FISH PRESENCE AND STRANDING ASSESSMENT TECHNICAL MEMORANDUM

LA GRANGE HYDROELECTRIC PROJECT FERC NO. 14581

Prepared for:
Turlock Irrigation District – Turlock, California
Modesto Irrigation District – Modesto, California

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September 2017

1.0 INTRODUCTION

1.1 Background

The Turlock Irrigation District (TID) and Modesto Irrigation District (MID) (collectively, the Districts) jointly own the La Grange Diversion Dam (LGDD) located on the Tuolumne River in Stanislaus County, California (Figures 1.1-1 and 1.1-2). LGDD is 131 feet high and is located at river mile (RM) 52.2 at the exit of a narrow canyon, the walls of which contain the headpond formed by the diversion dam. Under normal river flows, the headpond formed by the diversion dam extends for approximately two miles upstream. When not in spill mode, the water level upstream of the diversion dam is between elevation 294 feet and 296 feet approximately 90 percent of the time. Within this 2-foot range, the headpond storage is estimated to be less than 100 acre-feet of water.

The drainage area of the Tuolumne River upstream of LGDD is approximately 1,550 square miles. Tuolumne River flows upstream of LGDD are regulated by four reservoirs: Hetch Hetchy, Lake Eleanor, Cherry Lake (also known as Lake Lloyd), and Don Pedro. The Don Pedro Hydroelectric Project (Federal Energy Regulatory Commission [the Commission or FERC] No. 2299) is owned jointly by the Districts, and the other three dams are owned by the City and County of San Francisco (CCSF) and operated by the San Francisco Public Utilities Commission. Inflow to the La Grange headpond is the sum of releases from the Don Pedro Project, located 2.3 miles upstream, and very minor contributions from two small intermittent drainageways downstream of Don Pedro Dam.

LGDD was constructed from 1891 to 1893 displacing Wheaton Dam, which was built by other parties in the early 1870s. LGDD raised the level of the Tuolumne River to permit the diversion and delivery of water by gravity to irrigation systems owned by TID and MID. The Districts' irrigation systems currently provide water to over 200,000 acres of prime Central Valley farmland and drinking water to the City of Modesto. Built in 1924, the La Grange hydroelectric plant is located approximately 0.2 miles downstream of LGDD on the east (left) bank of the Tuolumne River and is owned and operated by TID. The powerhouse has a capacity of 4.7 megawatts (MW). The La Grange Hydroelectric Project (Project; FERC No. 14581) operates in run-of-river mode. The LGDD provides no flood control benefits, and there are no existing recreation facilities associated with the Project or the La Grange headpond.

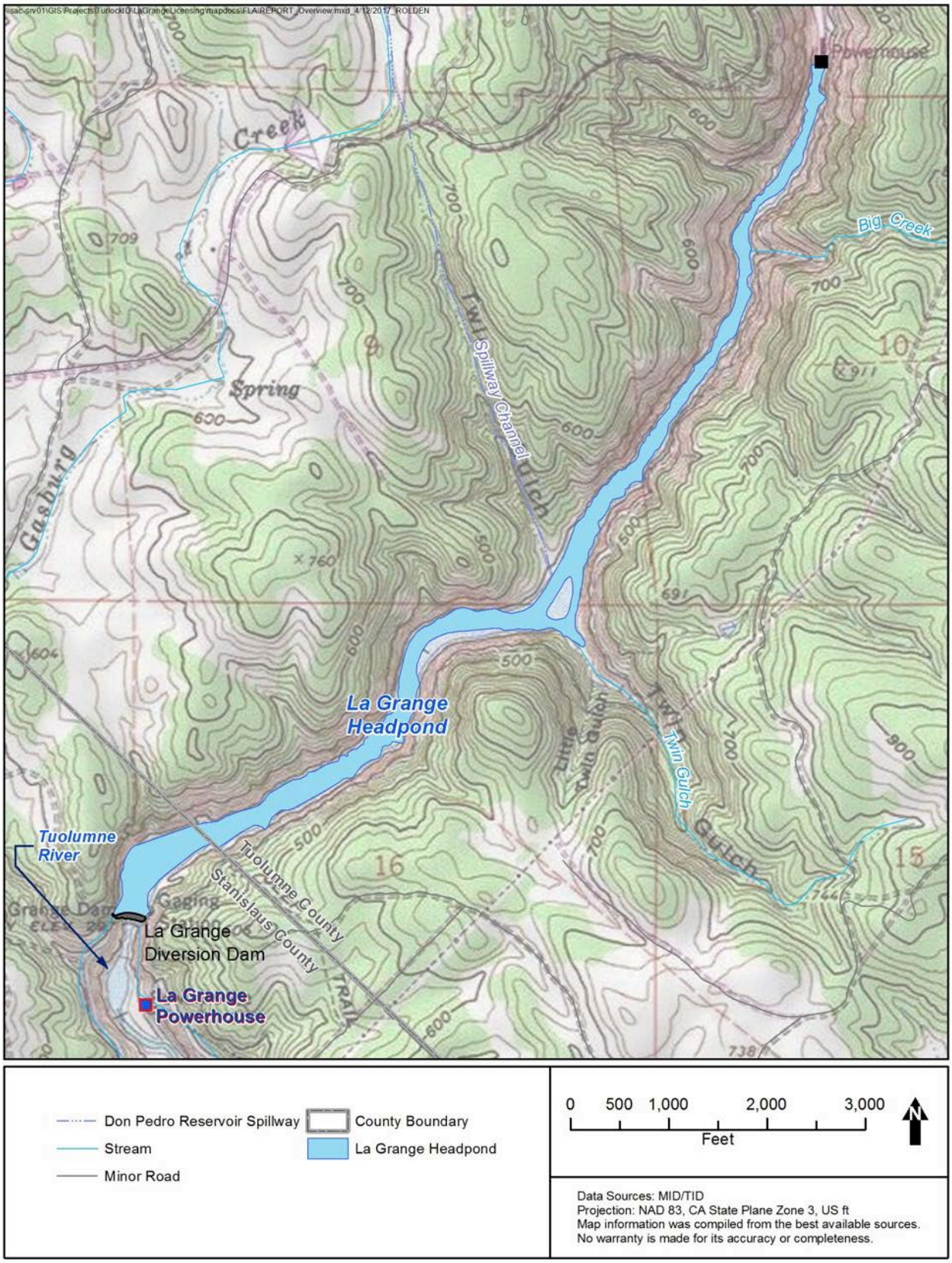

Figure 1.1-1. La Grange Hydroelectric Project location map.

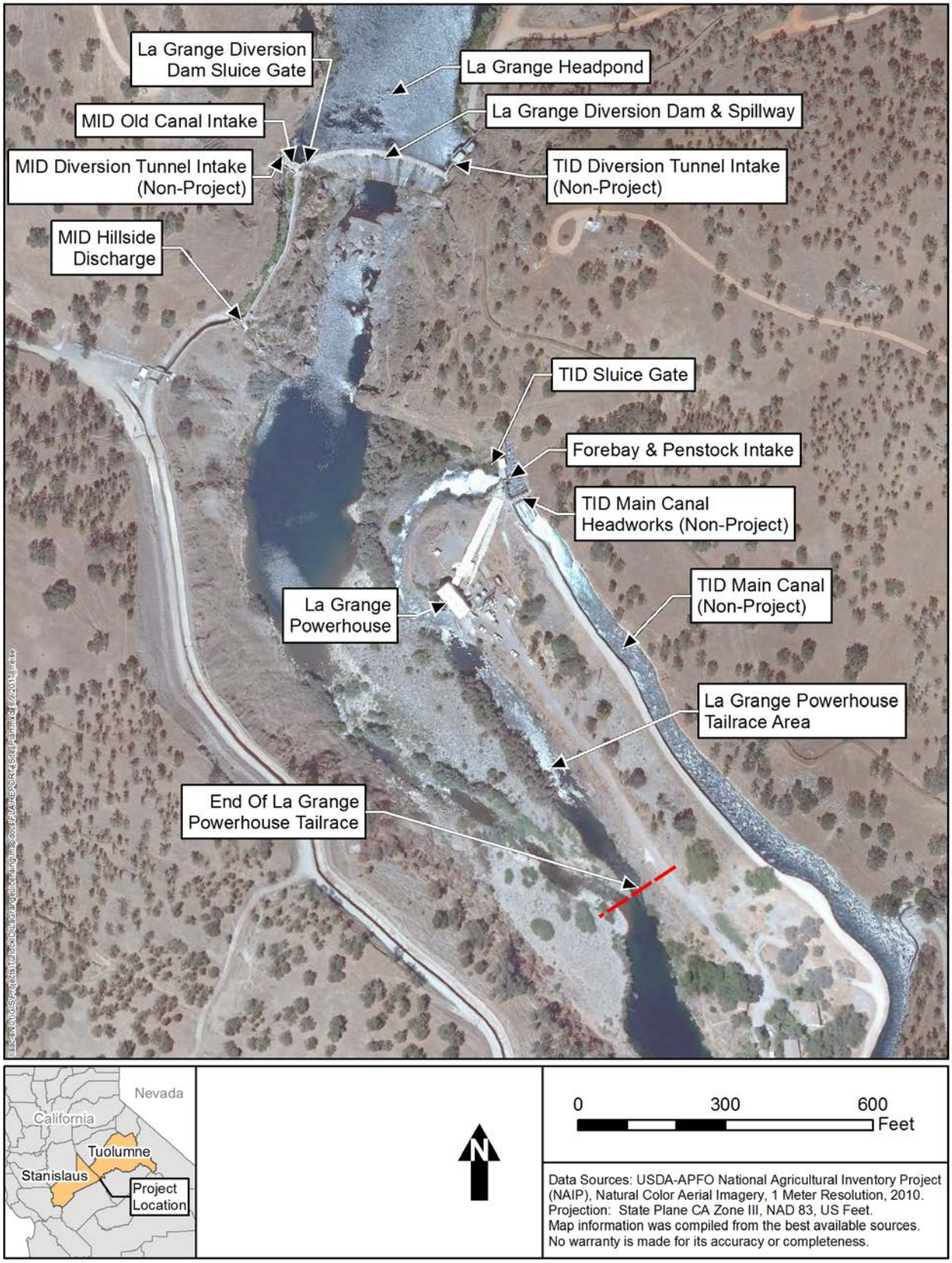

Figure 1.1-2. La Grange Hydroelectric Project site plan.

1.2 Licensing Process

In 2014, the Districts commenced the pre-filing process for the licensing of the La Grange Project by filing a Pre-Application Document with FERC[1]. On September 5, 2014, the Districts filed their Proposed Study Plan to assess Project effects on fish and aquatic resources, recreation, and cultural resources in support of their intent to license the Project. On January 5, 2015, in response to comments from licensing participants, the Districts filed their Revised Study Plan (RSP) containing three study plans: (1) Cultural Resources Study Plan; (2) Recreation Access and Safety Assessment Study Plan; and (3) Fish Passage Assessment Study Plan[2].

On February 2, 2015, FERC issued the Study Plan Determination (SPD), approving or approving with modifications six studies (Table 1.2-1). Of those six studies, five had been proposed by the Districts in the RSP. The Districts note that although FERC's SPD identified the Fish Passage Barrier Assessment, Fish Passage Facilities Alternatives Assessment, and Fish Habitat and Stranding Assessment below La Grange Diversion Dam as three separate studies, all three assessments are elements of the larger Fish Passage Assessment as described in the RSP. The sixth study approved by FERC, Effects of the Project and Related Activities on the Losses of Marine-Derived Nutrients in the Tuolumne River, was requested by the National Marine Fisheries Service (NMFS) in its July 22, 2014 comment letter.

Table 1.2-1. Studies approved or approved with modifications in FERC's Study Plan Determination.

No.	Study	Approved by FERC in SPD without Modifications	Approved by FERC in SPD with Modifications
1	Recreation Access and Safety Assessment		X
2	Cultural Resources Study		X
3	Fish Passage Barrier Assessment		X[1]
4	Fish Passage Facilities Alternatives Assessment		X
5	Fish Habitat and Stranding Assessment below La Grange Dam		X
6	Effects of the Project and Related Activities on the Losses of Marine-Derived Nutrients in the Tuolumne River	X[2]	

[1] Page A-1 of Appendix A of FERC's SPD states that FERC approved with modifications the Fish Passage Barrier Assessment. However, the Districts found no modifications to this study plan in the SPD and page B-7 of the SPD states "no modifications to the study plan are recommended."

[2] FERC directed the Districts to conduct the study plan as proposed by NMFS.

In the SPD, FERC recommended that, as part of the Fish Passage Facilities Alternatives Assessment, the Districts evaluate the technical and biological feasibility of the movement of

[1] On December 19, 2012, Commission staff issued an order finding that the La Grange Hydroelectric Project is required to be licensed under Section 23(b)(1) of the Federal Power Act. Turlock Irrigation District and Modesto Irrigation District, 141 FERC ¶ 62,211 (2012), aff'd Turlock Irrigation District and Modesto Irrigation District, 144 FERC ¶ 61,051 (2013). On May 15, 2015, the U.S. Court of Appeals for the District of Columbia Circuit denied the Districts' appeal and affirmed the Commission's finding that the La Grange Hydroelectric Project requires licensing. Turlock Irrigation District, et al., v. FERC, et al., No. 13-1250 (D.C. Cir. May 15, 2015).

[2] The Fish Passage Assessment Study Plan contained a number of individual, but related, study elements.

anadromous salmonids through La Grange and Don Pedro project reservoirs if the results from Phase 1 of that study indicate that the most feasible concept for fish passage would involve fish passage through Don Pedro Reservoir or La Grange headpond. On September 16, 2016, the Districts filed the final study plan with FERC. On November 17, 2016, the Districts filed a letter with FERC after consulting with fish management agencies (i.e., NMFS and the California Department of Fish and Wildlife [CDFW]) regarding the availability of test fish and a determination that no fish would be available to support conducting this study in 2017. On January 12, 2017, the Districts filed a letter with FERC stating that with FERC's approval, they intend to conduct the study in 2018 if the results from the Fish Passage Facilities Alternatives Assessment indicate that upstream or downstream fish passage at La Grange and Don Pedro projects would require anadromous fish transit through one or both reservoirs.

