turbidity Bridge Avoidance. The purpose of this Condition is to minimize the risk of entrainment of adult DS in the corridors of the Old and Middle rivers into the south Delta export facilities. This Condition is intended to avoid the formation of a turbidity bridge from the San Joaquin River shipping channel to the south Delta export facilities, which historically has been associated with elevated salvage of pre-spawning adult DS.

After the Integrated Early Winter Pulse Protection (Condition of Approval 8.1.3) or February 1 (whichever comes first), until April 1, Permittee shall manage exports to maintain daily average turbidity in Old River at Bacon Island (OBI) at a level of less than 12 NTU. If the daily average turbidity at OBI is greater than 12 NTU, Permittee shall restrict south Delta exports to achieve an OMR flow that is no more negative than -2,000 cfs until the daily average turbidity at OBI is less than 12 NTU.

If, after five consecutive days of OMR flow that is less negative than -2,000 cfs and the daily average turbidity at OBI is not less than 12 NTU, the Smelt Monitoring Team may convene to assess the risk of entrainment of DS (Condition of Approval 8.1.5.2). The Smelt Monitoring Team may provide advice to WOMT regarding changes in operations that could be conducted to minimize the risk of entrainment of DS (Condition of Approval 8.1.3). The Smelt Monitoring Team may also determine that OMR restrictions to manage turbidity are infeasible and may instead provide advice for a different OMR flow target that is between -2,000 and -5,000 cfs and is protective based on turbidity and adult DS distribution and salvage to the WOMT for consideration (Condition of Approval 8.1.3). Operational decisions shall be made following the process described in Condition of Approval 8.1.4 (Collaborative Real Time Risk Assessment).

Turbidity readings at individual sensors can generate spurious results in real time. Spurious results could be incorrectly interpreted as a turbidity bridge, when in fact the cause is a result of local conditions or sensor error. To assess whether turbidity readings at OBI are attributable to a sensor error or a localized turbidity spike, Permittee, in coordination with Reclamation, may consider and review data from other nearby locations and sources. Additional information that will be reviewed include regional visualizations of turbidity, alternative sensors, and boat-based turbidity mapping, particularly if there was evidence of a local sensor error. Permittee may bring data from these additional sources to the Smelt Monitoring Team for consideration during the development of a risk assessment to be provided to the WOMT for evaluation (Condition of Approval 8.1.3).

Permittee shall use the decision-making process described in Condition of Approval 8.1.4 (Collaborative Real-time Risk Assessment) to determine if south Delta exports may increase after five days of OMR no more negative than -2,000 cfs, or to determine that this action is not warranted due to a sensor error or localized turbidity event. Permittee shall implement this action until CDFW is in agreement that the action may be ended or modified.

8.5.2 Larval and Juvenile Delta Smelt Protection. If the five-day cumulative salvage of juvenile DS at the CVP and SWP facilities is greater than or equal to one plus the average prior three years' FMWT index (rounded down), Permittee shall restrict south Delta exports for seven consecutive days to maintain a seven-day average OMR index no more negative than -5,000 cfs. Additionally, if the five-day cumulative salvage threshold is met or exceeded, Permittee shall immediately convene the Smelt Monitoring Team to conduct a risk assessment (Condition of Approval 8.1.5.2) and determine the future risk of entrainment and take of larval and juvenile DS. The Smelt Monitoring Team may provide advice to further restrict south Delta exports to

maintain a more positive OMR than -5,000 cfs. The Smelt Monitoring Team may provide advice for further restrictions within three risk categories:

- Low risk: Limit OMR between -4,000 cfs to -5,000 cfs
- Medium risk: Limit OMR between -2,500 cfs to -4,000 cfs
- High risk: Limit OMR between -1,250 cfs to -2,500 cfs

The duration and magnitude of operational advice shall be provided to the WOMT (Condition of Approval 8.1.3) and decisions shall be made following the process described in Condition of Approval 8.1.4 (Collaborative Real Time Risk Assessment). When conducting risk assessments to evaluate the risk of entrainment and take of juvenile DS, the Smelt Monitoring Team shall evaluate the following information sources, in addition to any other models or surveys they deem appropriate and those listed in Condition of Approval 8.1.5.2:

- Results from a CDFW approved DS life cycle model.
- DS recruitment levels identified by the Smelt Monitoring Team using the CDFW-approved life cycle model that links environmental conditions to recruitment, including factors related to loss as a result of entrainment such as OMR flows. In this context, recruitment is defined as the estimated number of post-larval DS in June per number of spawning adults in the prior February-March period.
- Hydrodynamic models and forecasts of entrainment informed by the EDSM or other relevant survey data to estimate the percentage of larval and juvenile DS that could be entrained.

If expanded salvage at the CVP and SWP facilities of juvenile DS exceeds 11 within a three-day period under this condition, Permittee shall restrict south Delta exports for seven consecutive days to maintain a seven-day average OMR index no more negative than -3,500 cfs. If juvenile DS continue to be salvaged at the CVP and SWP facilities during the seven days of OMR restrictions, then Permittee shall continue restrictions and request a risk assessment by the Smelt Monitoring Team to determine if additional advice and subsequent restrictions are warranted and provide advice to WOMT (see Condition of Approval 8.1.3) and follow the decision-making process described in Condition of Approval 8.1.4.

8.12 Barker Slough Pumping Plant Longfin and Delta Smelt Protection. Permittee shall operate the BSPP to protect larval LFS from January 15 through March 31 of dry and critical water years. Permittee shall operate to protect larval DS from March 1 through June 30 of dry and critical years. If the water year type changes after January 1 to below normal, above normal or wet, this action will be suspended. If the water year type changes after January to dry or critical, Permittee shall operate according to this Condition of Approval.

From January 15 through March 31 of dry and critical water years, Permittee shall reduce the maximum seven-day average diversion rate at BSPP to less than 60 cfs when larval LFS are detected at Station 716. In addition, in its weekly meetings from January 15 through March 31, the Smelt Monitoring Team shall review LFS abundance and distribution survey data and other pertinent abiotic and biotic factors that influence the entrainment risk of larval LFS at the BSPP. When recommended by the Smelt Monitoring Team, and as approved through the decision-

making processes described in Conditions of Approval 8.1.3 and 8.1.4, Permittee shall reduce the maximum seven-day average diversion rate at BSPP according to the advice provided by the Smelt Monitoring Team.

From March 1 through June 30 of dry and critical water years, Permittee shall reduce the maximum seven-day average diversion rate at BSPP to less than 60 cfs when larval DS are detected at Station 716. In addition, in its weekly meetings from March 1 through June 30, the Smelt Monitoring Team shall review DS abundance and distribution survey data and other pertinent abiotic and biotic factors that influence the entrainment risk of larval DS at the BSPP (including temperature and turbidity). When recommended by the Smelt Monitoring Team, and as approved through the decision-making processes described in Conditions of Approval 8.1.3 and 8.1.4, Permittee shall reduce the maximum seven-day average diversion rate at BSPP to less than 60 cfs.

The DS requirements described in this condition may be adjusted to align with USFWS requirements to minimize take of DS through an amendment to this ITP.

8.13 Water Year Type Definition. All references to water year type in this ITP shall be defined based on the Sacramento Valley Index unless otherwise noted.

Discussion of Conditions of Approval

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

COAs relevant to initiating OMR management went into effect December 1st. The Smelt Monitoring Team conducted a Risk Assessment based on COA 8.1.5.2.

8.3.1: This COA was triggered by conditions measured on 12/17/2021 when the running three-day average of daily flow and turbidity reached 27,152 cfs and 66.79 FNU respectively. Operations were reduced on 12/20/2021 targeting a 14-day average OMR index no more negative than -2,000 cfs for 14 consecutive days. After maintaining a 14-day average OMR index no more negative than -2,000 cfs for 14 days, Permittee shall maintain a 14-day average OMR index no more negative than - 5,000 cfs, initiating the OMR Management season, until the OMR Management Season ends (Condition of Approval 8.8).

8.3.3: This COA is no longer active due to the initiation of an Integrated Early Winter Pulse Protection (COA 8.3.1).

8.4.1: This COA is no longer active due to the detection of larval LFS by Smelt larva Survey (SLS).