In addition to the six studies noted in Table 1.2-1, the SPD required the Districts to develop a plan to monitor anadromous fish movement in the vicinity of the Project's powerhouse draft tubes to determine the potential for injury or mortality from contact with the turbine runners. The Districts filed the Investigation of Fish Attraction to La Grange Powerhouse Draft Tubes study plan with FERC on June 11, 2015, and on August 12, 2015, FERC approved the study plan as filed.

On February 2, 2016, the Districts filed the Initial Study Report (ISR) for the La Grange Hydroelectric Project. The Districts held an ISR meeting on February 25, 2016, and on March 3, 2016, filed a meeting summary. Comments on the meeting summary and requests for new studies and study modifications were to be submitted to FERC by Monday, April 4, 2016. One new study request was submitted; NMFS requested a new study entitled Effects of La Grange Hydroelectric Project Under Changing Climate (Climate Change Study). On May 2, 2016, the Districts filed with FERC a response to comments received from licensing participants and proposed modifications to the Fish Passage Facilities Alternatives Assessment and the La Grange Project Fish Barrier Assessment, and a revised pre-filing schedule. On May 27, 2016, FERC filed a determination on requests for study modifications and new study. The May 27, 2016 determination approved the Districts' proposed modifications and did not approve the NMFS Climate Change Study, and accepted the Districts' revised pre-filing schedule.

On February 1, 2017, the Districts filed the Updated Study Report (USR) for the La Grange Hydroelectric Project. The Districts held a USR meeting on February 16, 2017, and on March 3, 2017, filed a meeting summary. Comments on the meeting summary and requests for new studies and study modifications were to be submitted to FERC by Monday, April 3, 2017. Comments on the USR were received from the Central Sierra Environmental Resource Center on February 27, 2017, from NMFS on April 3, 2017, and from CDFW on April 13, 2017. On May 2, 2017, the Districts filed with FERC a response to comments received from licensing participants.

On April 24, 2017, the Districts filed the Draft License Application for the La Grange Hydroelectric Project. Comments on the Draft License Application were received from NMFS on May 12, 2017, from FERC on July 18, 2017, and from CDFW on August 18, 2017. The Districts' response to these comments is included in the La Grange Hydroelectric Project Final

License Application (FLA). The FLA was filed with FERC on October 11, 2017, in accordance with the Districts' Request for Extension of Time granted by FERC on September 1, 2017.

1.3 Study Plan

FERC's Scoping Document 2 (SD2) issued on September 5, 2014 identified potential effects of Project operations on the stranding or displacement of fish.

FERC's SPD approved with modifications the Districts' proposed Fish Habitat and Stranding Assessment below La Grange Diversion Dam. In its SPD, FERC ordered the Districts to: (1) continue monitoring existing flow conduits where flow monitoring is already occurring, conduct two years of flow monitoring at flow conduits not currently monitored (i.e., the Modesto hillside discharge and LGDD sluice gate), develop estimates of historical flows, data permitting, for each of the five flow conduits at the Project, and, based on existing information, to the extent available, characterize the magnitude and rate of flow and stage changes when Project conduits are shut down, (2) collect topographic, depth, and habitat data downstream, and in the vicinity of, the Project, (3) assess fish presence and the potential for stranding, and (4) in consultation with NMFS and other interested parties, develop and implement a study plan for monitoring anadromous fish movement into the powerhouse draft tubes.

The Fish Presence and Stranding Assessment reported herein describes the work associated with Item (3) above. The other three study reports are provided under separate cover.

2.0 STUDY GOALS AND OBJECTIVES

The goal of this study is to document incidental fish observations in the vicinity of LGDD, La Grange powerhouse tailrace, and TID sluice gate channel during the fall-run Chinook salmon (*Oncorhynchus tshawytscha*) and steelhead (*O. mykiss*) migration period for the 2015/2016 and 2016/2017 seasons. Specific objectives of the assessment include:

- daily observations of fish in the immediate vicinities of LGDD, La Grange powerhouse, and within the sluice gate channel;
- if the La Grange powerhouse trips offline, conduct sluice gate channel surveys to record fish presence and, if necessary, conduct relocation activities; and
- notation of redds that become dewatered and the duration of any dewatering, due to changes in powerhouse operations.

3.0 STUDY AREA

The study area includes the main channel of the Tuolumne River from the base of LGDD downstream to its confluence with the powerhouse tailrace channel near RM 51.8, the length of the tailrace channel, and the length of the TID sluice gate channel (Figure 3.0-1).

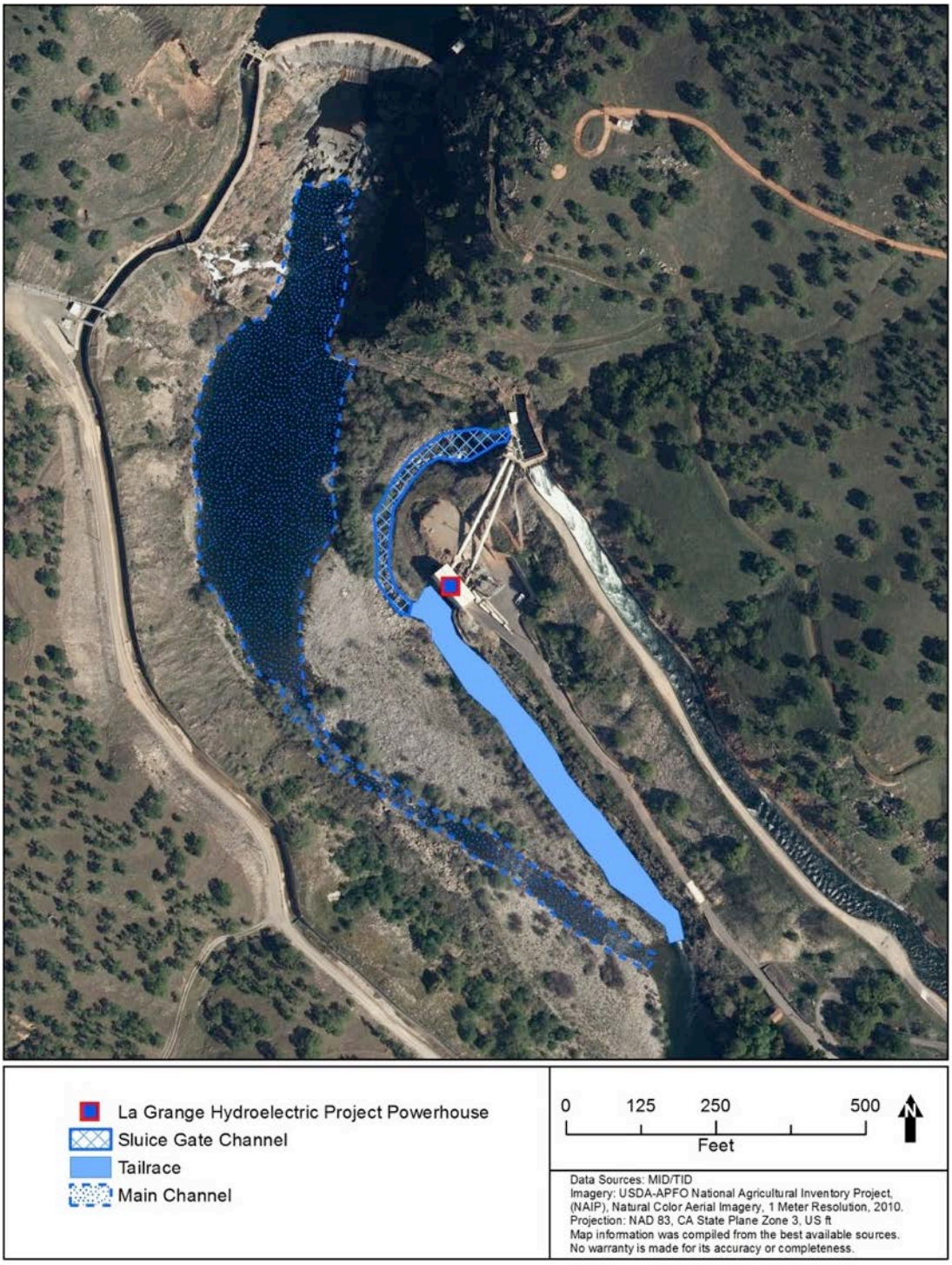

Figure 3.0-1 Map of the study area.

4.0 METHODOLOGY

4.1 Daily Observations of Fish

Daily fish observation surveys in the immediate vicinities of LGDD, La Grange powerhouse tailrace, and within the TID sluice gate channel were conducted twice daily; morning surveys were conducted by FISHBIO fisheries biologists/technicians during daily operations and maintenance of the counting weir associated with the Fish Barrier Assessment study (TID/MID 2017a). The counting weir facilities are comprised of two weir sections, one located in the tailrace channel and the other in the mainstem Tuolumne River. Afternoon surveys were conducted by TID Project operators. A qualified biologist was present during the first five surveys to train Project operators on fish identification.

FISHBIO surveys included observations in the tailrace channel above and below the weir, in the sluice gate channel, and in the mainstem Tuolumne River channel from LGDD downstream to its confluence with the tailrace channel. Surveys consisted of walking the length of the sluice gate channel, and floating both tailrace and mainstem channels from LGDD to 0.3 miles downstream of the weir locations.

Surveys conducted by TID Project operators included the tailrace channel and the sluice gate channel. These afternoon surveys consisted of walking the length of the sluice gate channel, and observing the tailrace channel from the access road above the channel.

Observation surveys recorded on standardized datasheets included the following:

- observer;
- date and time of survey;
- approximate discharge and sluice gate position status at time of survey (flow observations were also post-processed using data from the Project);
- powerhouse output at time of survey;
- number of fish observed and their approximate size;
- identification of species, if possible; at a minimum each fish was identified as either a salmonid or non-salmonid;
- locations of fish (to be indicated on a previously-generated base map);
- description of general fish behaviors, such as moving upstream or downstream, spawning, holding in one specific location, or leaping/jumping;
- notation of any observations of fish swimming into the La Grange powerhouse tailrace channel; and
- notation of any observations of fish swimming into the TID sluice gate channel.

In addition to the observations listed above, surveys of the tailrace channel also included daily inspections to observe spawning redds.

4.2 Sluice Gate Channel Stranding Surveys

If a La Grange powerhouse unit trips (i.e., unexpectedly stops generating), water stops flowing through the unit and into the tailrace from that unit. In such an event, the TID sluice gate is opened immediately to deliver flows from the forebay to the tailrace to maintain river flow. In addition, TID currently maintains in an open position an 18-inch pipe, which continuously delivers flow to the sluice gate channel and the tailrace. The exact flow quantity is not measured, but is roughly estimated to be 5 to 10 cubic feet per second (cfs) (TID/MID 2017b). Direct surveys to observe the TID sluice gate channel and the entire tailrace channel for the presence and potential stranding of salmonids were conducted during periods of flow transitions extending until sluice gate closure. Once powerhouse operations were restored and the sluice gate had been closed, an additional survey was conducted to observe the possible occurrence of fish stranding in the sluice gate channel.

Data collected during sluice gate channel stranding surveys included:

- presence of fish;
- species;
- fish location;
- estimated length;
- presence of adipose clip;
- general condition of fish;
- photo documentation; and, if appropriate,
- relocation time.

4.3 Redd Dewatering Surveys

To evaluate the potential for dewatering of redds and the duration of any dewatering due to a change in powerhouse operations, a water level data logger (Onset Computer Corporation) was deployed in the tailrace channel. Water level data was recorded every 15 minutes and correlated with salmonid redd mapping data collected in the tailrace channel. Bi-weekly surveys of redds were documented by recording the Global Positioning System (GPS) coordinates of redds and measuring the depth at the estimated egg pocket location of each redd. River stage was compared to the location of each documented redd to determine the frequency and duration of potential dewatering events.

5.0 RESULTS

5.1 Daily Fish Observations

5.1.1 2015/2016 Monitoring Season

Twice daily fish observation surveys began on September 23, 2015 and continued through April 14, 2016.

Fish species observed in the tailrace during this period included fall-run Chinook salmon, *O. mykiss*, Sacramento pikeminnow (*Ptychocheilus grandis*), Sacramento sucker (*Catostomus occidentalis*), and striped bass (*Morone saxatilis*). Observations of adult fall-run Chinook salmon in the tailrace and sluice gate channels occurred between October 26, 2015 and January 24, 2016, with daily counts ranging from zero to three (Figure 5.1-1).

Fish observed in the main channel surveys included bluegill (*Lepomis macrochirus*), fall-run Chinook salmon, hardhead (*Mylophardon conocephalus*), sculpin (*Cottidae* spp.), Sacramento pikeminnow, Sacramento sucker, and threespine stickleback (*Gasterosteus aculeatus*). No incidences of fish attempting to enter into the La Grange powerhouse or the TID sluice gate channel were observed. A summary of the daily fish observations is included in Attachment A.

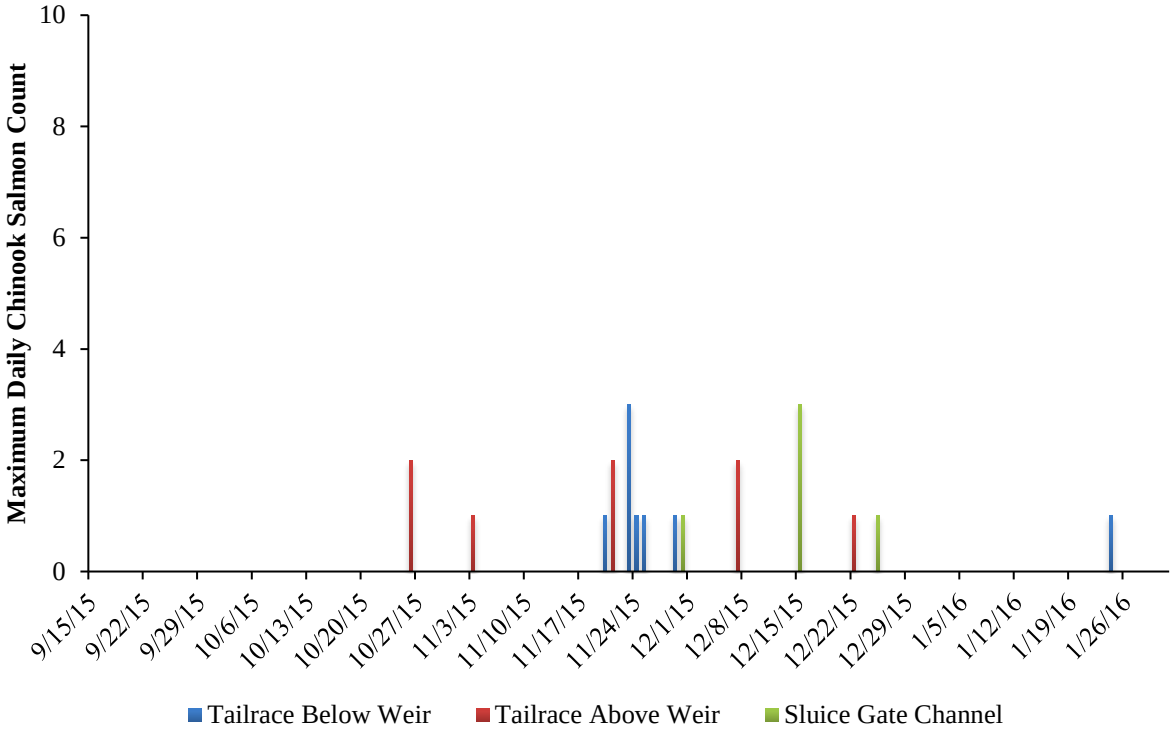

Figure 5.1-1. Maximum daily Chinook salmon counts in the tailrace and sluice gate channels during the 2015/16 monitoring seasons.

5.1.2 2016/2017 Monitoring Season

Twice daily fish observation surveys began on September 15, 2016 and continued through January 1, 2017. Monitoring was suspended on January 2, 2017 due to zero visibility conditions and safety concerns due to the onset of flood control releases from Don Pedro Reservoir.

Fish species observed in the tailrace channel during this period were limited to fall-run Chinook salmon, with the first observation on October 20, 2016, and maximum daily counts ranging from 0 to 60. Adult fall-run Chinook salmon were also observed in the sluice gate channel between October 20, 2016 and December 2, 2016, with maximum daily counts ranging from 0 to 30 (Figure 5.1-2).

Fish observed in the main channel surveys included fall-run Chinook salmon, sculpin, Sacramento pikeminnow, and Sacramento sucker. Observations of adult fall-run Chinook salmon in the main channel occurred between November 4, 2016 and December 29, 2016, with daily counts ranging from 0 to 7. A summary of daily fish observations is included in Attachment B.

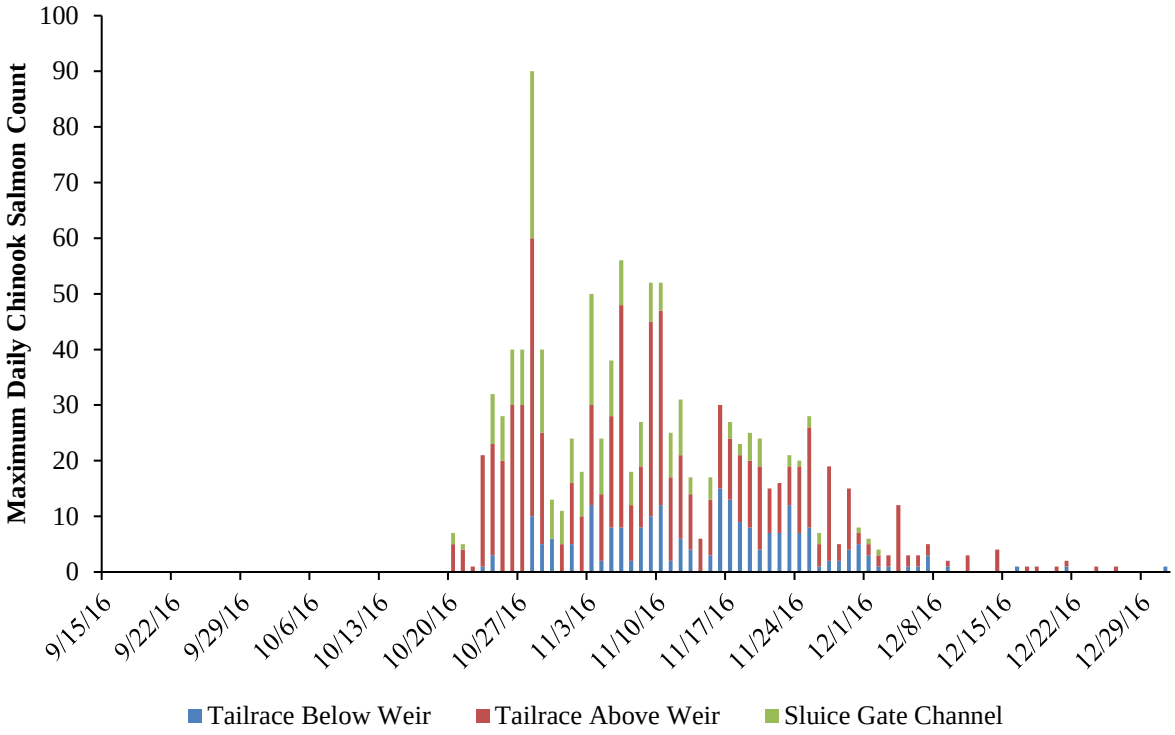

Figure 5.1-2. Maximum daily Chinook salmon counts in the tailrace and sluice gate channels during the 2016/17 monitoring seasons.

5.2 Sluice Gate Channel Stranding Surveys

5.2.1 2015/2016 Monitoring Season

The La Grange powerhouse tripped, resulting in the opening of the sluice gate, 18 times during the 2015/2016 monitoring season (September 23, 2015 through April 15, 2016). High levels of aquatic vegetation in the forebay and penstock intake area caused the La Grange powerhouse units to trip offline more than normal. The duration of flow events in the sluice gate channel (above the minimum flow maintained at all times) ranged from 0.25 to 505.5 hours (median 40.5 hours) (Table 5.2-1).

Table 5.2-1. TID sluice gate operations and stranding survey events during the 2015/2016 monitoring season.

Event No.	Sluice Gate Opened		Sluice Gate Closed		Duration (hours)	Stranding Survey		Fish Observed
	Date	Time	Date	Time		Date	Time	
1	9/29/15	0:30	9/29/15	8:45	8.25	9/29/15	8:50	No
2	10/17/15	23:15	10/19/15	9:45	34.5	10/19/15	11:00	No
3	10/21/15	5:15	10/23/15	14:15	57.0	10/23/15	16:00	No
4	10/28/15	13:15	10/28/15	15:00	15.0	10/29/15	7:45	No
5	11/3/15	13:30	11/24/15	15:00	505.5	11/24/15	15:00	No
6	11/26/15	6:30	11/30/15	10:45	100.25	11/30/15	11:00	Yes
7	12/14/15	7:00	12/14/15	9:15	2.25	12/14/15	9:15	No
8	12/15/15	6:15	12/15/15	9:45	3.5	12/15/15	10:45	Yes
9	12/17/15	23:15	12/18/15	0:15	1.0	12/18/15	8:45	No
10	12/23/15	17:00	12/23/15	18:15	1.25	12/24/15	9:15	No
--	--	--	--	--	--	12/25/15	9:45	Yes
11	12/25/15	14:15	12/25/15	15:15	1.0	12/25/15	15:30	No
12	12/26/15	14:45	12/28/15	12:00	45.25	12/28/15	13:00	No
13	1/1/16	16:30	1/1/16	17:45	1.25	1/1/16	18:45	No
14	1/3/16	9:30	1/3/16	10:30	1.0	1/3/16	11:00	No
15	1/10/16	20:00	1/10/16	22:00	2.0	1/11/16	9:15	No
16	1/17/16	16:30	1/17/16	18:15	1.75	1/18/16	13:00	No
17	2/8/16	15:30	2/8/16	16:30	1.0	2/9/16	9:15	No
18	2/18/16	12:45	2/18/16	13:00	0.25	2/18/16	15:45	No

TID operators and a fisheries biologist were on-site and surveyed the channel for stranded fish each time the sluice gate was closed and flow was reduced to the minimum flow of approximately 5 to 10 cfs. On three occasions during the 2015/2016 monitoring season, fish were documented in the sluice gate channel during the surveys, with five adult fall-run Chinook salmon observed (Table 5.2-2). Three fish were relocated to the tailrace channel, one fish swam into the tailrace channel volitionally, and a single unspawned female salmon carcass was recovered on December 25 (Figure 5.2-1). This salmon mortality likely occurred after sluice gate event #10 (December 23). No fish were observed in the sluice gate channel during the December 24 stranding survey; however, it is possible that this fish was near the channel margin under heavy vegetation. When the carcass was found on December 25, it showed signs of fresh predation, and had likely been moved into the center of the channel where it was discovered. The recovered salmon carcass was frozen and turned over to CDFW (La Grange field office).

Table 5.2-2. Fish observations during sluice gate channel stranding surveys during the 2015/2016 monitoring season.

Date	Species	Estimated Length (mm)	Ad-Clip	Fish Condition	Relocation Time	Comments
11/30/15	Fall-run Chinook Salmon	700	No	Good	12:00	Relocated to the pool directly below powerhouse
12/15/15	Fall-run Chinook Salmon	600	No	Good	11:00	Relocated to the pool directly below powerhouse
12/15/15	Fall-run Chinook Salmon	800	No	Good	11:00	Relocated to the pool directly below powerhouse
12/15/15	Fall-run Chinook Salmon	700	Unknown	Good	11:00	Swam volitionally to tailrace channel
12/25/15	Fall-run Chinook Salmon	780	No	Mortality	--	Unspawned female

5.2.2 2016/2017 Monitoring Season

The TID sluice gate opened 13 times during the 2016/2017 monitoring season (September 15, 2016 through January 1, 2017), with seven of the sluice gate events providing flow in excess of La Grange powerhouse operations. The duration of flow events in the sluice gate channel (above the minimum flow maintained at all times) ranged from 0.75 to 77.75 hours (median 9.5 hours) (Table 5.2-3).

TID operators and a fisheries biologist were on-site and surveyed the channel for stranded fish each time the sluice gate was closed and flow was reduced to the minimum flow of approximately 5 to 10 cfs. On six occasions during the 2016/2017 monitoring season, fish were documented in the sluice gate channel during stranding surveys, with counts ranging from 2-20 adult fall-run Chinook salmon observed. On all occasions, it was determined that fish were in good condition with low risk of becoming stranded due to sufficient egress to the tailrace channel, so relocation was not attempted. Three adult Chinook carcasses were recovered after the final stranding survey, with two carcasses recovered on November 24, 2016 and a single carcass recovered on November 25, 2016 (Table 5.2-4, Figure 5.2-1). These carcasses appeared to be post-spawn males found in pools within the sluice gate channel at the maintenance flow, and were not considered to be "stranded". The recovered salmon carcasses were frozen and turned over to CDFW (La Grange field office).

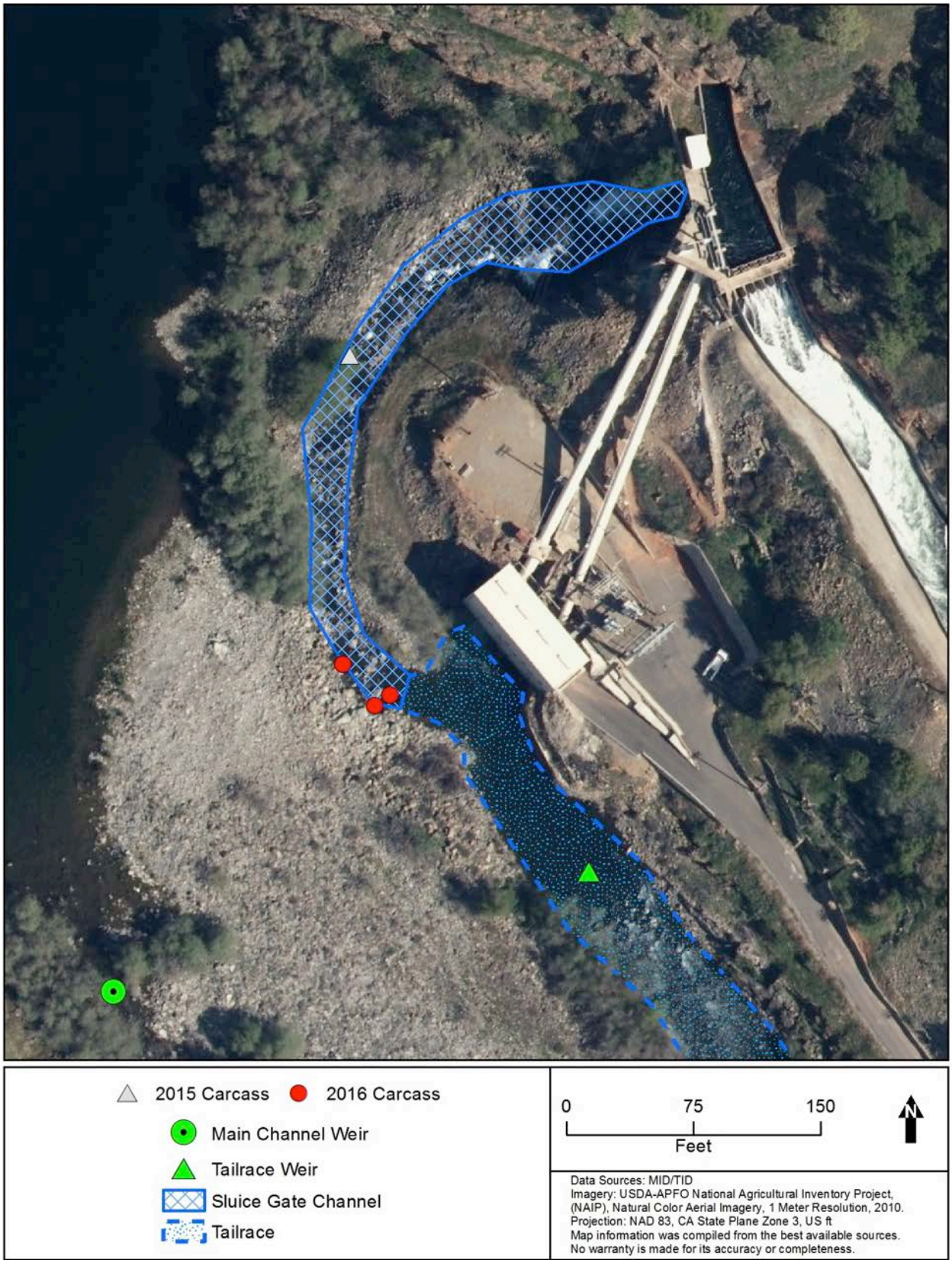

Figure 5.2-1. Location of Chinook salmon carcasses recovered from the sluice gate channel during the 2015/2016 and 2016/17 monitoring seasons.