8.4.2: This COA went into effect on 01/03/2022 following the 14-day Integrated Early Winter Pulse Protection (COA 8.3.1). SLS 1 was initially canceled due to COVID mitigation, however, the 12 south and central Delta stations listed in this COA were sampled on 1/18/2022. The resulting data triggered this COA by detection of larval LFS at more than four stations (809, 812, 815, 901, 906, and 910) and larval catch exceeded 5 fish per tow at two stations (809 and 812). Data

collected by SLS 2 triggered this action for the second time this season on 1/31/2022. Larval LFS were detected at four of the relevant stations (809, 812, 815 and 906) and catch per tow exceeded five LFS at two stations (809 and 812). The SMT did not advise a less negative OMR Index under this COA due to reduced exports. Data collected by SLS 3 did not trigger this COA. Data collected by SLS 4 (See Table 3 in attachments) triggered this action for the third time this season on 2/28/2022. Larval LFS were detected at five of the relevant stations (809, 812, 901, 902, and 915) and catch per tow exceeded five LFS at three stations (809, 812, and 901). However, the SMT did not advise a less negative OMRI under this COA due to low exports and positive Qwest. On March 8th the SMT requested a PTM run to help inform risk for larvae and determine if the fate of particles in the lower San Joaquin River would change if a recommendation to limit OMR was made. The injection points selected were at stations 812, 815, and 902. The scenarios modeled will compare planned exports with a recommendation to limit OMR to -1250 cfs.

8.5.1: This COA went into effect on 01/03/2022 following the 14-day Integrated Early Winter Pulse Protection (COA 8.3.1). Current OBI turbidity levels are below the threshold.

8.5.2: The 2021 FMWT Annual Index for DS is zero for the fourth consecutive year. The salvage threshold is one Juvenile DS. No juvenile DS have been salvaged this water year. One cultured subadult DS (fork length = 54 mm, adipose fin clipped) was salvaged on 1/16/2022.

8.12: This COA became active on 02/08/2022 when the Sacramento Valley Water Year Type Index (SVI) February Forecast was released. The forecasted value of 6.2 (50% exceedance) is within the range for a dry water year. SLS 3 collected 3 LFS larvae at station 716. This data was reported to the SMT via email on 2/14/2022, triggering this COA. SLS 2 also detected larvae at station 716, however, this COA was not active at the time based on the January SVI. SLS 4 did not detect LFS or DS larvae at station 716, therefore this COA was not triggered thereby removing the limitation on Barker Slough Pumping Plant of no more than 60 cfs exports on a 7-day average that was previously triggered by SLS 3. SLS 5 is sampling this week and LFS larvae have been detected at 2 of the 5 stations processed so far.

8.13: The Sacramento Valley Water Year Type Index (SVI) February forecast corresponding to the 50% probability of exceedance is 6.2 which is in the range for a Dry water year classification. The forecast was reported on the California Data Exchange Center (CDEC) Water Supply Index Webpage, accessed on 02/08/2022.

Section 3: Hydrology and Operations Assessment of hydrologic, operational, and meteorological information. 8.1.5.2 A.

Section 3-A: Water operations conditions. 8.1.5.2.A. i

- Antecedent Actions: *(e.g. Delta Cross Channel [DCC] gate closure and actions such as integrated early winter pulse protection, etc.)*

    - COA 8.4.2 was triggered for a third time this season by data reported to the SMT on 2/28/2022. No advice was provided due to low exports and positive Qwest.
    - COA 8.4.2 was triggered for a second time this season by data reported to the SMT 1/31/2022. No advice was provided.
    - OMR Management was initiated on 01/03/2021 following the 14-day Integrated Early Warning Pulse Protection action (COA 8.3.1).
    - COA 8.3.1 was triggered by conditions measured on 12/17/2021. Exports were reduced to comply with this COA on 12/20/2021 through 01/02/2021.
    - DCC gates closed on 11/30/2021.
    - The Drought barrier at False River has been notched. The notch is quite large, such that hydrodynamically no barrier is present.
- Controlling Factors: Delta outflow/X2 (D-1641)
- Water Temperature:
    - Clifton Court Forebay (CCF) Daily Average Water Temperature = NA
    - 3 Station Average = 12.71°C
- Tidal Cycle: Neap tide
- Turbidity:
    - 8.3.1 Freeport 3-day average = NA
    - 8.5.1 OBI Turbidity Daily Average = 3.24 FNU.
- Salinity: X2 is at 74 km.
- Hydrologic Footprint: A PTM was requested with injection points at 812, 815, and 902. The scenarios modeled will compare planned exports (with a resulting OMRI of -3000 cfs temporarily) with a recommendation to limit OMR to -1250 cfs.

Section 3-B: Water operations outlook. 8.1.5.2.A. ii

- Outages:
    - State Water Project (SWP): None
    - Central Valley Project (CVP): None
- Exports: Combined exports are targeting an NDOI of 11,400 cfs until delta outflow requirements change, thereafter an NDOI of 7,100 cfs will be targeted. Once SVI March forecast comes out later today, the number of days until delta outflow requirements change will be calculated.
    - SWP: 0 to 1,500 cfs
    - CVP: 800 to 1,800 cfs

Meteorological Forecast: No significant precipitation is in the forecast. Section 3-C: Projected conditions. 8.1.5.2.A. iii

- No significant precipitation expected this week.
- DCC Gates position: Closed 11/30/2021.
- Sacramento River flow at Freeport 12,000 cfs yesterday
- San Joaquin River flow at Vernalis 1,170 cfs yesterday.

- Qwest: +1,900 cfs, expected to be stable until delta outflow requirements change, then expected to be negative for 1-2 days until flows stabilize. Once inflow stabilizes, Qwest expected to go positive again.
- Expected changes in South Delta Exports: Exports may increase later this week depending on when delta outflow requirements change. Increased exports may result in OMRI temporarily reaching -3000 cfs.
- NDOI: 11,800 cfs
- Upstream releases:
    - Keswick = 3,250 cfs
    - Nimbus = 2,000 cfs, looking for opportunities for reductions possibly to 1500 cfs.
    - Goodwin = 700 cfs, will decrease to 600 cfs on March 9th and then to 500 cfs on March 10th.
    - Oroville = 5,250 cfs to meet Delta outflow requirement, will reduce releases around the 12th depending on SVI determining when delta outflow requirements will change.

Table 1: Comparison of OMR and OMR Index (5-day and 14-day averages in this table for OMR Index and USGS gauge were reported on SacPAS website, accessed 03/08/2022).

Date	Averaging Period	USGS gauges (cfs)	Index (cfs)
03/06/2022	Daily	Not Reported	-962 cfs
03/05/2022	5-day	-1,550 cfs	-850 cfs
03/05/2022	14-day	-1,270 cfs	-680 cfs

Section 4: Distribution and Biology.

8.1.5.2.B. Assessment of biological information for Delta Smelt and Longfin Smelt

Section 4-A: Delta Smelt population status 8.1.5.2.B. i

- The last DS (adipose fin clipped) detection occurred on 03/08/2022 in the SDWSC stratum.
- EDSM: From 02/27/2022 through 03/05/2022 EDSM completed sampling at 36 sites and collected 1 marked DS in Suisun Marsh and 4 marked DS in the SDWSC. See Table 1 in Attachments for details.
- Chipps: From 02/27/2022 through 03/05/2022 Chipps Island Trawl completed 50 tows and collected no DS. See Table 2 in Attachments for details.
- Spring Kodiak Trawl (SKT): Survey 2 is complete and five marked DS were caught on 02/18/2022 in Suisun Marsh, none of them were ripe.
- Bay Study: Survey 2 sampling is complete and one marked DS was detected at station 762 (68 mm) on 02/03/2022 in the Sacramento River.

- Salvage: No DS have been salvaged at either facility in the past seven days and no larvae have been detected.
- Fall Mid-water Trawl (FMWT) Index for DS = 0
- DS life cycle model (LCM) discussion: NA
- Biological Conditions: Water temperatures are within the range conducive to spawning as reported in Damon et al. (2016).
- % of population in Delta zones: NA

Section 4-B: Longfin Smelt population status 8.1.5.2.B. ii.

- FMWT Index for LFS = 323
- Other Surveys:
- EDSM: From 02/27/2022 through 03/05/2022 EDSM completed sampling at 36 sites and collected 15 LFS in Suisun Marsh and 3 LFS in Suisun Bay. See Table 1 in the Attachments for details.
- Chipps: From 02/27/2022 through 03/05/2022 Chipps Island Trawl completed 50 tows and collected 1 LFS. See Table 2 in the Attachments for details.
- SKT survey 2 sampling is complete and one LFS was detected in Suisun Marsh.
- SLS 4 sampled from February 22nd through the 28th. Sample collection is complete and processing is ongoing. Stations in the central and south delta have been processed and LFS were caught at 5 of the 12 stations and catch exceeded 5 at 3 of those stations, triggering COA 8.4.2. No LFS were detected at 716, so COA 8.12 was not triggered. See Table 3 in Attachments for details. Many larvae still had yolk sacs.
- SLS 5 started sampling March 7th. Sampling and processing is ongoing, and of the 5 stations processed in the central and south Delta so far LFS larvae have been detected at 3 of the stations. Yolk sac larvae have also been detected, indicating that hatching is ongoing.
- LEPS sampling continues, and processing is ongoing, however final data may not be available until the end of the season. Larval LFS continue to be detected at low densities as of sampling conducted on 02/25/2022. No yolk sac larvae were present as of February 25th.
- Salvage: No LFS have been salvaged.
- Qualitative larvae sampling began at both facilities on February 7th and larvae were detected at the CVP fish facility on March 4th, 6th, and 7th. No larvae have been detected at the SWP fish facility.