Table 5.2-3. TID sluice gate operations and stranding survey events during the 2016/2017 monitoring season.

Event No.	Sluice Gate Opened		Sluice Gate Closed		Duration (hours)	Stranding Survey		Fish Observed
	Date	Time	Date	Time		Date	Time	
1	9/12/16[1]	7:30	9/15/16	13:15	77.75	9/15/16	13:30	No
2	10/4/16	6:00	10/14/16	8:30	2.5	10/4/16	9:15	No
3	10/5/16	7:15	10/5/16	9:15	2.0	10/5/16	10:45	No
4	10/13/16[2]	0:00	10/13/16	13:30	13.5	10/14/16	10:30	No
5	10/14/16[2]	22:15	10/14/16	23:15	1.0	10/15/16	8:30	No
6	10/17/16[2]	0:45	10/17/16	10:15	9.5	10/17/16	14:30	No
7	10/19/16[2]	0:15	10/19/16	22:45	22.5	10/20/16	9:30	Yes
8	10/26/16[2]	0:00	10/27/16	0:45	24.75	10/27/16	9:30	No
9	10/28/16[2]	22:00	10/28/16	22:45	0.75	10/29/16	8:15	Yes
10	11/2/16[2]	4:45	11/2/16	23:15	18.5	11/3/16	11:25	Yes
11	11/11/16	13:30	11/11/16	15:45	2.25	11/11/16	16:40	Yes
12	11/14/16	0:30	11/14/16	11:45	11.25	11/14/16	14:00	Yes
13	11/23/16	10:00	11/23/16	13:00	3.0	11/23/16	16:05	Yes

[1] Planned La Grange powerhouse outage for installation of the tailrace-counting weir.
[2] Sluice gate(s) opened to provide flow in excess of the La Grange powerhouse operations.

Table 5.2-4. Fish observations during sluice gate channel stranding surveys during the 2016/2017 monitoring season.

Date	Species	# of Fish	Estimated Length (mm)	Ad-Clip	Fish Condition	Comments
10/20/16	Fall-run Chinook Salmon	2	600	Unknown	Good	Low risk of stranding
10/29/16	Fall-run Chinook Salmon	4	600	Unknown	Good	Low risk of stranding
11/3/16	Fall-run Chinook Salmon	20	600-800	Unknown	Good	Low risk of stranding
11/11/16	Fall-run Chinook Salmon	8	600-800	Unknown	Good	Low risk of stranding
11/14/16	Fall-run Chinook Salmon	6	600-800	Unknown	Good	Low risk of stranding
11/23/16	Fall-run Chinook Salmon	2	600-800	Unknown	Good	Low risk of stranding
11/24/16	Fall-run Chinook Salmon	1	845	No	Mortality	Spawned male
11/24/16	Fall-run Chinook Salmon	1	710	Yes	Mortality	Spawned male
11/25/16	Fall-run Chinook Salmon	1	805	Yes	Mortality	Spawned male

5.3 Redd Dewatering

5.3.1 2015/2016 Monitoring Season

Bi-weekly salmonid redd mapping surveys began on October 14, 2015 and continued through April 6, 2016. A single fall-run Chinook salmon redd was identified in the tailrace channel on November 30, 2015 (Figure 5.3-1) during bi-weekly redd mapping surveys. Based on levelogger data, this redd was not dewatered during the monitoring period (Figure 5.3-2).

Figure 5.3-1. Location of fall-run Chinook salmon redds identified in the tailrace and main channels during the 2015/2016 and 2016/17 monitoring seasons.

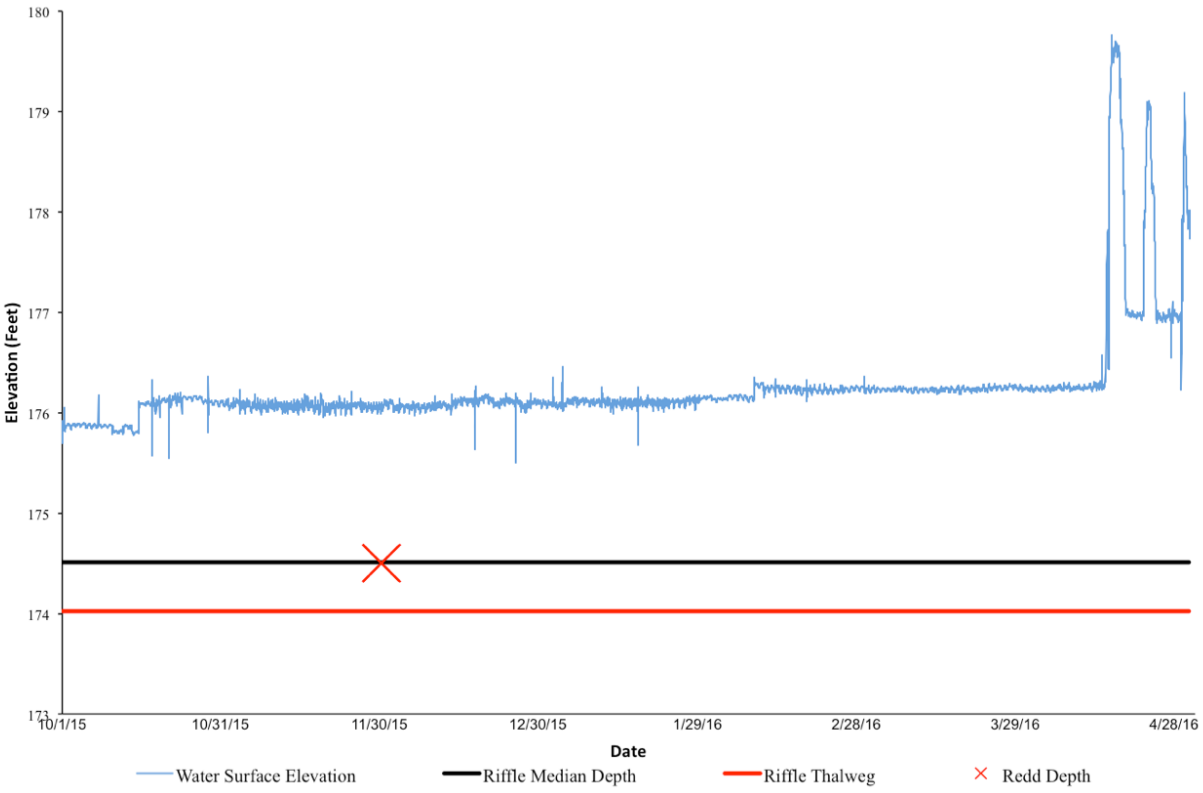

Figure 5.3-2. Tailrace channel water surface elevation levelogger data for the 2015/2016 monitoring season.

5.3.2 2016/2017 Monitoring Season

Bi-weekly salmonid redd mapping surveys began on October 11, 2016 and continued through December 28, 2016. A total of 11 fall-run Chinook salmon redds were identified in the tailrace channel during bi-weekly redd mapping surveys, with nine redds identified on November 14 and two redds identified on November 29. The measured redd depths ranged from 1.0 foot to 2.5 feet (mean 1.7 feet). In the main channel, two fall-run Chinook redds were identified just upstream of the weir location on November 16 (Figure 5.3-1).

Due to flood control releases, which began January 2, 2017, the levelogger was inaccessible for data download and assessment of potential redd dewatering. The estimated daily flow in the tailrace channel was 150 cfs between November 14, 2016 and January 1, 2017, and there was a single sluice gate event (November 23, 2016) during this period. There were no dewatered Chinook salmon redds identified during daily surveys in the tailrace channel through January 1, 2017. Flood control releases from Don Pedro Reservoir from January 2, 2017 to April 30, 2017 ranged from 1,770 cfs to 13,900 cfs. Given these consistent flows followed by extended high flow event, it is highly unlikely that there was any redd dewatering during the 2016/2017 monitoring period.

6.0 DISCUSSION AND FINDINGS

Results from the daily fish observations in the tailrace and/or main channels in the vicinities of LGDD and La Grange powerhouse have documented multiple species including bluegill, fall-run Chinook salmon, hardhead, *O. mykiss*, Sacramento pikeminnow, striped bass, Sacramento sucker, sculpin, and threespine stickleback. During the 2015/2016 monitoring period, the majority of fish observations were juvenile Sacramento pikeminnow and juvenile Sacramento sucker, which accounted for 95 percent of the observations. For the 2016/2017 monitoring period, the majority of fish observations were adult fall-run Chinook salmon, which accounted for 98 percent of observations. The majority of these observations were likely the same individual fish observed multiple times over consecutive days throughout the monitoring period.

Adult fall-run Chinook salmon were documented to enter the sluice gate channel during periods when the sluice gates were opened and at minimum flow conditions during both monitoring seasons. Given that a minimum flow of 5 to 10 cfs is maintained in the sluice gate channel, stranding of fish in this channel has been extremely rare. During the 2015/2016 monitoring season, high levels of aquatic vegetation in the forebay and penstock intake area caused the La Grange powerhouse units to trip offline more than normal. Chinook were observed on three of the 12 sluice gate events during the fall-run Chinook period (9/15 to 12/31), and a single unspawned female carcass was recovered.

Total adult fall-run Chinook escapement into the Tuolumne River was much higher during the 2016/2017 monitoring season, with 3,555 salmon passing the weir at RM 24.5 (Sonke 2017). Daily observations of the sluice gate channel observed 0 to 30 Chinook between October 20, 2016 and December 2, 2016. Adult Chinook were also observed during six of the 13 sluice gate stranding surveys. On all occasions, it was determined that fish were in good condition with low risk of becoming stranded due to sufficient egress to the tailrace channel. Three male carcasses were recovered in the sluice gate channel, but were post-spawn individuals that were not believed to be stranded in the channel due to sluice gate operations.

Water level data collected in the tailrace channel over the past two years has shown that operations of the La Grange powerhouse and the sluice gates are well synchronized if the powerhouse trips, resulting in a relatively stable flow in the tailrace channel. Based on water level data recorded at 15-minute intervals, the maximum elevation change between readings was 0.57 feet during the 2015/2016 monitoring season. Due to the extended high flow period beginning January 2, 2017, the levelogger in the tailrace channel was inaccessible for data download during the 2016/2017 monitoring season. Based on levelogger data from the 2015/2016 monitoring season showing minimal changes in tailrace water surface elevation related to powerhouse operations and the extended high flow period beginning January 2, 2017, it is not believed that any redds were dewatered during the 2016/2017 monitoring period. Given that the sluice gates open immediately when the La Grange powerhouse trips offline, there is very little risk in dewatering the tailrace channel during these operational changes.

7.0 STUDY VARIANCES AND MODIFICATIONS

This study was conducted consistent with the FERC-approved study plan. No variances or modifications occurred.

8.0 REFERENCES

Sonke, C. 2017. Fall Migration Monitoring at the Tuolumne River Weir 2016 Annual Report. Submitted to Turlock and Modesto Irrigation Districts. March 2017.

Turlock Irrigation District and Modesto Irrigation District (TID/MID). 2017a. Fish Barrier Assessment Study Report. Prepared by FISHBIO. September 2017.

_____. 2017b. Flow Records for Five Discharge Structures at the La Grange Project Technical Memorandum. Prepared by HDR, Inc. September 2017.

FISH PRESENCE AND STRANDING ASSESSMENT TECHNICAL MEMORANDUM

ATTACHMENT A

DAILY FISH OBSERVATIONS SURVEY INFORMATION FOR THE 2015/2016 MONITORING SEASON

Table A-1. Daily fish observation survey information for the 2016/2017 monitoring season.

Sample Date	Sample Time	Count	Species[1]	Life Stage[1]	Location[1,2]
9/23/15	9:15	25	Sacramento Pikeminnow	Juvenile	MC Below Weir
		55	Sacramento Sucker	Juvenile	MC Below Weir
		15	Sacramento Sucker	Juvenile	MC Above Weir
9/23/15	12:00	0	N/A	N/A	N/A
9/24/15	9:30	50	Sacramento Sucker	Juvenile	MC Below Weir
		30	Sacramento Pikeminnow	Juvenile	MC Below Weir
		15	Sacramento Sucker	Juvenile	MC Above Weir
9/24/15	15:00	0	N/A	N/A	N/A
9/25/15	8:30	50	Sacramento Sucker	Juvenile	MC Below Weir
		30	Sacramento Pikeminnow	Juvenile	MC Below Weir
		10	Sacramento Sucker	Juvenile	MC Above Weir
9/26/15	8:45	1	Sculpin	Juvenile	MC Below Weir
		1	Sculpin	Adult	MC Below Weir
		1	Sacramento Sucker	Juvenile	MC Below Weir
		4	Sacramento Sucker	Juvenile	MC Above Weir
		6	Sacramento Pikeminnow	Juvenile	MC Above Weir
9/26/15	15:15	0	N/A	N/A	N/A
9/27/15	9:15	1	*O. mykiss*	Adult	TR Below Weir
		10	Sacramento Pikeminnow	Juvenile	MC Below Weir
		5	Sacramento Sucker	Juvenile	MC Above Weir
9/27/15	14:45	0	N/A	N/A	N/A
9/28/15	11:00	0	N/A	N/A	N/A
9/28/15	16:00	0	N/A	N/A	N/A
9/29/15	10:30	10	Sacramento pikeminnow	Juvenile	MC Below Weir
		25	Sacramento sucker	Juvenile	MC Below Weir
9/29/15	15:30	0	N/A	N/A	N/A
9/30/15	11:15	11	Sacramento sucker	Juvenile	MC Below Weir
		4	Sacramento sucker	Juvenile	MC Above Weir
9/30/15	12:30	0	N/A	N/A	N/A
10/1/15	9:00	9	Sacramento pikeminnow	Juvenile	MC Below Weir
		4	Sacramento pikeminnow	Juvenile	MC Above Weir
10/1/15	18:00	0	N/A	N/A	N/A
10/2/15	9:15	20	Sacramento Sucker	Juvenile	MC Below Weir
		15	Sacramento Pikeminnow	Juvenile	MC Below Weir
10/2/15	13:45	0	N/A	N/A	N/A
10/3/15	8:45	15	Sacramento Sucker	Juvenile	MC Above Weir
		2	Sacramento Pikeminnow	Juvenile	MC Above Weir
		40	Sacramento Sucker	Juvenile	MC Below Weir
		14	Sacramento Pikeminnow	Juvenile	MC Below Weir
10/3/15	14:45	0	N/A	N/A	N/A
10/4/15	8:30	6	Sacramento Sucker	Adult	MC Above Weir
		50+	Sacramento Sucker	Juvenile	MC Below Weir
10/4/15	14:30	0	N/A	N/A	N/A
10/5/15	9:45	50+	Sacramento Sucker	Juvenile	MC Below Weir
		3	Sacramento Pikeminnow	Juvenile	MC Above Weir
		1	Bluegill	Juvenile	MC Above Weir
10/5/15	15:30	0	N/A	N/A	N/A
10/6/15	9:15	1	Sacramento Sucker	Adult	TR Above Weir
		2	Sacramento Pikeminnow	Juvenile	TR Above Weir
		50+	Sacramento Sucker	Juvenile	MC Below Weir

Sample Date	Sample Time	Count	Species[1]	Life Stage[1]	Location[1,2]
		25	Sacramento Pikeminnow	Juvenile	MC Below Weir
		15	Sacramento Pikeminnow	Juvenile	MC Above Weir
		4	Sacramento Sucker	Juvenile	MC Above Weir
		1	Bluegill	Adult	MC Above Weir
10/7/15	9:30	1	Sacramento Pikeminnow	Juvenile	TR Above Weir
		50+	Sacramento Sucker	Juvenile	MC Below Weir
		20	Sacramento Pikeminnow	Juvenile	MC Below Weir
		6	Sacramento Sucker	Juvenile	MC Above Weir
		10	Sacramento Pikeminnow	Juvenile	MC Above Weir
		2	Bluegill	Juvenile	MC Above Weir
10/7/15	13:30	0	N/A	N/A	N/A
10/8/15	9:00	1	Sacramento Sucker	Adult	TR Below Weir
		25	Sacramento Sucker	Juvenile	MC Below Weir
		15	Sacramento Pikeminnow	Juvenile	MC Below Weir
		4	Sacramento Sucker	Juvenile	MC Above Weir
		3	Sacramento Pikeminnow	Juvenile	MC Above Weir
10/8/15	18:30	0	N/A	N/A	N/A
10/9/15	9:00	20	Sacramento Sucker	Juvenile	MC Below Weir
		40	Sacramento Pikeminnow	Juvenile	MC Below Weir
		6	Sacramento Sucker	Juvenile	MC Above Weir
		4	Sacramento Pikeminnow	Juvenile	MC Above Weir
10/9/15	17:30	0	N/A	N/A	N/A
10/10/15	9:00	50+	Sacramento Sucker	Juvenile	MC Below Weir
		1	Sculpin	Juvenile	MC Below Weir
		20	Sacramento Pikeminnow	Juvenile	MC Below Weir
		15	Sacramento Sucker	Juvenile	MC Above Weir
10/10/15	12:45	0	N/A	N/A	N/A
10/11/15	8:45	75	Sacramento Sucker	Juvenile	MC Below Weir
		25	Sacramento Pikeminnow	Juvenile	MC Below Weir
		15	Sacramento Sucker	Juvenile	MC Above Weir
10/11/15	15:00	0	N/A	N/A	N/A
10/12/15	9:00	65	Sacramento Sucker	Juvenile	MC Below Weir
		40	Sacramento Pikeminnow	Juvenile	MC Below Weir
		25	Sacramento Sucker	Juvenile	MC Above Weir
10/12/15	17:15	0	N/A	N/A	N/A
10/13/15	8:45	12	Sacramento Sucker	Juvenile	MC Below Weir
		18	Sacramento Pikeminnow	Juvenile	MC Below Weir
		6	Sacramento Sucker	Juvenile	MC Above Weir
		6	Sacramento Pikeminnow	Juvenile	MC Above Weir
10/13/15	15:45	0	N/A	N/A	N/A
10/14/15	9:15	125	Sacramento Sucker	Juvenile	MC Below Weir
		60	Sacramento Pikeminnow	Juvenile	MC Below Weir
		25	Sacramento Sucker	Juvenile	MC Above Weir
10/14/15	18:00	0	N/A	N/A	N/A
10/15/15	8:45	50+	Sacramento Pikeminnow	Juvenile	MC Below Weir
		30	Sacramento Sucker	Juvenile	MC Below Weir
		4	Sacramento Pikeminnow	Juvenile	MC Above Weir
		12	Sacramento Sucker	Juvenile	MC Above Weir
10/15/15	17:15	0	N/A	N/A	N/A
10/16/15	8:45	2	Sacramento Pikeminnow	Adult	TR Below Weir
		50+	Sacramento Sucker	Juvenile	MC Below Weir

Sample Date	Sample Time	Count	Species[1]	Life Stage[1]	Location[1,2]
		50+	Sacramento Pikeminnow	Juvenile	MC Below Weir
		2	Sacramento Sucker	Juvenile	MC Above Weir
10/16/15	17:45	0	N/A	N/A	N/A
10/17/15	8:45	50+	Sacramento Sucker	Juvenile	MC Below Weir
		30	Sacramento Pikeminnow	Juvenile	MC Below Weir
		5	Sacramento Sucker	Juvenile	MC Above Weir
10/17/15	14:30	0	N/A	N/A	N/A
10/18/15	11:00	50+	Sacramento Sucker	Juvenile	MC Below Weir
		30	Sacramento Pikeminnow	Juvenile	MC Below Weir
		5	Sacramento Sucker	Juvenile	MC Above Weir
10/18/15	15:45	0	N/A	N/A	N/A
10/19/15	11:15	50+	Sacramento Sucker	Juvenile	MC Below Weir
		40	Sacramento Pikeminnow	Juvenile	MC Below Weir
		20	Sacramento Sucker	Juvenile	MC Above Weir
10/19/15	16:00	0	N/A	N/A	N/A
10/20/15	10:00	50+	Sacramento Sucker	Juvenile	MC Below Weir
		35	Sacramento Pikeminnow	Juvenile	MC Below Weir
		4	Sacramento Sucker	Juvenile	MC Above Weir
10/20/15	16:00	0	N/A	N/A	N/A
10/21/15	9:30	4	Sacramento Sucker	Juvenile	MC Above Weir
		16	Sacramento Sucker	Juvenile	MC Below Weir
		25	Sacramento Pikeminnow	Juvenile	MC Below Weir
10/21/15	16:15	0	N/A	N/A	N/A
10/22/15	10:00	4	Sacramento Pikeminnow	Juvenile	MC Above Weir
		1	Sacramento Sucker	Juvenile	MC Above Weir
		37	Sacramento Pikeminnow	Juvenile	MC Below Weir
		29	Sacramento Sucker	Juvenile	MC Below Weir
10/22/15	17:45	0	N/A	N/A	N/A
10/23/15	8:30	16	Sacramento Sucker	Juvenile	MC Below Weir
		4	Sacramento Sucker	Juvenile	MC Above Weir
10/23/15	16:00	0	N/A	N/A	N/A
10/24/15	8:45	50+	Sacramento Sucker	Juvenile	MC Below Weir
		25	Sacramento Pikeminnow	Juvenile	MC Below Weir
		10	Sacramento Sucker	Juvenile	MC Above Weir
10/24/15	15:15	0	N/A	N/A	N/A
10/25/15	8:45	30	Sacramento Sucker	Juvenile	MC Below Weir
		20	Sacramento Pikeminnow	Juvenile	MC Below Weir
10/25/15	15:45	0	N/A	N/A	N/A
10/26/15	8:45	2	Fall-run Chinook Salmon	Adult	TR Above Weir
		29	Sacramento Sucker	Juvenile	MC Below Weir
		47	Sacramento Pikeminnow	Juvenile	MC Below Weir
10/26/15	16:45	0	N/A	N/A	N/A
10/27/15	8:45	50+	Sculpin	Juvenile	MC Below Weir
		5	Threespine Stickleback	Juvenile	MC Below Weir
		6	Hardhead	Adult	MC Below Weir
10/28/15	9:15	39	Sacramento sucker	Juvenile	MC Below Weir
		17	Sacramento pikeminnow	Juvenile	MC Below Weir
10/28/15	17:30	0	N/A	N/A	N/A
10/29/15	8:00	1	Striped Bass	Adult	TR Below Weir
10/29/15	16:00	0	N/A	N/A	N/A
10/30/15	10:30	6	Unidentified	Juvenile	MC Above Weir

Sample Date	Sample Time	Count	Species[1]	Life Stage[1]	Location[1,2]
10/30/15	17:45	0	N/A	N/A	N/A
10/31/15	9:15	50+	Sacramento Sucker	Juvenile	MC Below Weir
		20	Sacramento Pikeminnow	Juvenile	MC Below Weir
		2	Sacramento Sucker	Juvenile	MC Above Weir
10/31/15	16:15	0	N/A	N/A	N/A
11/1/15	11:00	50+	Sacramento Sucker	Juvenile	MC Below Weir
		35	Sacramento Pikeminnow	Juvenile	MC Below Weir
11/1/15	16:15	0	N/A	N/A	N/A
11/2/15	10:00	--[3]	N/A	N/A	N/A
11/2/15	16:00	0	N/A	N/A	N/A
11/3/15	8:45	1	Fall-run Chinook Salmon	Adult	TR Above Weir
		1	Sacramento Pikeminnow	Adult	MC Below Weir
		50+	Sacramento Pikeminnow	Juvenile	MC Below Weir
		40	Sacramento Sucker	Juvenile	MC Below Weir
		1	Sacramento Sucker	Juvenile	MC Above Weir
11/3/15	12:15	0	N/A	N/A	N/A
11/4/15	7:30	33	Sacramento Pikeminnow	Juvenile	MC Below Weir
		21	Sacramento Sucker	Juvenile	MC Below Weir
		6	Threespine Stickleback	Adult	MC Below Weir
11/4/15	12:00	0	N/A	N/A	N/A
11/5/15	9:15	50+	Sacramento Sucker	Juvenile	MC Below Weir
		50+	Sacramento Pikeminnow	Juvenile	MC Below Weir
11/5/15	12:30	0	N/A	N/A	N/A
11/6/15	9:00	19	Sacramento Sucker	Juvenile	MC Below Weir
		27	Sacramento Pikeminnow	Juvenile	MC Below Weir
11/6/15	12:30	0	N/A	N/A	N/A
11/7/15	9:30	50+	Sacramento Sucker	Juvenile	MC Below Weir
		15	Sacramento Pikeminnow	Juvenile	MC Below Weir
11/7/15	12:15	0	N/A	N/A	N/A
11/8/15	9:45	50+	Sacramento Sucker	Juvenile	MC Below Weir
		20	Sacramento Pikeminnow	Juvenile	MC Below Weir
11/8/15	12:15	0	N/A	N/A	N/A
11/9/15	9:30	50+	Sacramento Sucker	Juvenile	MC Below Weir
		25+	Sacramento Pikeminnow	Juvenile	MC Below Weir
		6	Sacramento Sucker	Juvenile	MC Above Weir
11/9/15	12:00	0	N/A	N/A	N/A
11/10/15	9:00	1	Sacramento Sucker	Juvenile	MC Below Weir
		3	Sacramento Sucker	Adult	MC Below Weir
		50+	Sacramento Pikeminnow	Juvenile	MC Below Weir
		2	Sacramento Pikeminnow	Adult	MC Below Weir
11/10/15	12:15	0	N/A	N/A	N/A
11/11/15	8:30	8	Sacramento Sucker	Adult	MC Below Weir
		50+	Sacramento Sucker	Juvenile	MC Above Weir
11/11/15	11:45	0	N/A	N/A	N/A
11/12/15	11:00	50	Sacramento Sucker	Juvenile	MC Below Weir
		3	Sculpin	Adult	MC Below Weir
		1	Fall-run Chinook Salmon	Adult	MC Below Weir
11/12/15	12:00	0	N/A	N/A	N/A
11/13/15	9:15	50+	Sacramento Sucker	Juvenile	MC Below Weir
		10	Sculpin	Adult	MC Below Weir
11/13/15	12:00	0	N/A	N/A	N/A