Section 4-C: Additional data sources to assess sensitivity to entrainment Delta.8.1.5.2.C & D. i

<u>Notes</u>:

- D-1641 continues to control water exports. X2 is targeted to remain at Chipps Island with Delta outflow at 11,400 cfs through most of the week. The Eight River Index will be released later today and the number of days that outflow needs to remain at 11,400 cfs before dropping down to 7,100 cfs will be determined.

Some variability in exports, OMRI, and Qwest will occur with the changes in outflow. OMRI is expected to stay around -1000 cfs until the change occurs, then potentially drop down as low as -3000 cfs temporarily as water from Oroville is decreasing and exports increase to capture that water. Maximum combined exports during that transition will be 3,300 cfs and Qwest is expected to turn negative for a couple of days. Once inflows stabilize, exports will return to minimal and OMRI will return to less negative (around -1000 cfs) and Qwest is expected to turn positive again.

- Question was asked last week about if turbidity effects LFS distribution like it does for DS. Mahardja et al. 2017 (paper was shared that showed that LFS distribution appears to be as closely associated with turbidity as DS distribution is. Topic to be discussed further at a later time. https://onlinelibrary.wiley.com/doi/epdf/10.1111/fme.12257

- To follow up on a discussion from last week about where length cutoff for larval to juvenile life stage of >20mm fork length came from, a report from Brown et al. 1996 was shared with the group.

Literature cited:

Brown, R., S. Greene, P. Coulston and S. Barrow (1996). An evaluation of the effectiveness of fish salvage operations at the intake to the California aqueduct, 1979-1993. In Seventy-Fifth Annual Meeting of the Pacific Division/American Association for the Advancement of Science, June 19-24 1994, 146 San Francisco, CA. In, San Francisco State University, San Francisco, CA. pp. 497-518. J. Hollibaugh (editor).

Damon, L. J., S. B. Slater, R. D. Baxter, and R. W. Fujimura. 2016. Fecundity and reproductive potential of wild female Delta smelt in the upper San Francisco Estuary, California. California Fish and Game 102(4):188–210.

Attachments: Table 1: EDSM Catch Table, Figure 1: EDSM Sample Locations, Table 2: Chipps Island Catch Table, Table 3: SLS 4 Catch Table, Figure 2: SLS Station Locations.

Table 1. Delta Smelt (DSM) and Longfin Smelt (LFS) catch per station for EDSM 2022 Phase 1 Kodiak trawls, from 2/28/2022–3/3/2022. These data are preliminary and subject to change.

Water Year	Phase	Station Code	Date	# Tows	Species	Mark Type	Fork Length	Total Catch	Disposition	Stratum
2022	1	22-31-CF01	3/1/2022	4	NA	NA	NA	NA	NA	Suisun Bay
2022	1	22-31-CF02	3/1/2022	4	NA	NA	NA	NA	NA	Suisun Bay
2022	1	22-31-HB01	3/1/2022	4	NA	NA	NA	NA	NA	Suisun Bay
2022	1	22-31-HB02	3/2/2022	4	NA	NA	NA	NA	NA	Suisun Bay
2022	1	22-31-SBM01	3/2/2022	4	LFS	None	69	1	Released	Suisun Bay
2022	1	22-31-SBM01	3/2/2022	4	LFS	None	73	1	Released	Suisun Bay
2022	1	22-31-SBM01	3/2/2022	4	LFS	None	77	1	Released	Suisun Bay
2022	1	22-31-SBW01	3/2/2022	4	NA	NA	NA	NA	NA	Suisun Bay
2022	1	22-31-GB01	3/3/2022	4	LFS	None	59	1	Released	Suisun Marsh
2022	1	22-31-GB01	3/3/2022	4	LFS	None	65	1	Released	Suisun Marsh
2022	1	22-31-GB01	3/3/2022	4	LFS	None	68	1	Released	Suisun Marsh
2022	1	22-31-GB01	3/3/2022	4	LFS	None	69	1	Released	Suisun Marsh
2022	1	22-31-GB01	3/3/2022	4	LFS	None	74	2	Released	Suisun Marsh