Sample Date	Sample Time	Count	Species[1]	Life Stage[1]	Location[1,2]
11/14/15	9:45	20	Sacramento Sucker	Juvenile	MC Below Weir
		40	Sacramento Pikeminnow	Juvenile	MC Below Weir
11/14/15	12:15	0	N/A	N/A	N/A
11/15/15	13:30	20	Sacramento Sucker	Juvenile	MC Below Weir
		4	Sacramento Pikeminnow	Juvenile	MC Below Weir
11/15/15	12:15	0	N/A	N/A	N/A
11/16/15	10:15	55	Sacramento Pikeminnow	Juvenile	MC Below Weir
		40	Sacramento Sucker	Juvenile	MC Below Weir
11/16/15	12:00	0	N/A	N/A	N/A
11/17/15	10:15	4	Sacramento Pikeminnow	Juvenile	MC Below Weir
		15	Sacramento Sucker	Juvenile	MC Below Weir
11/17/15	12:00	0	N/A	N/A	N/A
11/18/15	10:15	50+	Sacramento Pikeminnow	Juvenile	MC Below Weir
		10	Sacramento Sucker	Juvenile	MC Below Weir
11/18/15	12:00	0	N/A	N/A	N/A
11/19/15	9:15	25	Sacramento Sucker	Juvenile	MC Below Weir
		45	Sacramento Pikeminnow	Juvenile	MC Below Weir
11/19/15	12:15	0	N/A	N/A	N/A
11/20/15	9:00	1	Fall-run Chinook Salmon	Adult	TR Below Weir
		15	Sacramento Sucker	Juvenile	MC Below Weir
		23	Sacramento Pikeminnow	Juvenile	MC Below Weir
11/20/15	11:45	0	N/A	N/A	N/A
11/21/15	9:15	2	Fall-run Chinook Salmon	Adult	TR Above Weir
		25	Sacramento Sucker	Juvenile	MC Below Weir
		50+	Sacramento Pikeminnow	Juvenile	MC Below Weir
11/21/15	12:00	0	N/A	N/A	N/A
11/22/15	9:00	20	Sacramento Sucker	Juvenile	MC Below Weir
		15	Sacramento Pikeminnow	Juvenile	MC Below Weir
11/22/15	12:00	0	N/A	N/A	N/A
11/23/15	10:30	3	Fall-run Chinook Salmon	Adult	TR Below Weir
		35	Sacramento Sucker	Juvenile	MC Below Weir
		45	Sacramento Pikeminnow	Juvenile	MC Below Weir
		1	Unidentified	Unknown	MC Above Weir
11/23/15	11:30	0	N/A	N/A	N/A
11/24/15	10:00	1	Fall-run Chinook Salmon	Adult	TR Below Weir
		12	Sacramento Pikeminnow	Juvenile	MC Above Weir
		3	Sacramento Sucker	Juvenile	MC Above Weir
11/24/15	12:00	0	N/A	N/A	N/A
11/25/15	9:00	1	Fall-run Chinook Salmon	Adult	TR Below Weir
		25	Sacramento Sucker	Juvenile	MC Below Weir
		15	Sacramento Pikeminnow	Juvenile	MC Below Weir
11/25/15	16:30	0	N/A	N/A	N/A
11/26/15	8:45	20	Sacramento Sucker	Juvenile	MC Below Weir
		1	Fall-run Chinook Salmon	Adult	MC Below Weir
11/26/15	11:50	0	N/A	N/A	N/A
11/27/15	9:45	20	Sacramento Pikeminnow	Juvenile	MC Below Weir
		15	Sacramento Sucker	Juvenile	MC Below Weir
11/27/15	16:50	0	N/A	N/A	N/A
11/28/15	9:15	10	Sacramento Pikeminnow	Juvenile	MC Below Weir
		20	Sacramento Sucker	Juvenile	MC Below Weir
11/28/15	12:00	0	N/A	N/A	N/A

Sample Date	Sample Time	Count	Species[1]	Life Stage[1]	Location[1,2]
11/29/15	9:30	1	Fall-run Chinook Salmon	Adult	TR Below Weir
		15	Sacramento Sucker	Juvenile	MC Below Weir
		5	Sacramento Pikeminnow	Juvenile	MC Below Weir
11/30/15	9:30	12	Sacramento Sucker	Juvenile	MC Below Weir
		3	Sacramento Pikeminnow	Juvenile	MC Below Weir
11/30/15	12:00	5	Sacramento Sucker	Juvenile	Sluice Gate Channel
11/30/15	12:00	1	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
12/1/15	9:15	12	Sacramento Pikeminnow	Juvenile	MC Below Weir
12/1/15	16:20	0	N/A	N/A	N/A
12/2/15	8:45	2	Sacramento Pikeminnow	Juvenile	MC Below Weir
12/2/15	15:40	0	N/A	N/A	N/A
12/3/15	9:00	5	Sacramento Pikeminnow	Juvenile	MC Below Weir
12/3/15	13:30	0	N/A	N/A	N/A
12/4/15	9:15	0	N/A	N/A	N/A
12/5/15	9:00	10	Sacramento sucker	Juvenile	MC Below Weir
12/6/15	9:00	7	Sacramento sucker	Juvenile	MC Below Weir
12/7/15	8:30	2	Fall-run Chinook salmon	Adult	TR Above Weir
		30	Sacramento sucker	Juvenile	MC Below Weir
12/8/15	8:30	0	N/A	N/A	N/A
12/9/15	8:15	28	Sacramento Sucker	Juvenile	MC Below Weir
		15	Sacramento Pikeminnow	Juvenile	MC Below Weir
		1	Fall-run Chinook Salmon	Adult	MC Above Weir
12/10/15	8:45	10	Sacramento Sucker	Juvenile	MC Below Weir
		15	Sacramento Pikeminnow	Juvenile	MC Below Weir
		2	Fall-run Chinook Salmon	Adult	MC Above Weir
12/11/15	9:30	2	Fall-run Chinook Salmon	Adult	MC Above Weir
12/12/15	9:00	10	Sacramento Sucker	Juvenile	MC Below Weir
12/12/15	16:20	0	N/A	N/A	N/A
12/13/15	9:00	0	N/A	N/A	N/A
12/14/15	8:45	7	Sacramento Sucker	Juvenile	MC Below Weir
12/15/15	9:00	3	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
12/16/15	9:30	1	Sculpin	Unknown	MC Below Weir
12/16/15	17:00	0	N/A	N/A	N/A
12/17/15	9:45	4	Sacramento Sucker	Juvenile	MC Below Weir
12/17/15	16:30	0	N/A	N/A	N/A
12/18/15	9:00	3	Sacramento Pikeminnow	Juvenile	MC Below Weir
12/18/15	16:00	0	N/A	N/A	N/A
12/19/15	10:00	--[3]	N/A	N/A	N/A
12/19/15	15:55	0	N/A	N/A	N/A
12/20/15	10:45	14	Sacramento Sucker	Juvenile	MC Below Weir
		6	Sacramento Pikeminnow	Juvenile	MC Below Weir
		4	Sacramento Sucker	Juvenile	MC Above Weir
12/20/15	15:50	0	N/A	N/A	N/A
12/21/15	11:15	1	Sculpin	Adult	MC Below Weir
12/21/15	15:45	0	N/A	N/A	N/A
12/22/15	8:30	1	Fall-run Chinook Salmon	Adult	TR Above Weir
12/22/15	15:15	0	N/A	N/A	N/A
12/23/15	10:30	11	Sacramento Sucker	Juvenile	MC Below Weir
		28	Sacramento Pikeminnow	Juvenile	MC Below Weir
12/23/15	16:15	0	N/A	N/A	N/A
12/24/15	10:00	--[3]	N/A	N/A	N/A

Sample Date	Sample Time	Count	Species[1]	Life Stage[1]	Location[1,2]
12/24/15	15:30	0	N/A	N/A	N/A
12/25/15	9:45	1	Fall-run Chinook Salmon (mortality)	Adult	Sluice Gate Channel
12/25/15	16:05	0	N/A	N/A	N/A
12/26/15	11:30	0	N/A	N/A	N/A
12/27/15	8:30	0	N/A	N/A	N/A
12/27/15	16:00	0	N/A	N/A	N/A
12/28/15	8:30	0	N/A	N/A	N/A
12/28/15	15:45	0	N/A	N/A	N/A
12/29/15	9:15	1	Sculpin	Adult	MC Below Weir
12/30/15	8:45	0	N/A	N/A	N/A
12/30/15	16:30	0	N/A	N/A	N/A
12/31/15	11:30	0	N/A	N/A	N/A
12/31/15	16:30	0	N/A	N/A	N/A
1/1/16	14:50	0	N/A	N/A	N/A
1/2/16	8:45	1	Sculpin	Juvenile	MC Below Weir
1/3/16	11:00	0	N/A	N/A	N/A
1/3/16	16:30	0	N/A	N/A	N/A
1/4/16	10:45	0	N/A	N/A	N/A
1/4/16	16:00	0	N/A	N/A	N/A
1/5/16	13:30	0	N/A	N/A	N/A
1/6/16	16:30	0	N/A	N/A	N/A
1/7/16	10:30	0	N/A	N/A	N/A
1/7/16	15:00	0	N/A	N/A	N/A
1/8/16	9:30	0	N/A	N/A	N/A
1/8/16	16:30	0	N/A	N/A	N/A
1/9/16	9:15	0	N/A	N/A	N/A
1/9/16	16:30	0	N/A	N/A	N/A
1/10/16	9:30	0	N/A	N/A	N/A
1/10/16	15:45	0	N/A	N/A	N/A
1/11/16	9:45	0	N/A	N/A	N/A
1/11/16	9:30	0	N/A	N/A	N/A
1/12/16	9:30	0	N/A	N/A	N/A
1/12/16	13:30	0	N/A	N/A	N/A
1/13/16	10:45	0	N/A	N/A	N/A
1/13/16	15:10	0	N/A	N/A	N/A
1/14/16	10:00	0	N/A	N/A	N/A
1/14/16	15:30	0	N/A	N/A	N/A
1/15/16	12:00	0	N/A	N/A	N/A
1/15/16	16:00	0	N/A	N/A	N/A
1/16/16	11:15	0	N/A	N/A	N/A
1/16/16	16:20	0	N/A	N/A	N/A
1/17/16	11:00	0	N/A	N/A	N/A
1/17/16	15:15	0	N/A	N/A	N/A
1/17/16	18:45	0	N/A	N/A	N/A
1/18/16	13:15	0	N/A	N/A	N/A
1/18/16	15:30	0	N/A	N/A	N/A
1/19/16	10:00	--[3]	N/A	N/A	N/A
1/19/16	16:00	0	N/A	N/A	N/A
1/20/16	10:00	0	N/A	N/A	N/A
1/22/16	8:00	0	N/A	N/A	N/A

Sample Date	Sample Time	Count	Species[1]	Life Stage[1]	Location[1,2]
1/23/16	14:00	0	N/A	N/A	N/A
1/24/16	8:30	1	Fall-run Chinook Salmon	Adult	TR Below Weir
1/24/16	14:30	0	N/A	N/A	N/A
1/25/16	9:15	0	N/A	N/A	N/A
1/25/16	15:30	0	N/A	N/A	N/A
1/26/16	12:30	0	N/A	N/A	N/A
1/26/16	16:00	0	N/A	N/A	N/A
1/27/16	11:00	0	N/A	N/A	N/A
1/29/16	11:00	0	N/A	N/A	N/A
1/30/16	10:00	0	N/A	N/A	N/A
1/30/16	14:30	0	N/A	N/A	N/A
1/31/16	10:00	0	N/A	N/A	N/A
1/31/16	16:00	0	N/A	N/A	N/A
2/1/16	11:30	0	N/A	N/A	N/A
2/1/16	13:00	0	N/A	N/A	N/A
2/2/16	10:00	0	N/A	N/A	N/A
2/2/16	17:00	0	N/A	N/A	N/A
2/3/16	9:45	0	N/A	N/A	N/A
2/3/16	16:40	0	N/A	N/A	N/A
2/4/16	9:30	0	N/A	N/A	N/A
2/4/16	17:05	0	N/A	N/A	N/A
2/5/16	12:30	0	N/A	N/A	N/A
2/5/16	17:00	0	N/A	N/A	N/A
2/6/16	12:30	0	N/A	N/A	N/A
2/6/16	16:35	0	N/A	N/A	N/A
2/7/16	9:45	0	N/A	N/A	N/A
2/7/16	14:00	0	N/A	N/A	N/A
2/8/16	9:30	0	N/A	N/A	N/A
2/8/16	15:30	0	N/A	N/A	N/A
2/9/16	9:30	0	N/A	N/A	N/A
2/9/16	13:00	0	N/A	N/A	N/A
2/10/16	10:00	0	N/A	N/A	N/A
2/10/16	17:05	0	N/A	N/A	N/A
2/11/16	9:15	0	N/A	N/A	N/A
2/11/16	16:30	0	N/A	N/A	N/A
2/12/16	9:00	0	N/A	N/A	N/A
2/12/16	10:00	--[3]	N/A	N/A	N/A
2/13/16	10:30	0	N/A	N/A	N/A
2/13/16	16:00	0	N/A	N/A	N/A
2/14/16	10:15	0	N/A	N/A	N/A
2/14/16	17:00	0	N/A	N/A	N/A
2/15/16	10:30	0	N/A	N/A	N/A
2/15/16	16:00	0	N/A	N/A	N/A
2/16/16	9:45	0	N/A	N/A	N/A
2/16/16	12:00	0	N/A	N/A	N/A
2/17/16	9:00	0	N/A	N/A	N/A
2/17/16	14:50	0	N/A	N/A	N/A
2/18/16	10:45	0	N/A	N/A	N/A
2/18/16	15:45	0	N/A	N/A	N/A
2/19/16	11:00	1	Unknown Bass	Adult	TR Below Weir
2/19/16	15:20	0	N/A	N/A	N/A