Water Year	Phase	Station Code	Date	# Tows	Species	Mark Type	Fork Length	Total Catch	Disposition	Stratum
2022	1	22-31-GB01	3/3/2022	4	LFS	None	75	1	Released	Suisun Marsh
2022	1	22-31-GB01	3/3/2022	4	LFS	None	76	1	Released	Suisun Marsh
2022	1	22-31-GB01	3/3/2022	4	LFS	None	77	1	Released	Suisun Marsh
2022	1	22-31-GB01	3/3/2022	4	LFS	None	79	1	Released	Suisun Marsh
2022	1	22-31-GB01	3/3/2022	4	LFS	None	80	1	Released	Suisun Marsh
2022	1	22-31-GB01	3/3/2022	4	LFS	None	83	1	Released	Suisun Marsh
2022	1	22-31-GB01	3/3/2022	4	LFS	None	87	1	Released	Suisun Marsh
2022	1	22-31-GB01	3/3/2022	4	LFS	None	89	1	Released	Suisun Marsh
2022	1	22-31-SM01	3/3/2022	3	DSM	AdClipped	79	1	UCD AHP	Suisun Marsh
2022	1	22-31-SM03	3/3/2022	4	LFS	None	84	1	Released	Suisun Marsh
2022	1	22-31-RV02	2/28/2022	4	NA	NA	NA	NA	NA	Lower Sac River
2022	1	22-31-RV03	2/28/2022	4	NA	NA	NA	NA	NA	Lower Sac River
2022	1	22-31-RV05	2/28/2022	4	NA	NA	NA	NA	NA	Lower Sac River
2022	1	22-31-LSR01	3/1/2022	4	NA	NA	NA	NA	NA	Lower Sac River
2022	1	22-31-RV01	3/1/2022	4	NA	NA	NA	NA	NA	Lower Sac River

Water Year	Phase	Station Code	Date	# Tows	Species	Mark Type	Fork Length	Total Catch	Disposition	Stratum
2022	1	22-31-RV04	3/1/2022	4	NA	NA	NA	NA	NA	Lower Sac River
2022	1	22-31-LSJ01	3/2/2022	4	NA	NA	NA	NA	NA	Lower San Joaquin River
2022	1	22-31-SJT01	3/2/2022	4	NA	NA	NA	NA	NA	Lower San Joaquin River
2022	1	22-31-SJT02	3/2/2022	4	NA	NA	NA	NA	NA	Lower San Joaquin River
2022	1	22-31-PP01	3/3/2022	4	NA	NA	NA	NA	NA	Lower San Joaquin River
2022	1	22-31-PP02	3/3/2022	4	NA	NA	NA	NA	NA	Lower San Joaquin River
2022	1	22-31-SJT03	3/3/2022	4	NA	NA	NA	NA	NA	Lower San Joaquin River
2022	1	22-31-CS01	3/3/2022	4	NA	NA	NA	NA	NA	Cache Slough
2022	1	22-31-CS02	3/3/2022	4	NA	NA	NA	NA	NA	Cache Slough
2022	1	22-31-CS03	3/3/2022	4	NA	NA	NA	NA	NA	Cache Slough
2022	1	22-31-LSSC01	3/2/2022	2	DSM	AdClipped	71	1	UCD AHP	Sac DW Ship Channel

Water Year	Phase	Station Code	Date	# Tows	Species	Mark Type	Fork Length	Total Catch	Disposition	Stratum
2022	1	22-31-LSSC01	3/2/2022	2	DSM	VIE	66	1	UCD AHP	Sac DW Ship Channel
2022	1	22-31-LSSC02	3/2/2022	2	DSM	AdClipped	76	1	UCD AHP	Sac DW Ship Channel
2022	1	22-31-USSC01	3/2/2022	3	DSM	AdClipped	84	1	UCD AHP	Sac DW Ship Channel
2022	1	22-31-FT02	2/28/2022	4	NA	NA	NA	NA	NA	Southern Delta
2022	1	22-31-HC01	2/28/2022	4	NA	NA	NA	NA	NA	Southern Delta
2022	1	22-31-OR01	2/28/2022	4	NA	NA	NA	NA	NA	Southern Delta
2022	1	22-31-FT01	3/1/2022	4	NA	NA	NA	NA	NA	Southern Delta
2022	1	22-31-MIW01	3/1/2022	4	NA	NA	NA	NA	NA	Southern Delta
2022	1	22-31-MIW02	3/1/2022	4	NA	NA	NA	NA	NA	Southern Delta
2022	1	22-31-CQS01	2/28/2022	4	NA	NA	NA	NA	NA	Western Delta
2022	1	22-31-SPE01	2/28/2022	4	NA	NA	NA	NA	NA	Western Delta
2022	1	22-31-SPE02	2/28/2022	4	NA	NA	NA	NA	NA	Western Delta

Unmarked DSM collected during Phase 1 are transferred alive to FCCL to contribute to DSM broodstock if tow temperatures are below 17°C. If tow temperatures are above 17°C, unmarked DSM are flash frozen in liquid nitrogen and transferred to the UC Davis

Aquatic Health Program for processing. All marked DSM are flash frozen in liquid nitrogen and transferred to UC Davis for processing.

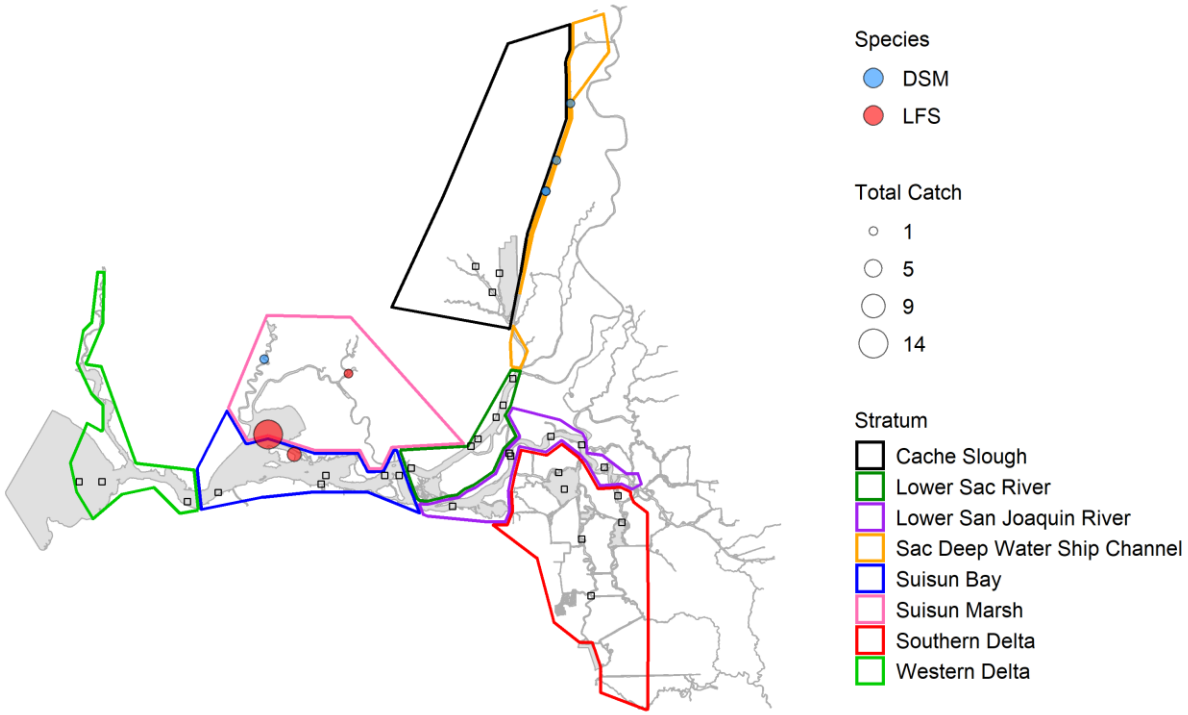

Figure 1. Delta Smelt (DSM) and Longfin Smelt (LFS) catch per station for EDSM 2022 Phase 1 Kodiak trawls, from 2/28/2022–3/3/2022. Sites with no DSM or LFS catch are indicated with squares.

Table 2. Delta Smelt (DSM) and Longfin Smelt (LFS) catch in Chipps Island mid-water trawls from 02/27/2022–3/4/2022. These data are preliminary and subject to change.

Water Year	Station Code	Date	Species	Mark Type	Fork Length	Total Catch	Disposition	Location
2022	SB018M	3/1/2022	LFS	None	117	1	FCCL	Chipps Island

As requested, LFS >80 mm fork length collected in Chipps Island trawls during Dec–Apr are transferred alive to FCCL to contribute to LFS broodstock if tow temperatures are below 14.5°C. All DSM are flash frozen in liquid nitrogen and transferred to the UC Davis Aquatic Health Program for processing.