Sample Date	Sample Time	Count	Species[1]	Life Stage[1]	Location[1,2]
2/20/16	10:30	1	Sculpin	N/A	MC Above Weir
2/20/16	14:00	0	N/A	N/A	N/A
2/21/16	10:15	0	N/A	N/A	N/A
2/21/16	15:50	0	N/A	N/A	N/A
2/22/16	9:45	0	N/A	N/A	N/A
2/22/16	17:30	0	N/A	N/A	N/A
2/23/16	10:00	0	N/A	N/A	N/A
2/23/16	17:00	0	N/A	N/A	N/A
2/24/16	9:15	0	N/A	N/A	N/A
2/24/16	16:30	0	N/A	N/A	N/A
2/25/16	9:30	0	N/A	N/A	N/A
2/25/16	14:20	0	N/A	N/A	N/A
2/26/16	9:15	1	Unknown Bass	Adult	TR Below Weir
2/26/16	16:50	0	N/A	N/A	N/A
2/27/16	9:45	0	N/A	N/A	N/A
2/27/16	15:00	0	N/A	N/A	N/A
2/28/16	9:30	0	N/A	N/A	N/A
2/28/16	17:30	0	N/A	N/A	N/A
2/29/16	10:00	--[3]	N/A	N/A	N/A
2/29/16	14:15	0	N/A	N/A	N/A
3/1/16	10:45	0	N/A	N/A	N/A
3/1/16	11:30	0	N/A	N/A	N/A
3/2/16	9:30	0	N/A	N/A	N/A
3/2/16	16:30	0	N/A	N/A	N/A
3/3/16	10:15	0	N/A	N/A	N/A
3/3/16	16:30	0	N/A	N/A	N/A
3/4/16	10:00	0	N/A	N/A	N/A
3/4/16	13:30	0	N/A	N/A	N/A
3/5/16	16:00	0	N/A	N/A	N/A
3/6/16	14:00	0	N/A	N/A	N/A
3/7/16	13:30	0	N/A	N/A	N/A
3/7/16	17:15	0	N/A	N/A	N/A
3/8/16	9:45	0	N/A	N/A	N/A
3/8/16	16:00	0	N/A	N/A	N/A
3/9/16	9:15	0	N/A	N/A	N/A
3/9/16	17:00	0	N/A	N/A	N/A
3/10/16	10:00	0	N/A	N/A	N/A
3/10/16	16:50	0	N/A	N/A	N/A
3/11/16	9:15	0	N/A	N/A	N/A
3/11/16	15:00	0	N/A	N/A	N/A
3/12/16	11:00	0	N/A	N/A	N/A
3/12/16	15:30	0	N/A	N/A	N/A
3/13/16	10:00	--[3]	N/A	N/A	N/A
3/13/16	17:00	0	N/A	N/A	N/A
3/14/16	11:00	0	N/A	N/A	N/A
3/14/16	12:15	0	N/A	N/A	N/A
3/15/16	12:00	0	N/A	N/A	N/A
3/15/16	12:30	0	N/A	N/A	N/A
3/16/16	9:15	0	N/A	N/A	N/A
3/16/16	16:30	0	N/A	N/A	N/A
3/17/16	13:30	0	N/A	N/A	N/A

Sample Date	Sample Time	Count	Species[1]	Life Stage[1]	Location[1,2]
3/17/16	16:00	0	N/A	N/A	N/A
3/18/16	9:15	0	N/A	N/A	N/A
3/18/16	18:00	0	N/A	N/A	N/A
3/19/16	10:30	0	N/A	N/A	N/A
3/19/16	13:10	0	N/A	N/A	N/A
3/20/16	10:15	0	N/A	N/A	N/A
3/20/16	14:00	0	N/A	N/A	N/A
3/21/16	8:30	0	N/A	N/A	N/A
3/21/16	15:00	0	N/A	N/A	N/A
3/22/16	9:15	0	N/A	N/A	N/A
3/22/16	17:00	0	N/A	N/A	N/A
3/23/16	10:00	0	N/A	N/A	N/A
3/24/16	8:45	0	N/A	N/A	N/A
3/25/16	9:30	0	N/A	N/A	N/A
3/26/16	9:45	0	N/A	N/A	N/A
3/27/16	9:00	0	N/A	N/A	N/A
3/27/16	16:00	0	N/A	N/A	N/A
3/28/16	8:45	0	N/A	N/A	N/A
3/28/16	15:00	0	N/A	N/A	N/A
3/29/16	13:30	0	N/A	N/A	N/A
3/29/16	15:15	0	N/A	N/A	N/A
3/30/16	13:15	0	N/A	N/A	N/A
3/31/16	13:45	0	N/A	N/A	N/A
4/1/16	9:15	0	N/A	N/A	N/A
4/2/16	9:00	0	N/A	N/A	N/A
4/3/16	9:00	0	N/A	N/A	N/A
4/3/16	16:00	0	N/A	N/A	N/A
4/4/16	9:45	0	N/A	N/A	N/A
4/4/16	12:45	0	N/A	N/A	N/A
4/5/16	10:45	0	N/A	N/A	N/A
4/5/16	12:30	0	N/A	N/A	N/A
4/6/16	9:45	0	N/A	N/A	N/A
4/7/16	11:15	0	N/A	N/A	N/A
4/8/16	10:30	0	N/A	N/A	N/A
4/9/16	10:00	--[3]	N/A	N/A	N/A
4/10/16	10:45	0	N/A	N/A	N/A
4/10/16	13:00	0	N/A	N/A	N/A
4/11/16	9:00	0	N/A	N/A	N/A
4/11/16	16:45	0	N/A	N/A	N/A
4/12/16	12:45	0	N/A	N/A	N/A
4/12/16	15:15	0	N/A	N/A	N/A
4/13/16	10:15	0	N/A	N/A	N/A
4/13/16	16:00	0	N/A	N/A	N/A
4/14/16	8:15	0	N/A	N/A	N/A

[1] N/A – Data not applicable, as no fish were observed during survey event.
[2] MC – Location is the main channel of the Tuolumne River; TR – Location is the tailrace channel.
[3] Survey not conducted due to heavy rain causing low visibility condition.

FISH PRESENCE AND STRANDING ASSESSMENT
TECHNICAL MEMORANDUM

ATTACHMENT B

DAILY FISH OBSERVATIONS SURVEY INFORMATION FOR THE 2016/2017 MONITORING SEASON

Table B-1. Daily fish observation survey information for the 2016/2017 monitoring season.

Sample Date	Sample Time	Count	Species[1]	Life Stage[1]	Location[1,2]
9/15/16	9:45	2	Sculpin	Adult	MC Above Weir
		6	Sacramento Pikeminnow	Juvenile	MC Below Weir
9/16/16	9:15	0	N/A	N/A	N/A
9/17/16	13:15	0	N/A	N/A	N/A
9/18/16	9:00	0	N/A	N/A	N/A
9/19/16	12:00	0	N/A	N/A	N/A
9/20/16	8:30	3	Sacramento Pikeminnow	Juvenile	MC Below Weir
9/20/16	16:30	0	N/A	N/A	N/A
9/21/16	9:15	0	N/A	N/A	N/A
9/21/16	14:00	0	N/A	N/A	N/A
9/22/16	9:00	0	N/A	N/A	N/A
9/22/16	15:15	0	N/A	N/A	N/A
9/23/16	8:45	0	N/A	N/A	N/A
9/23/16	11:15	0	N/A	N/A	N/A
9/24/16	9:00	0	N/A	N/A	N/A
9/24/16	13:00	0	N/A	N/A	N/A
9/25/16	8:30	0	N/A	N/A	N/A
9/25/16	11:15	0	N/A	N/A	N/A
9/26/16	9:00	1	Sacramento Sucker	Juvenile	MC Below Weir
9/26/16	14:45	0	N/A	N/A	N/A
9/27/16	8:30	3	Sacramento Pikeminnow	Juvenile	MC Below Weir
9/27/16	15:45	0	N/A	N/A	N/A
9/28/16	9:15	0	N/A	N/A	N/A
9/28/16	16:00	0	N/A	N/A	N/A
9/29/16	8:45	0	N/A	N/A	N/A
9/30/16	8:45	0	N/A	N/A	N/A
10/1/16	8:30	0	N/A	N/A	N/A
10/2/16	8:15	4	Sacramento pikeminnow	Juvenile	MC Below Weir
10/2/16	10:45	0	N/A	N/A	N/A
10/3/16	9:00	0	N/A	N/A	N/A
10/3/16	13:15	0	N/A	N/A	N/A
10/4/16	9:15	0	N/A	N/A	N/A
10/4/16	10:30	0	N/A	N/A	N/A
10/4/16	13:15	0	N/A	N/A	N/A
10/5/16	10:00	8	Sacramento Pikeminnow	Juvenile	MC Below Weir
10/5/16	12:00	0	N/A	N/A	N/A
10/6/16	9:15	0	N/A	N/A	N/A
10/6/16	17:30	0	N/A	N/A	N/A
10/7/16	9:00	0	N/A	N/A	N/A
10/7/16	16:30	0	N/A	N/A	N/A
10/8/16	8:30	0	N/A	N/A	N/A
10/8/16	18:00	0	N/A	N/A	N/A
10/9/16	8:45	0	N/A	N/A	N/A
10/9/16	14:00	0	N/A	N/A	N/A
10/10/16	8:45	0	N/A	N/A	N/A
10/10/16	15:00	0	N/A	N/A	N/A
10/11/16	8:30	4	Unknown	Juvenile	MC Below Weir
10/11/16	14:00	0	N/A	N/A	N/A
10/12/16	15:15	0	N/A	N/A	N/A
10/13/16	11:15	0	N/A	N/A	N/A

Sample Date	Sample Time	Count	Species[1]	Life Stage[1]	Location[1,2]
10/14/16	10:45	0	N/A	N/A	N/A
10/15/16	11:15	0	N/A		N/A
10/16/16	10:00	0	N/A	N/A	N/A
10/16/16	14:00	0	N/A	N/A	N/A
10/17/16	12:45	0	N/A	N/A	N/A
10/17/16	14:00	0	N/A	N/A	N/A
10/18/16	11:15	0	N/A	N/A	N/A
10/18/16	16:00	0	N/A	N/A	N/A
10/19/16	12:00	0	N/A	N/A	N/A
10/19/16	16:30	0	N/A	N/A	N/A
10/20/16	9:30	5	Fall-run Chinook Salmon	Adult	TR Above Weir
		2	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
10/20/16	14:30	2	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
10/21/16	11:00	4	Fall-run Chinook Salmon	Adult	TR Above Weir
		1	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
10/22/16	9:00	1	Fall-run Chinook Salmon	Adult	TR Above Weir
10/23/16	9:00	7	Fall-run Chinook Salmon	Adult	TR Above Weir
		1	Fall-run Chinook Salmon	Adult	TR Below Weir
10/23/16	16:30	20	Fall-run Chinook Salmon	Adult	TR Above Weir
10/24/16	10:45	3	Fall-run Chinook Salmon	Adult	TR Below Weir
		17	Fall-run Chinook Salmon	Adult	TR Above Weir
		9	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
10/24/16	16:30	20	Fall-run Chinook Salmon	Adult	TR Above Weir
		5	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
10/25/16	9:00	3	Fall-run Chinook Salmon	Adult	TR Above Weir
		7	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
10/25/16	16:00	8	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
		20	Fall-run Chinook Salmon	Adult	TR Above Weir
10/26/16	8:00	10	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
		30	Fall-run Chinook Salmon	Adult	TR Above Weir
10/27/16	9:30	3	Fall-run Chinook Salmon	Adult	TR Above Weir
10/27/16	17:50	30	Fall-run Chinook Salmon	Adult	TR Above Weir
		10	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
10/28/16	9:00	10	Fall-run Chinook Salmon	Adult	TR Below Weir
		2	Fall-run Chinook Salmon	Adult	TR Above Weir
10/28/16	16:30	50	Fall-run Chinook Salmon	Adult	TR Above Weir
		30	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
10/29/16	8:15	4	Fall-run Chinook Salmon	Adult	TR Above Weir
		5	Fall-run Chinook Salmon	Adult	TR Below Weir
10/29/16	17:00	20	Fall-run Chinook Salmon	Adult	TR Above Weir
		15	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
10/30/16	8:15	7	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
		6	Fall-run Chinook Salmon	Adult	TR Below Weir
10/30/16	13:00	3	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
10/31/16	10:45	4	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
10/31/16	12:30	6	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
		5	Fall-run Chinook Salmon	Adult	TR Above Weir
11/1/16	8:15	11	Fall-run Chinook Salmon	Adult	TR Above Weir
		5	Fall-run Chinook Salmon	Adult	TR Below Weir
11/1/16	16:00	6	Fall-run Chinook Salmon	Adult	TR Above Weir
		8	Fall-run Chinook Salmon	Adult	Sluice Gate Channel

Sample Date	Sample Time	Count	Species[1]	Life Stage[1]	Location[1,2]
11/2/16	12:30	8	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
		10	Fall-run Chinook Salmon	Adult	TR Above Weir
11/2/16	13:00	3	Fall-run Chinook Salmon	Adult	TR Above Weir
		3	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
11/3/16	11:25	18	Fall-run Chinook Salmon	Adult	TR Above Weir
		20	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
		12	Fall-run Chinook Salmon	Adult	TR Below Weir
11/3/16	16:00	6	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
		10	Fall-run Chinook Salmon	Adult	TR Above Weir
11/4/16	9:15	2	Fall-run Chinook Salmon	Adult	TR Below Weir
		2	Fall-run Chinook Salmon	Adult	MC Below Weir
11/4/16	17:00	10	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
		12	Fall-run Chinook Salmon	Adult	TR Above Weir
11/5/16	8:30	20	Fall-run Chinook Salmon	Adult	TR Above Weir
		4	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
		8	Fall-run Chinook Salmon	Adult	TR Below Weir
11/5/16	13:30	10	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
		15	Fall-run Chinook Salmon	Adult	TR Above Weir
11/6/16	9:00	40	Fall-run Chinook Salmon	Adult	TR Above Weir
		8	Fall-run Chinook Salmon	Adult	TR Below Weir
		3	Sacramento Pikeminnow	Juvenile	MC Below Weir
11/6/16	11:00	6	Fall-run Chinook Salmon	Adult	TR Above Weir
		8	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
11/7/16	8:30	2	Fall-run Chinook Salmon	Adult	TR Above Weir
		2	Fall-run Chinook Salmon	Adult	TR Below Weir
11/7/16	16:00	10	Fall-run Chinook Salmon	Adult	TR Above Weir
		6	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
11/8/16	8:45	40+	Fall-run Chinook Salmon	Adult	TR Above Weir
		8	Fall-run Chinook Salmon	Adult	TR Below Weir
11/8/16	11:00	11	Fall-run Chinook Salmon	Adult	TR Above Weir
		8	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
11/9/16	9:45	1	Fall-run Chinook Salmon	Adult	MC Below Weir
		35	Fall-run Chinook Salmon	Adult	TR Above Weir
		10	Fall-run Chinook Salmon	Adult	TR Below Weir
		3	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
11/9/16	17:00	7	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
		16	Fall-run Chinook Salmon	Adult	TR Above Weir
11/10/16	10:55	35	Fall-run Chinook Salmon	Adult	TR Above Weir
		12	Fall-run Chinook Salmon	Adult	TR Below Weir
		2	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
		5	Fall-run Chinook Salmon	Adult	MC Above Weir
11/10/16	16:00	5	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
		15	Fall-run Chinook Salmon	Adult	TR Above Weir
11/11/16	8:30	10	Fall-run Chinook Salmon	Adult	TR Above Weir
		2	Fall-run Chinook Salmon	Adult	TR Below Weir
		6	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
		1	Fall-run Chinook Salmon	Adult	MC Below Weir
11/11/16	16:40	8	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
		15	Fall-run Chinook Salmon	Adult	TR Above Weir
11/12/16	8:45	9	Fall-run Chinook Salmon	Adult	TR Above Weir
		6	Fall-run Chinook Salmon	Adult	TR Below Weir