Table 3. Longfin Smelt catch per station from 2022 Smelt Larva Survey, Survey 4. Longfin Smelt incidental take permit criteria stations are highlighted in blue (Barker Slough Pumping Plant) and yellow (South Delta exports). Survey 4 was conducted between 02/22/2022 - 2/28/2022.

Year	Survey #	SLS Station	Turbidity (NTU)	Sample Status	Species	Smelt Catch	Min Length	Max Length	Mean Length
2022	4	340	NA	Not Yet Processed	NA	NA	NA	NA	NA
2022	4	342	NA	Not Yet Processed	NA	NA	NA	NA	NA
2022	4	343	NA	Not Yet Processed	NA	NA	NA	NA	NA
2022	4	344	NA	Not Yet Processed	NA	NA	NA	NA	NA
2022	4	345	NA	Not Yet Processed	NA	NA	NA	NA	NA
2022	4	346	NA	Not Yet Processed	NA	NA	NA	NA	NA
2022	4	347	NA	Not Yet Processed	NA	NA	NA	NA	NA
2022	4	348	NA	Not Yet Processed	NA	NA	NA	NA	NA
2022	4	349	NA	Not Yet Processed	NA	NA	NA	NA	NA
2022	4	405	11.5	Processed	Longfin Smelt	8	6	10	7.9
2022	4	411	15.7	Processed	Longfin Smelt	36	6	9	7.3
2022	4	418	21.1	Processed	Longfin Smelt	5	6	9	7.8
2022	4	501	30.5	Processed	Longfin Smelt	106	6	12	8.2
2022	4	504	16.7	Processed	Longfin Smelt	218	5	10	7.9
2022	4	508	36.7	Processed	Longfin Smelt	41	6	13	7.5
2022	4	513	25.5	Processed	Longfin Smelt	33	6	9	6.7
2022	4	519	23.8	Processed	Longfin Smelt	10	6	10	7.6

Year	Survey #	SLS Station	Turbidity (NTU)	Sample Status	Species	Smelt Catch	Min Length	Max Length	Mean Length
2022	4	520	33.7	Processed	Longfin Smelt	50	5	11	7.0
2022	4	602	29.3	Processed	Longfin Smelt	14	7	9	7.9
2022	4	606	53.6	Processed	Longfin Smelt	15	7	15	9.2
2022	4	609	30.9	Processed	Longfin Smelt	7	6	7	6.9
2022	4	610	26.2	Processed	Longfin Smelt	3	7	8	7.7
2022	4	703	19.6	Processed	Longfin Smelt	13	7	8	7.2
2022	4	704	26.4	Processed	Longfin Smelt	21	6	8	6.8
2022	4	705	9.7	Processed	Longfin Smelt	1	8	8	8.0
2022	4	706	29.8	Processed	Longfin Smelt	35	6	8	6.7
2022	4	707	4.0	Processed	Longfin Smelt	1	7	7	7.0
2022	4	711	4.0	Processed	NA	No Smelt Catch	NA	NA	NA
2022	4	716	4.9	Processed	NA	No Smelt Catch	NA	NA	NA
2022	4	723	5.9	Processed	Longfin Smelt	1	7	7	7.0
2022	4	801	29.5	Processed	Longfin Smelt	23	5	8	6.3
2022	4	804	18.4	Processed	Longfin Smelt	14	5	10	7.1
2022	4	809	N/A	Processed	Longfin Smelt	32	6	8	6.7
2022	4	812	N/A	Processed	Longfin Smelt	9	6	7	6.2
2022	4	815	N/A	Processed	NA	No Smelt Catch	NA	NA	NA
2022	4	901	N/A	Processed	Longfin Smelt	6	6	9	7.2
2022	4	902	N/A	Processed	Longfin Smelt	1	7	7	7.0
2022	4	906	N/A	Processed	NA	No Smelt Catch	NA	NA	NA
2022	4	910	N/A	Processed	NA	No Smelt Catch	NA	NA	NA
2022	4	912	N/A	Processed	NA	No Smelt Catch	NA	NA	NA
2022	4	914	N/A	Processed	NA	No Smelt Catch	NA	NA	NA

Year	Survey #	SLS Station	Turbidity (NTU)	Sample Status	Species	Smelt Catch	Min Length	Max Length	Mean Length
2022	4	915	N/A	Processed	Longfin Smelt	2	7	7	7.0
2022	4	918	N/A	Processed	NA	No Smelt Catch	NA	NA	NA
2022	4	919	N/A	Processed	NA	No Smelt Catch	NA	NA	NA

Processing is complete through 03/07/2022.

Figure 2: Smelt Larva Survey station locations.