Sample Date	Sample Time	Count	Species[1]	Life Stage[1]	Location[1,2]
		10	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
		1	Fall-run Chinook Salmon	Adult	MC Above Weir
11/12/16	17:30	5	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
		15	Fall-run Chinook Salmon	Adult	TR Above Weir
11/13/16	9:00	10	Fall-run Chinook Salmon	Adult	TR Above Weir
		4	Fall-run Chinook Salmon	Adult	TR Below Weir
		2	Fall-run Chinook Salmon	Adult	MC Above Weir
11/13/16	13:00	3	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
		6	Fall-run Chinook Salmon	Adult	TR Above Weir
11/14/16	11:00	0	N/A	N/A	N/A
11/14/16	14:00	6	Fall-run Chinook Salmon	Adult	TR Above Weir
		4	Fall-run Chinook Salmon	Adult	MC Above Weir
11/15/16	8:30	5	Fall-run Chinook Salmon	Adult	TR Above Weir
		3	Fall-run Chinook Salmon	Adult	TR Below Weir
		1	Fall-run Chinook Salmon	Adult	MC Below Weir
		4	Fall-run Chinook Salmon	Adult	MC Above Weir
11/15/16	15:00	4	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
		10	Fall-run Chinook Salmon	Adult	TR Above Weir
11/16/16	8:45	9	Fall-run Chinook Salmon	Adult	TR Above Weir
		15	Fall-run Chinook Salmon	Adult	TR Below Weir
		7	Fall-run Chinook Salmon	Adult	MC Below Weir
		6	Fall-run Chinook Salmon	Adult	MC Above Weir
11/16/16	11:00	15	Fall-run Chinook Salmon	Adult	TR Above Weir
11/17/16	9:15	11	Fall-run Chinook Salmon	Adult	TR Above Weir
		13	Fall-run Chinook Salmon	Adult	TR Below Weir
		1	Fall-run Chinook Salmon	Adult	MC Below Weir
		7	Fall-run Chinook Salmon	Adult	MC Above Weir
11/17/16	15:30	3	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
		10	Fall-run Chinook Salmon	Adult	TR Above Weir
11/18/16	9:15	7	Fall-run Chinook Salmon	Adult	TR Above Weir
		9	Fall-run Chinook Salmon	Adult	TR Below Weir
		1	Fall-run Chinook Salmon	Adult	MC Below Weir
		6	Fall-run Chinook Salmon	Adult	MC Above Weir
11/18/16	15:30	2	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
		12	Fall-run Chinook Salmon	Adult	TR Above Weir
11/19/16	8:30	8	Fall-run Chinook Salmon	Adult	TR Below Weir
		1	Fall-run Chinook Salmon	Adult	TR Below Weir
		2	Fall-run Chinook Salmon	Adult	MC Above Weir
		1	Fall-run Chinook Salmon	Adult	MC Below Weir
11/19/16	10:00	5	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
		12	Fall-run Chinook Salmon	Adult	TR Above Weir
11/20/16	9:30	6	Fall-run Chinook Salmon	Adult	TR Above Weir
		4	Fall-run Chinook Salmon	Adult	TR Below Weir
		5	Fall-run Chinook Salmon	Adult	MC Above Weir
11/20/16	12:00	15	Fall-run Chinook Salmon	Adult	TR Above Weir
		5	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
11/21/16	8:45	8	Fall-run Chinook Salmon	Adult	TR Above Weir
		7	Fall-run Chinook Salmon	Adult	TR Below Weir
		4	Fall-run Chinook Salmon	Adult	MC Below Weir
		6	Fall-run Chinook Salmon	Adult	MC Above Weir
11/21/16	14:30	6	Fall-run Chinook Salmon	Adult	TR Above Weir

Sample Date	Sample Time	Count	Species[1]	Life Stage[1]	Location[1,2]
11/22/16	8:45	9	Fall-run Chinook Salmon	Adult	TR Above Weir
		7	Fall-run Chinook Salmon	Adult	TR Below Weir
		1	Fall-run Chinook Salmon	Adult	MC Below Weir
		4	Fall-run Chinook Salmon	Adult	MC Above Weir
11/22/16	13:00	4	Fall-run Chinook Salmon	Adult	TR Above Weir
11/23/16	8:15	4	Fall-run Chinook Salmon	Adult	TR Above Weir
		12	Fall-run Chinook Salmon	Adult	TR Below Weir
		1	Fall-run Chinook Salmon	Adult	MC Above Weir
		1	Fall-run Chinook Salmon	Adult	MC Below Weir
11/23/16	16:05	2	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
		7	Fall-run Chinook Salmon	Adult	TR Above Weir
11/24/16	9:00	1	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
		12	Fall-run Chinook Salmon	Adult	TR Above Weir
11/24/16	9:25	7	Fall-run Chinook Salmon	Adult	TR Below Weir
		4	Fall-run Chinook Salmon	Adult	MC Above Weir
11/25/16	9:30	18	Fall-run Chinook Salmon	Adult	TR Above Weir
		8	Fall-run Chinook Salmon	Adult	TR Below Weir
		1	Fall-run Chinook Salmon	Adult	MC Above Weir
11/25/16	10:30	2	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
		5	Fall-run Chinook Salmon	Adult	TR Above Weir
11/26/16	8:30	4	Fall-run Chinook Salmon	Adult	TR Above Weir
		1	Fall-run Chinook Salmon	Adult	TR Below Weir
		1	Sculpin	Adult	MC Below Weir
11/26/16	15:00	2	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
		3	Fall-run Chinook Salmon	Adult	TR Above Weir
11/27/16	9:15	17	Fall-run Chinook Salmon	Adult	TR Above Weir
		2	Fall-run Chinook Salmon	Adult	TR Below Weir
11/27/16	11:00	0	N/A	N/A	N/A
11/28/16	8:45	3	Fall-run Chinook Salmon	Adult	TR Above Weir
		2	Fall-run Chinook Salmon	Adult	TR Below Weir
		1	Fall-run Chinook Salmon	Adult	MC Below Weir
11/28/16	13:15	0	N/A	N/A	N/A
11/29/16	9:30	11	Fall-run Chinook Salmon	Adult	TR Above Weir
		4	Fall-run Chinook Salmon	Adult	TR Below Weir
		2	Fall-run Chinook Salmon	Adult	MC Below Weir
11/29/16	10:00	0	N/A	N/A	N/A
11/30/16	8:30	2	Fall-run Chinook Salmon	Adult	TR Above Weir
		5	Fall-run Chinook Salmon	Adult	TR Below Weir
		1	Fall-run Chinook Salmon	Adult	MC Above Weir
		1	Fall-run Chinook Salmon	Adult	MC Below Weir
11/30/16	16:00	2	Fall-run Chinook Salmon	Adult	TR Above Weir
		1	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
12/1/16	9:00	2	Fall-run Chinook Salmon	Adult	TR Above Weir
		3	Fall-run Chinook Salmon	Adult	TR Below Weir
		1	Fall-run Chinook Salmon	Adult	MC Below Weir
12/1/16	15:15	2	Fall-run Chinook Salmon	Adult	TR Above Weir
		1	Fall-run Chinook Salmon	Adult	Sluice Gate Channel
12/2/16	8:30	2	Fall-run Chinook Salmon	Adult	TR Above Weir
		1	Fall-run Chinook Salmon	Adult	TR Below Weir
12/2/16	15:30	2	Fall-run Chinook Salmon	Adult	TR Above Weir
		1	Fall-run Chinook Salmon	Adult	Sluice Gate Channel

Sample Date	Sample Time	Count	Species[1]	Life Stage[1]	Location[1,2]
12/3/16	8:30	1	Fall-run Chinook Salmon	Adult	TR Above Weir
		1	Fall-run Chinook Salmon	Adult	TR Below Weir
		1	Fall-run Chinook Salmon	Adult	MC Below Weir
12/3/16	16:00	2	Fall-run Chinook Salmon	Adult	TR Above Weir
12/4/16	8:30	12	Fall-run Chinook Salmon	Adult	TR Above Weir
12/4/16	9:00	0	N/A	N/A	N/A
12/5/16	9:15	2	Fall-run Chinook Salmon	Adult	TR Above Weir
		1	Fall-run Chinook Salmon	Adult	TR Below Weir
12/5/16	10:00	0	N/A	N/A	N/A
12/6/16	8:30	2	Fall-run Chinook Salmon	Adult	TR Above Weir
		1	Fall-run Chinook Salmon	Adult	TR Below Weir
12/6/16	15:30	0	N/A	N/A	N/A
12/7/16	8:45	3	Fall-run Chinook Salmon	Adult	TR Below Weir
		2	Fall-run Chinook Salmon	Adult	TR Above Weir
12/7/16	14:00	0	N/A	N/A	N/A
12/8/16	8:15	0	N/A	N/A	N/A
12/8/16	14:00	0	N/A	N/A	N/A
12/9/16	8:30	1	Fall-run Chinook Salmon	Adult	TR Above Weir
		1	Fall-run Chinook Salmon	Adult	TR Below Weir
12/9/16	14:00	0	N/A	N/A	N/A
12/10/16	8:45	0	N/A	N/A	N/A
12/10/16	11:30	0	N/A	N/A	N/A
12/11/16	8:30	3	Fall-run Chinook Salmon	Adult	TR Above Weir
12/11/16	11:00	0	N/A	N/A	N/A
12/12/16	8:30	0	N/A	N/A	N/A
12/12/16	10:45	0	N/A	N/A	N/A
12/13/16	8:45	0	N/A	N/A	N/A
12/13/16	13:30	0	N/A	N/A	N/A
12/14/16	9:15	4	Fall-run Chinook Salmon	Adult	TR Above Weir
12/14/16	10:00	0	N/A	N/A	N/A
12/15/16	8:45	0	N/A	N/A	N/A
12/15/16	13:00	0	N/A	N/A	N/A
12/16/16	9:00	1	Fall-run Chinook Salmon	Adult	TR Below Weir
		1	Fall-run Chinook Salmon	Adult	MC Above Weir
		1	Fall-run Chinook Salmon	Adult	MC Below Weir
12/16/16	12:00	0	N/A	N/A	N/A
12/17/16	8:30	1	Fall-run Chinook Salmon	Adult	TR Above Weir
		1	Fall-run Chinook Salmon	Adult	MC Above Weir
12/17/16	11:30	0	N/A	N/A	N/A
12/18/16	8:30	1	Fall-run Chinook Salmon	Adult	TR Above Weir
		2	Fall-run Chinook Salmon	Adult	MC Above Weir
		1	Sculpin	Adult	MC Below Weir
12/18/16	11:00	0	N/A	N/A	N/A
12/19/16	9:15	1	sculpin	Adult	MC Below Weir
12/19/16	13:00	0	N/A	N/A	N/A
12/20/16	9:30	1	Fall-run Chinook Salmon	Adult	TR Above Weir
12/20/16	10:30	0	N/A	N/A	N/A
12/21/16	8:45	1	Fall-run Chinook Salmon	Adult	TR Above Weir
		1	Fall-run Chinook Salmon	Adult	TR Below Weir
12/21/16	10:30	0	N/A	N/A	N/A
12/22/16	9:00	0	N/A	N/A	N/A

Sample Date	Sample Time	Count	Species[1]	Life Stage[1]	Location[1,2]
12/22/16	15:00	0	N/A	N/A	N/A
12/23/16	8:45	1	Fall-run Chinook Salmon	Adult	MC Below Weir
12/23/16	15:00	0	N/A	N/A	N/A
12/24/16	8:15	1	Fall-run Chinook Salmon	Adult	TR Above Weir
12/24/16	10:30	0	N/A	N/A	N/A
12/25/16	9:00	0	N/A	N/A	N/A
12/25/16	14:30	0	N/A	N/A	N/A
12/26/16	8:45	1	Fall-run Chinook Salmon	Adult	TR Above Weir
12/26/16	10:15	0	N/A	N/A	N/A
12/27/16	10:45	0	N/A	N/A	N/A
12/27/16	15:00	0	N/A	N/A	N/A
12/28/16	9:00	1	Fall-run Chinook Salmon	Adult	MC Above Weir
12/28/16	11:00	0	N/A	N/A	N/A
12/29/16	9:10	1	Fall-run Chinook Salmon	Adult	MC Below Weir
12/29/16	10:00	0	N/A	N/A	N/A
12/30/16	8:30	0	N/A	N/A	N/A
12/30/16	13:00	0	N/A	N/A	N/A
12/31/16	9:00	1	Fall-run Chinook Salmon	Adult	TR Below Weir
12/31/16	14:00	0	N/A	N/A	N/A
1/1/17	8:30	0	N/A	N/A	N/A
1/1/17	15:00	0	N/A	N/A	N/A

[1] N/A – Data not applicable, as no fish were observed during survey event.
[2] MC – Location is the main channel of the Tuolumne River; TR – Location is the tailrace channel.